in Austria

41st Report of the Austrian HIV Cohort Study

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HIV / AIDS
in Austria

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Austrian HIV Cohort Study

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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.

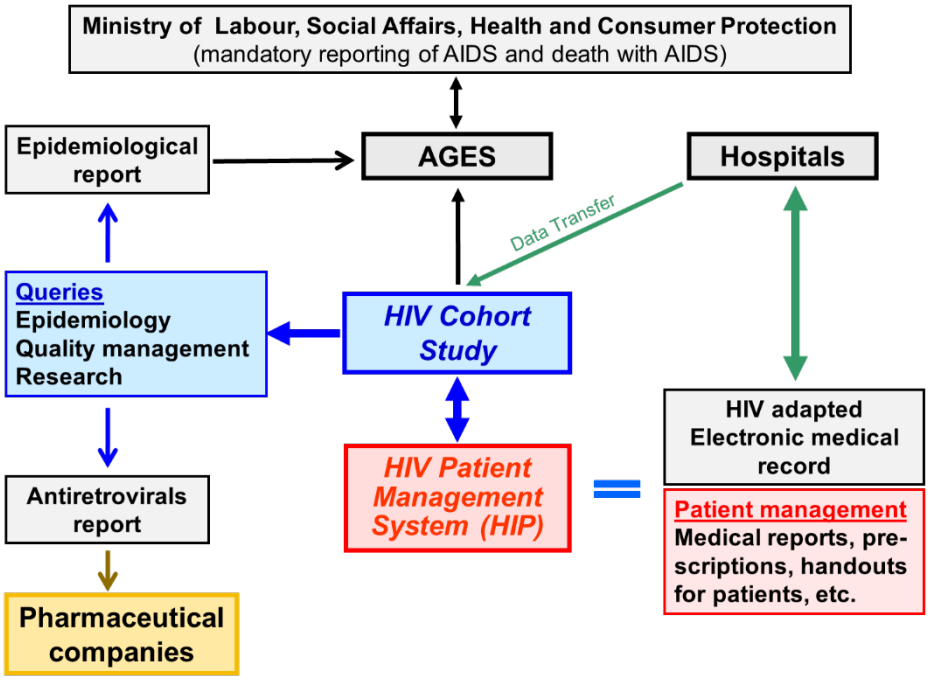
On the one hand, the *HIP* fulfils complex tasks for the clinical management of HIV infected patients, and on the other hand it allows queries and analyses to be performed by the users without restrictions. However, to allow both individual patient management and scientific queries is an enormous challenge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

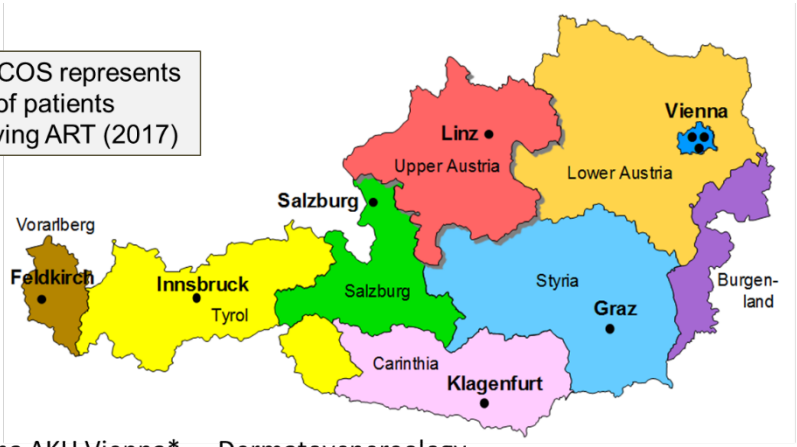
2 Organization of the Austrian HIV cohort study

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.

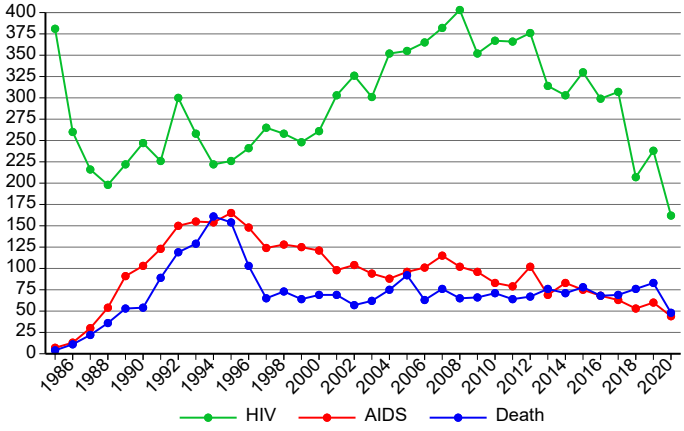
Minimal dataset:

- 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)

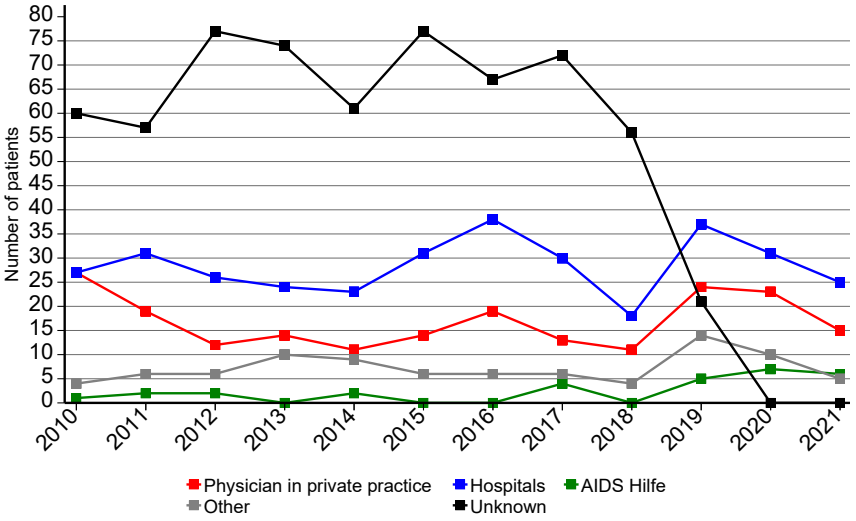
4.2 HIV, AIDS and Death per calendar year

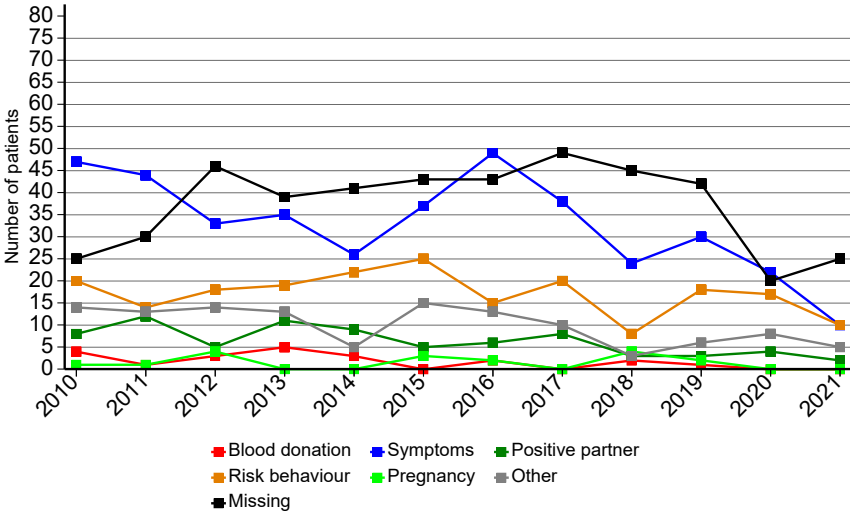


Year	HIV	AIDS	DEATH
1985	381	7	4
1986	260	13	11
1987	216	30	22
1988	198	54	36
1989	222	91	53
1990	247	103	54
1991	226	123	89
1992	300	150	119
1993	258	155	129
1994	222	154	161
1995	226	165	154
1996	241	148	103
1997	265	124	65
1998	258	128	73
1999	248	125	64
2000	261	121	69
2001	303	98	69
2002	326	104	57
2003	301	94	62
2004	352	88	75
2005	355	96	92
2006	365	101	63
2007	382	115	76
2008	403	102	65
2009	352	96	66
2010	367	83	71
2011	366	79	64
2012	376	102	67
2013	314	69	76
2014	303	83	71
2015	330	75	78
2016	299	68	68
2017	307	63	69
2018	207	53	76
2019	238	60	83
2020	162	44	48
2021	108	31	14
Total	10545	3395	2616

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, 10545 HIV infected patients providing 113452.96 years of follow-up have been recruited into the cohort study. We assume that there were more than 2616 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
01.09.2021	2732	3191	243	1194	523	1435	118	800	309	**10545**

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	843	60	744	1647
AKH Vienna	1368	77	1181	2626
KFJ Vienna	186	10	41	237
Linz	635	13	162	810
Salzburg	301	44	138	483
Innsbruck	727	221	88	1036
Feldkirch	95	2	15	112
Graz	473	19	200	692
Klagenfurt	229	12	45	286
Total	4857	458	2614	7929

	Death		Total
	Death within the last 12 months	Death since more than 12 months	
OWS Vienna	9	1076	1085
AKH Vienna	9	556	565
KFJ Vienna	1	5	6
Linz	1	383	384
Salzburg	0	40	40
Innsbruck	7	392	399
Feldkirch	0	6	6
Graz	1	107	108
Klagenfurt	0	23	23
Total	28	2588	2616

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

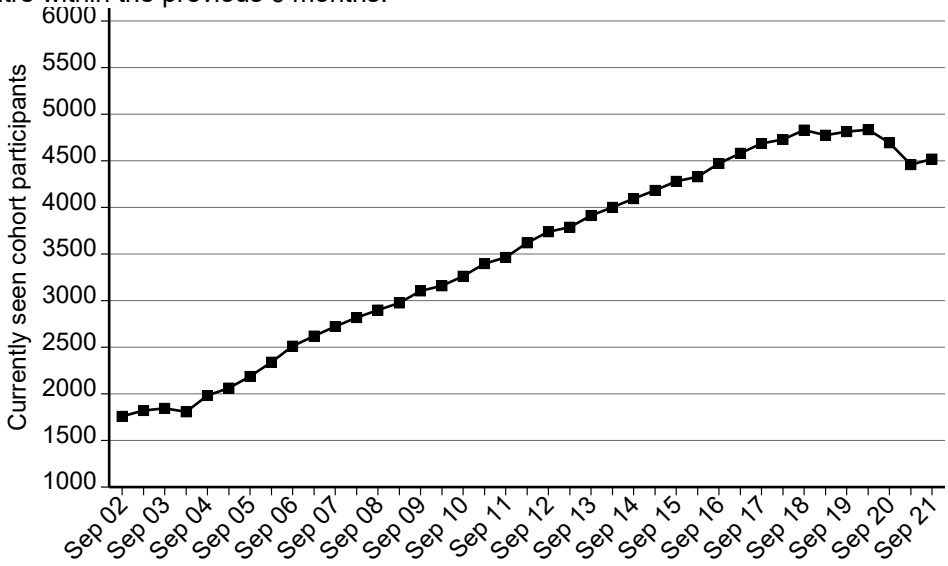
Persons with residency abroad were excluded from this analysis.

All centres	Frequencies		%	Univariable logistic Regression			Multivariable logistic Regression		
Variable	2614	7471	34.99%	**OR**	**(95%CI)**	**p-value**	**OR**	**(95%CI)**	**p-value**
Demographic characteristics									
Age at last contact									
< 30	531	756	70.24%	10.88	[9.05,13.09]	0.000	9.04	[7.41,11.03]	0.000
30-50	1603	4022	39.86%	3.06	[2.72,3.43]	0.000	2.67	[2.35,3.02]	0.000
> 50	480	2693	17.82%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	290	696	41.67%	1.28	[1.08,1.51]	0.004	1.22	[1.02,1.47]	0.029
Female IDU	115	309	37.22%	1.06	[0.83,1.35]	0.626	1.10	[0.85,1.44]	0.462
Male hetero	398	1313	30.31%	0.78	[0.68,0.89]	0.000	0.96	[0.82,1.13]	0.612
Female hetero	398	1346	29.57%	0.75	[0.66,0.86]	0.000	0.76	[0.65,0.89]	0.001
Other	230	505	45.54%	1.50	[1.24,1.81]	0.000	1.23	[0.98,1.54]	0.069
MSM	1183	3302	35.83%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Population size of residence area									
Vienna	1672	3575	46.77%	2.93	[2.65,3.24]	0.000	2.84	[2.55,3.16]	0.000
Missing	56	56	100.0%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Outside Vienna	886	3840	23.07%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
High prevalence	351	777	45.17%	1.87	[1.61,2.18]	0.000	1.62	[1.34,1.95]	0.000
Low prevalence	595	1420	41.90%	1.64	[1.45,1.85]	0.000	1.25	[1.10,1.43]	0.001
Missing	89	106	83.96%	11.90	[7.06,20.06]	0.000	5.70	[3.20,10.17]	0.000
Austria	1579	5168	30.55%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Stage of disease									
AIDS									
Yes	442	1603	27.57%	0.65	[0.57,0.73]	0.000	0.89	[0.78,1.02]	0.091
No	2172	5868	37.01%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

4.5 Patients currently in care

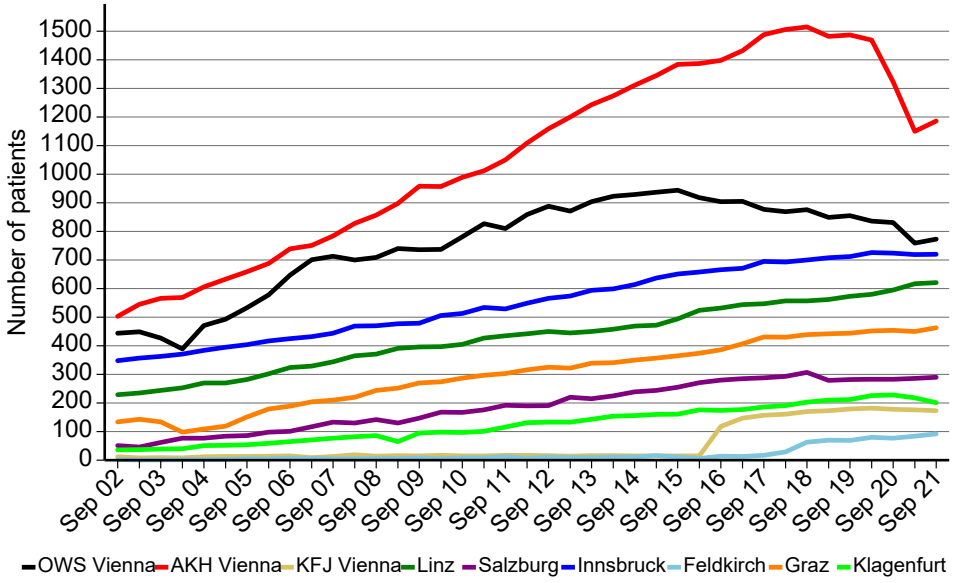
4.5.1 Overall

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
01.09.2021	773	1186	173	621	290	720	92	463	201	**4519**

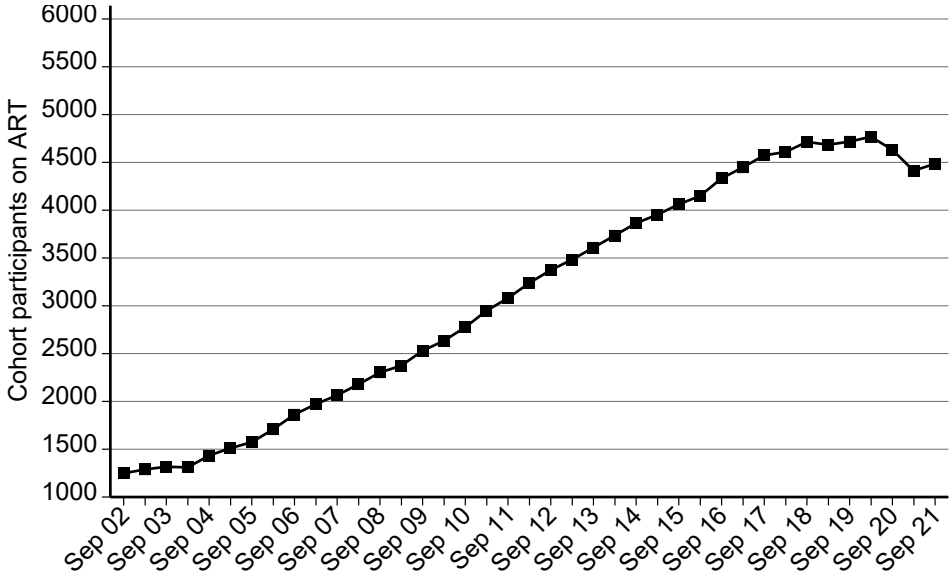


Number of currently seen patients by residence

	HIV-centre									
	OWS Vienna	AKH Vienna	KFJ Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	**Total**
Burgenland	22	27	8	0	0	0	0	15	0	**72**
Carinthia	0	1	0	3	7	8	0	15	194	**228**
Lower Austria	169	209	14	43	1	3	1	2	1	**443**
Upper Austria	0	5	0	552	22	4	0	1	0	**584**
Salzburg	0	1	1	5	220	29	0	1	0	**257**
Styria	3	7	0	5	7	3	0	421	2	**448**
Tyrol	0	0	0	1	5	528	0	1	0	**535**
Vorarlberg	0	0	0	1	0	126	90	0	0	**217**
Vienna	577	934	146	8	1	9	0	6	1	**1682**
Foreign/missing	2	2	4	3	27	10	1	1	3	**53**
Total	**773**	**1186**	**173**	**621**	**290**	**720**	**92**	**463**	**201**	**4519**

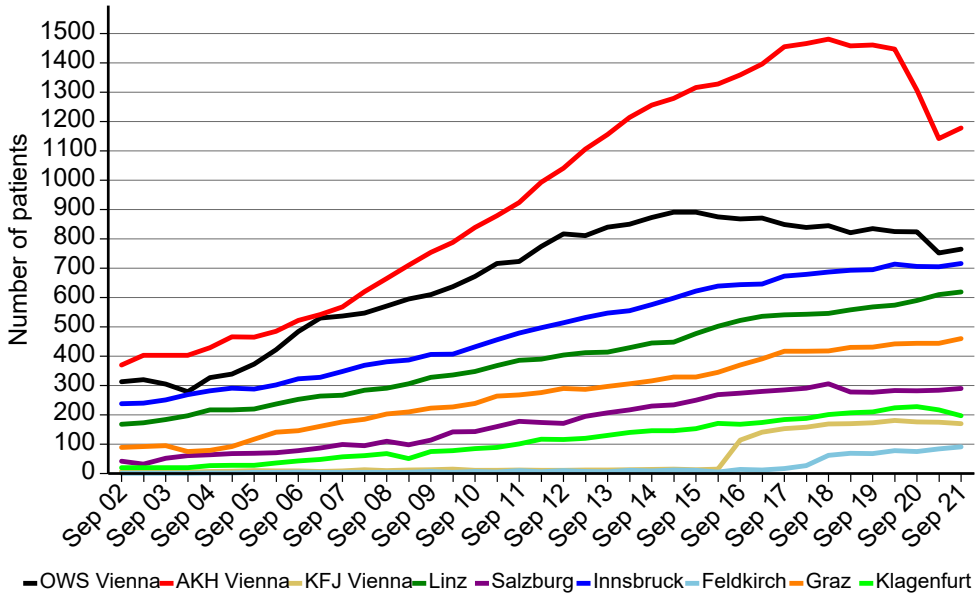
4.5.2 Number of patients currently on antiretroviral therapy

4486 patients (99.3%) were on antiretroviral therapy in the 9 HIV treatment centres. Of the 33 patients not on treatment 13 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**
01.09.2021	765	1178	170	619	290	716	91	460	197	**4486**



Number of participants currently on antiretroviral therapy by area of residence

	HIV-centre									
	OWS Vienna	AKH Vienna	KFJ Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	**Total**
Burgenland	22	27	8	0	0	0	0	15	0	**72**
Carinthia	0	1	0	3	7	8	0	15	190	**224**
Lower Austria	167	207	14	43	1	3	1	2	1	**439**
Upper Austria	0	5	0	550	22	4	0	1	0	**582**
Salzburg	0	1	1	5	220	29	0	1	0	**257**
Styria	3	7	0	5	7	3	0	418	2	**445**
Tyrol	0	0	0	1	5	524	0	1	0	**531**
Vorarlberg	0	0	0	1	0	126	89	0	0	**216**
Vienna	572	928	143	8	1	9	0	6	1	**1668**
Foreign/missing	1	2	4	3	27	10	1	1	3	**52**
Total	**765**	**1178**	**170**	**619**	**290**	**716**	**91**	**460**	**197**	**4486**

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

As of January 1st 2020, the modelling tool of ECDC reveals a number of 7655 PLHIV, assuming that AHIVCOS is representative for the whole of Austria, the number sums up to 10 000. This is very likely an overestimation, since the ascertainment of patients who left the country is incomplete.

According to *Hauptverband der Sozialversicherungsträger*, 7182 persons received cART in 2020. An analysis within AHIVCOS, based on the same method, revealed 5037 persons with cART in 2020 representing 70% of all patients in Austria receiving cART. Overall, we estimate, according to the ECDC tool, that about 86-93% of PLHIV are receiving cART. Thus the estimate for PLHIV, based on the number given by the Hauptverband and the calculation of 80-85% receiving cART, add up to 7725-8350 PLHIV for end of 2020 (see also page 90).

4.6 Use of antiretroviral drugs to prevent HIV infection

PEP

	Non-occupational PEP started in					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Sex						
Women	37	40	63	65	44	3
Men	107	133	161	263	149	25
Age (years)						
<30	64	97	114	163	103	12
30-48	72	71	103	151	83	15
≥50	8	5	7	14	7	1
Area of residence						
Vienna	74	98	127	190	104	13
Lower Austria	4	5	9	13	21	2
Burgenland	1	0	1	4	4	0
Upper Austria	3	15	17	25	11	6
Salzburg	0	7	8	10	2	0
Tyrol	23	11	23	30	30	4
Vorarlberg	2	1	2	3	4	1
Styria	10	7	14	17	8	1
Carinthia	0	0	1	1	0	0
Missing/Foreign	27	29	22	35	9	1

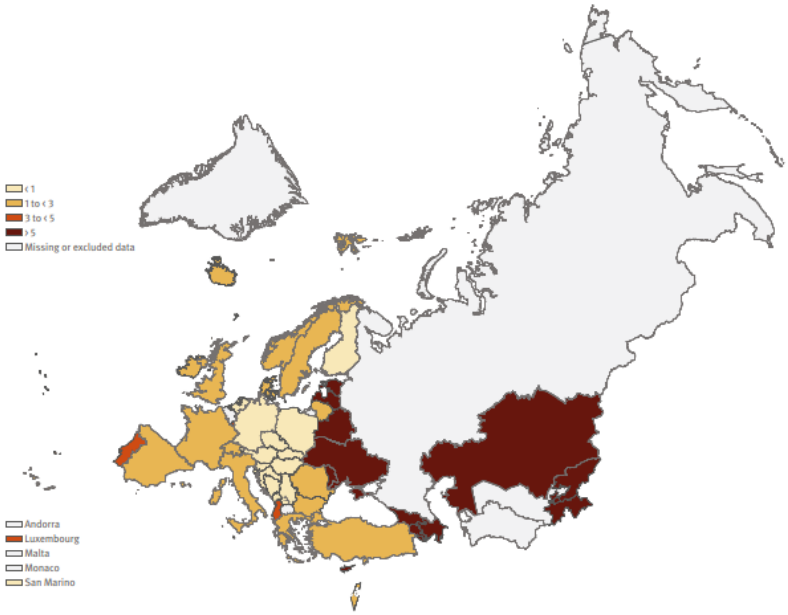
PrEP

	PrEP started in						
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**On PrEP at 01.03.2021**
Sex							
Women	0	0	3	8	4	1	13
Men	3	101	197	285	211	33	678
Age (years)							
<30	1	32	51	82	62	14	190
30-48	2	63	123	185	132	18	430
≥50	0	6	26	26	21	2	71
Area of residence							
Vienna	1	79	83	133	60	10	277
Lower Austria	0	5	8	11	10	2	31
Burgenland	0	0	0	3	1	1	5
Upper Austria	0	0	22	28	33	5	82
Salzburg	0	1	5	6	2	0	11
Tyrol	2	13	61	86	76	16	205
Vorarlberg	0	1	17	11	17	0	44
Styria	0	1	3	10	14	0	27
Carinthia	0	0	0	0	1	0	1
Missing/Foreign	0	1	1	5	1	0	8

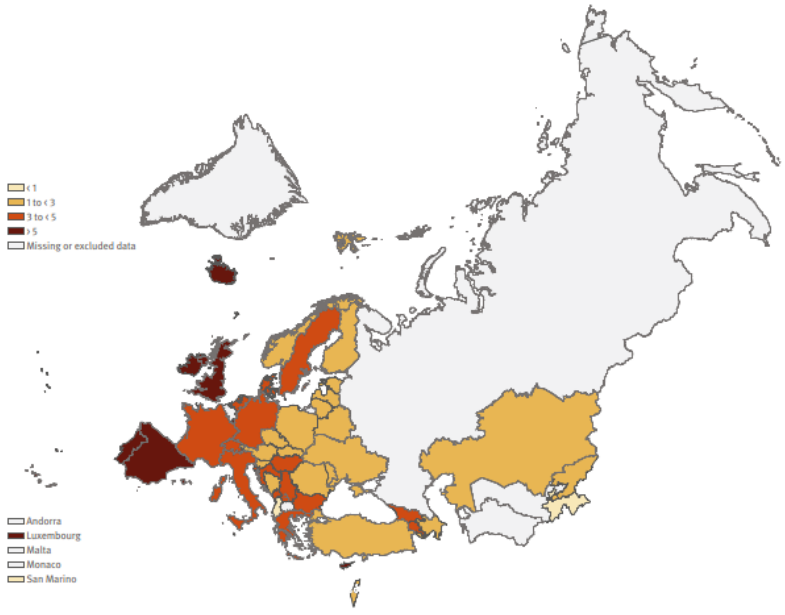
5 HIV/AIDS Surveillance in Austria

5.1 General overview (ECDC data)

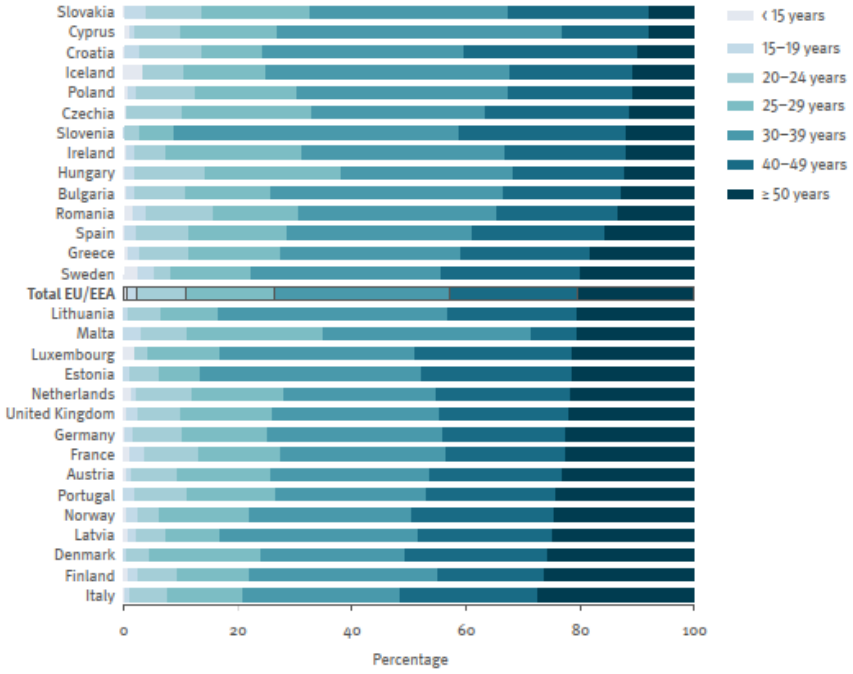
HIV diagnoses, per 100 000 population, reported for 2019: Heterosexual cases



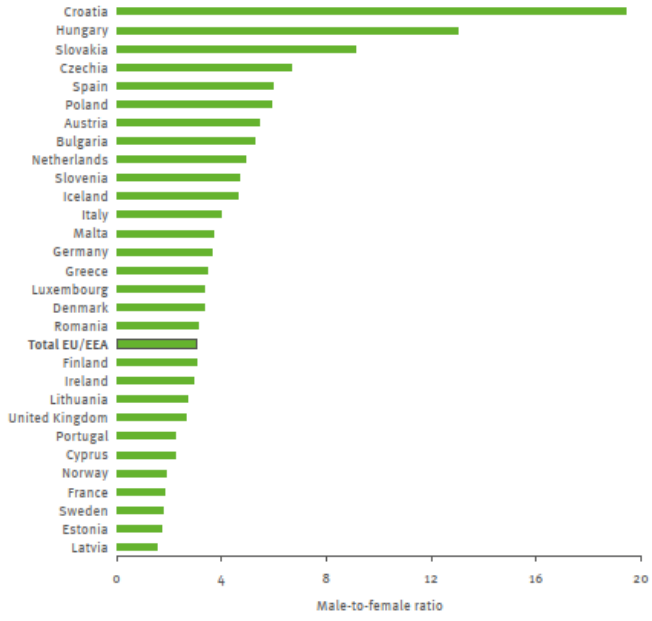
HIV diagnoses, per 100 000 population, reported for 2019: Men who have sex with men cases



Percentage of HIV diagnoses, by age group and country, EU/EEA, 2019 (n=24 715)

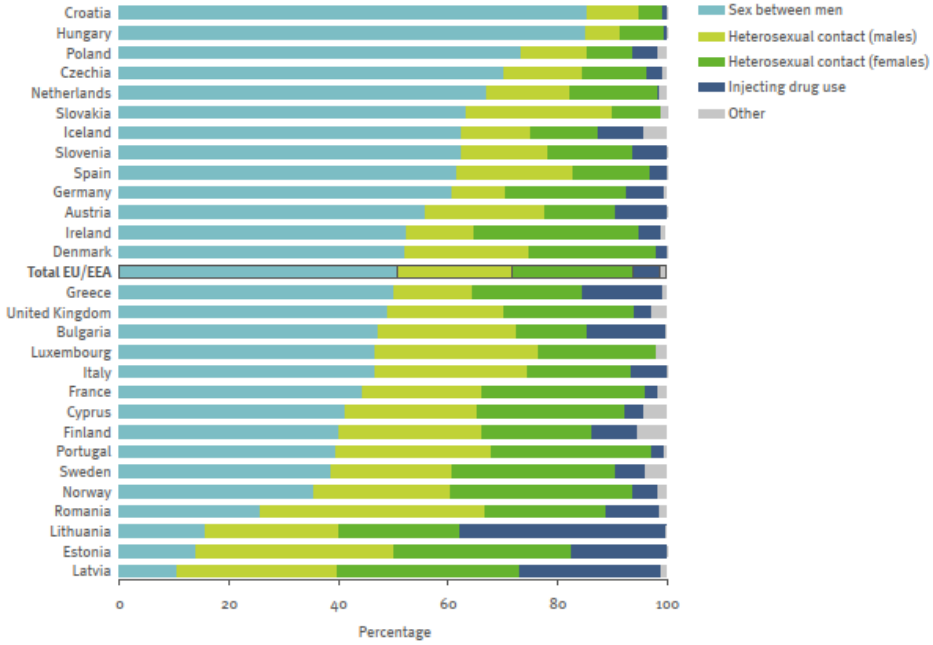


Male-to-female ratio in HIV diagnoses, by country, EU/EEA, 2019 (n=24 674)



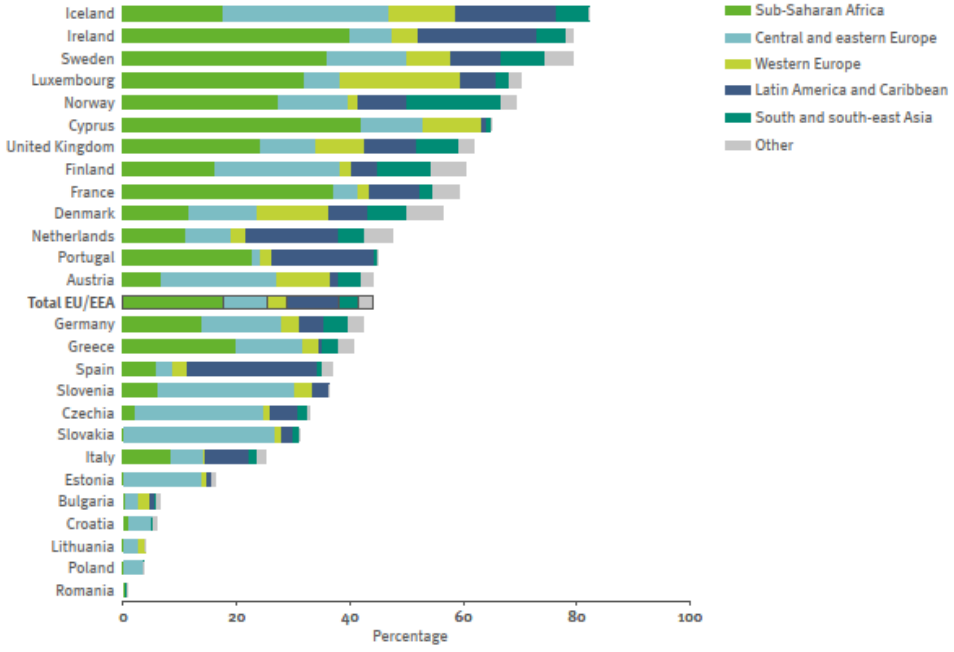
Note: Belgium did not report data and Liechtenstein reported zero cases in 2019.

Percentage of new HIV diagnoses with known mode of transmission, by transmission route and country, EU/EEA, 2019 (n=18 957)



Note: Belgium did not report data, Liechtenstein reported zero cases and Malta did not report transmission data in 2019. Unknown route of transmission is excluded from the proportions presented here.

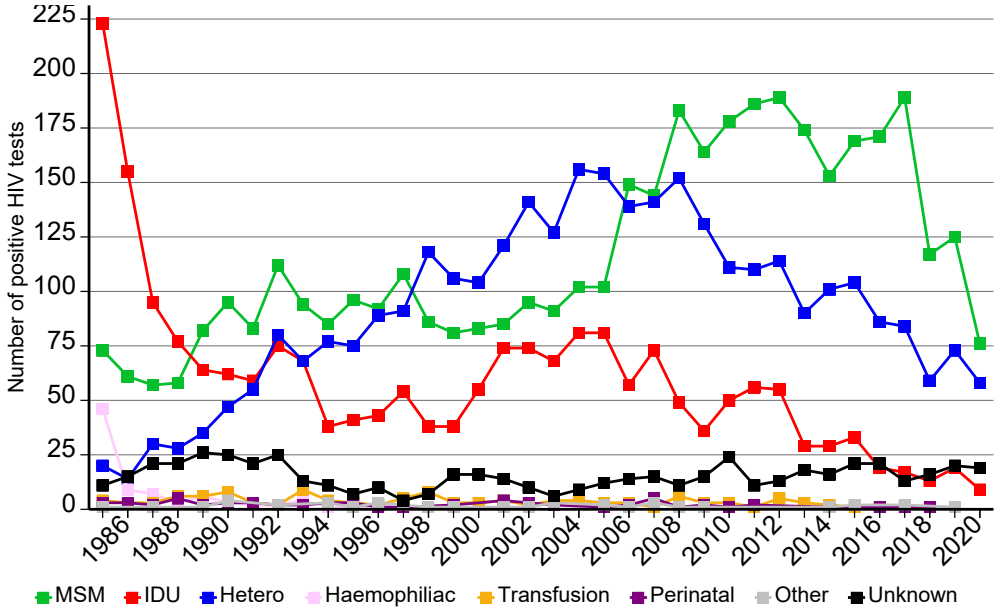
Percentage of new HIV diagnoses among migrants out of all reported cases with known information on region of origin, by country, EU/EEA, 2019 (n=20 430)



Note: Belgium did not report data in 2019 and Hungary, Latvia and Malta did not report data on country of birth or region of origin.

5.2 Mode of transmission

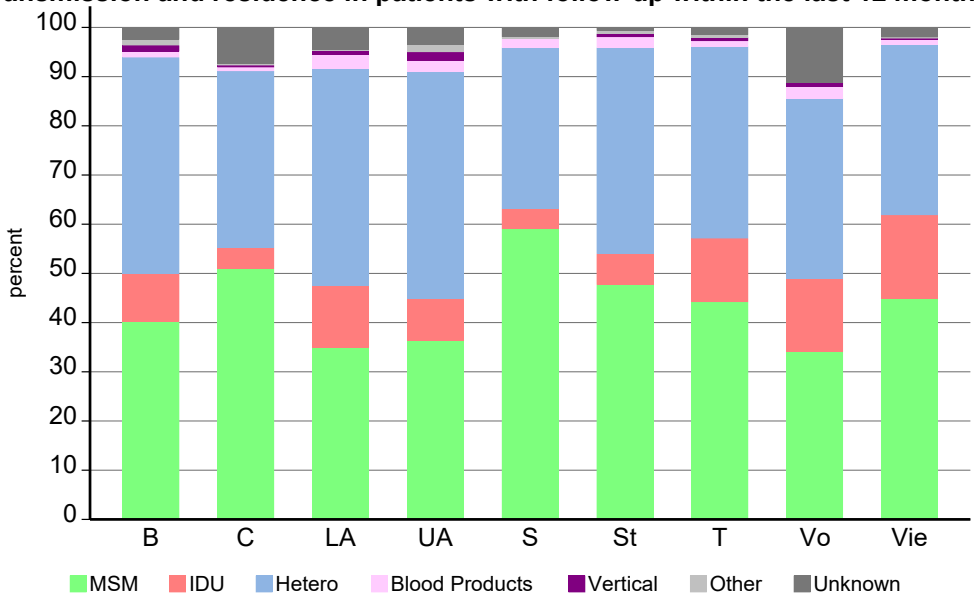
5.2.1 All modes of transmission



	BMG	AHIVCOS											
		Heterosexually											
Year	Total	MSM		IDU		infected		Others		Total	Women		
1998	313	86	33.33%	38	14.73%	118	45.74%	16	6.20%	258	60	23.26%	
1999	339	81	32.66%	38	15.32%	106	42.74%	23	9.27%	248	69	27.82%	
2000	428	83	31.80%	55	21.07%	104	39.85%	19	7.28%	261	74	28.35%	
2001	402	85	28.05%	74	24.42%	121	39.93%	23	7.59%	303	73	24.09%	
2002	442	95	29.14%	74	22.70%	141	43.25%	16	4.91%	326	92	28.22%	
2003	423	91	30.23%	68	22.59%	127	42.19%	15	4.98%	301	91	30.23%	
2004	470	102	28.98%	81	23.01%	156	44.32%	13	3.69%	352	107	30.40%	
2005	453	102	28.73%	81	22.82%	154	43.38%	18	5.07%	355	100	28.17%	
2006	435	149	40.82%	57	15.62%	139	38.08%	20	5.48%	365	88	24.11%	
2007	515	144	37.70%	73	19.11%	141	36.91%	24	6.28%	382	85	22.25%	
2008	505	183	45.41%	49	12.16%	152	37.72%	19	4.71%	403	95	23.57%	
2009	507	164	46.59%	36	10.23%	131	37.22%	21	5.97%	352	79	22.44%	
2010	487	178	48.50%	50	13.62%	111	30.25%	28	7.63%	367	68	18.53%	
2011	525	186	50.82%	56	15.30%	110	30.05%	14	3.83%	366	74	20.22%	
2012	523	189	50.27%	55	14.63%	114	30.32%	18	4.79%	376	74	19.68%	
2013	481	174	55.41%	29	9.24%	90	28.66%	21	6.69%	314	46	14.65%	
2014	403	153	50.50%	29	9.57%	101	33.33%	20	6.60%	303	63	20.79%	
2015	428	169	51.21%	33	10.00%	104	31.52%	24	7.27%	330	41	12.42%	
2016	447	171	57.19%	19	6.35%	86	28.76%	23	7.69%	299	49	16.39%	
2017	510	189	61.56%	17	5.54%	84	27.36%	17	5.54%	307	47	15.31%	
2018	397*	117	56.52%	13	6.28%	59	28.50%	18	8.70%	207	30	14.49%	
2019	313	125	52.52%	19	7.98%	73	30.67%	21	8.82%	238	36	15.13%	
2020		76	46.91%	9	5.56%	58	35.80%	19	11.73%	162	30	18.52%	
2021		58	53.70%	10	9.26%	28	25.93%	12	11.11%	108	16	14.81%	

*78 of them have been tested anonymously

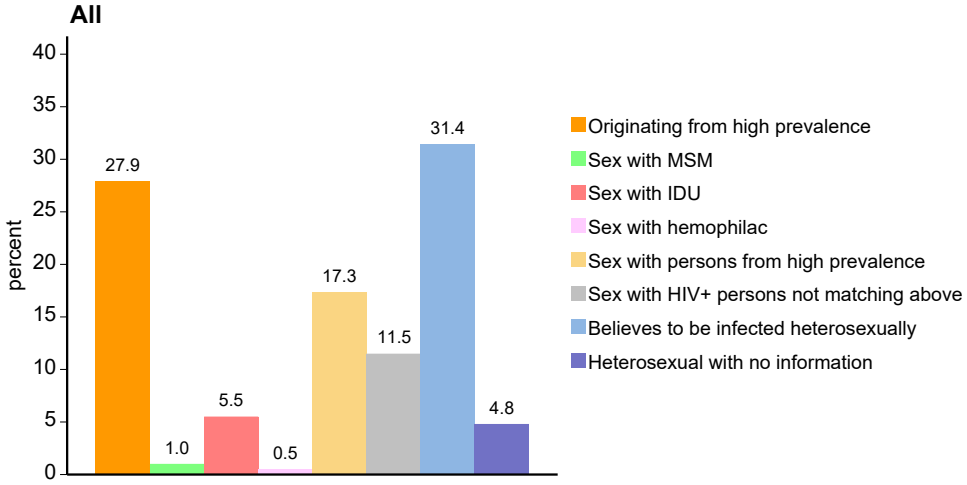
Transmission and residence in patients with follow-up within the last 12 months

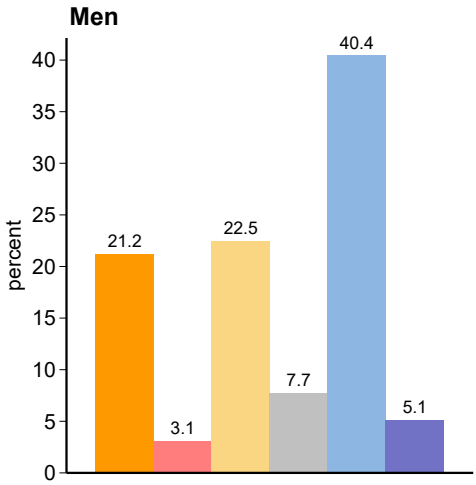


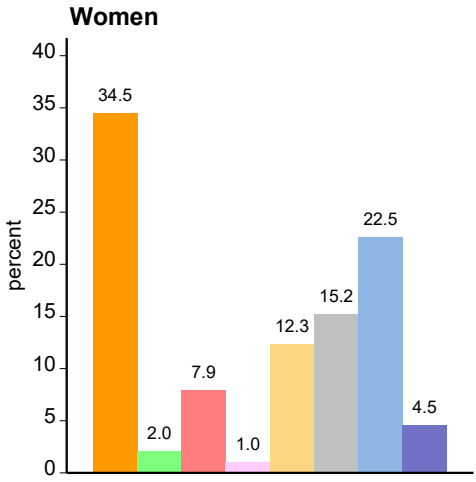
The abbreviation MSM is used for „Men who have sex with men". IDU means „Injecting Drug Use". The category IDU also includes men who are both MSM and IDU. The category "blood products" includes cohort participants who have received coagulation compounds or blood transfusions. Among the patients with a follow-up in the last 12 months, 38.4% have been infected through heterosexual contacts, 43.6% through homosexual contacts and 12.4% through the injection of drugs.

5.2.2 Categories of heterosexually acquired infections

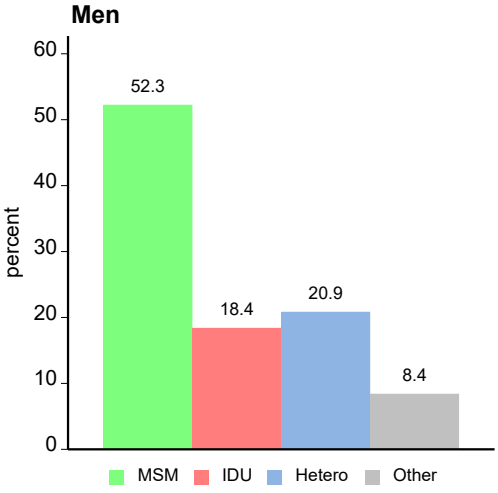
Because of missing data, the HIV treatment centre OWS Vienna has been excluded from some analyses.

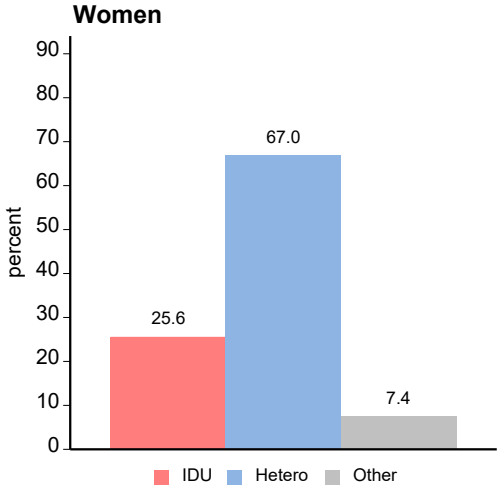




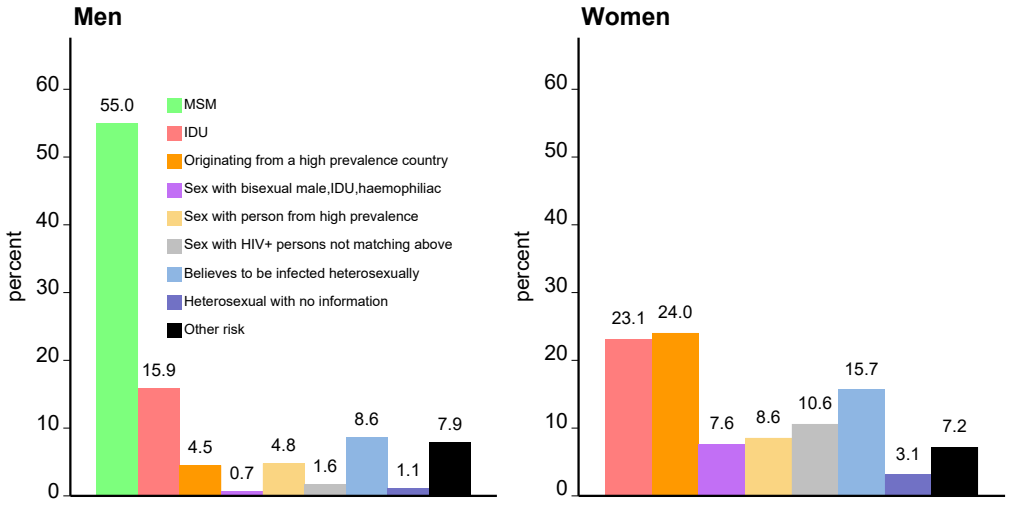


Categories of transmission

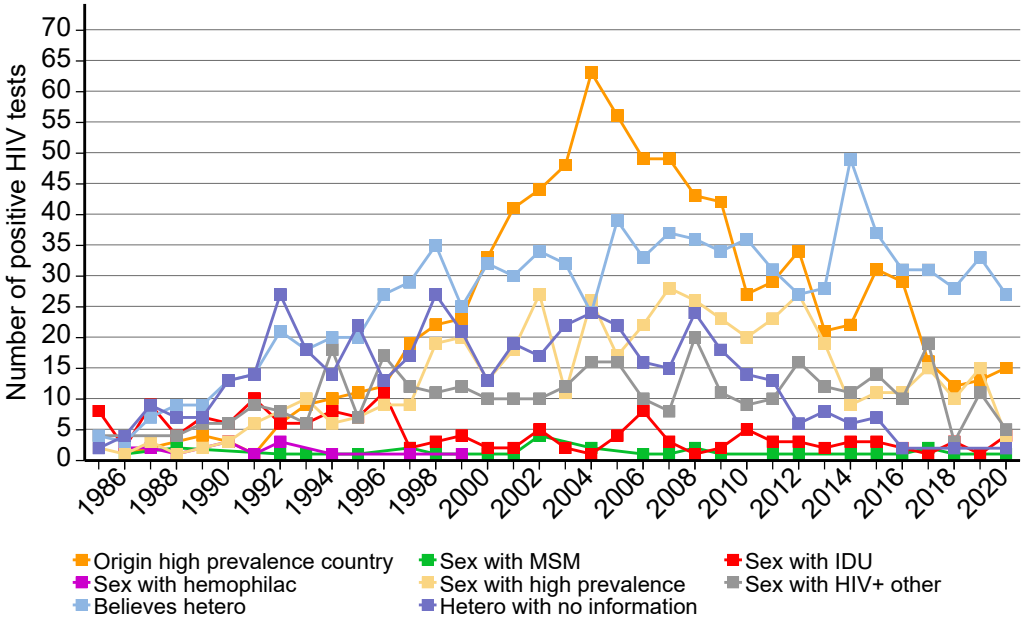




Sub-categories of transmission



Sub-categories of heterosexually acquired infections

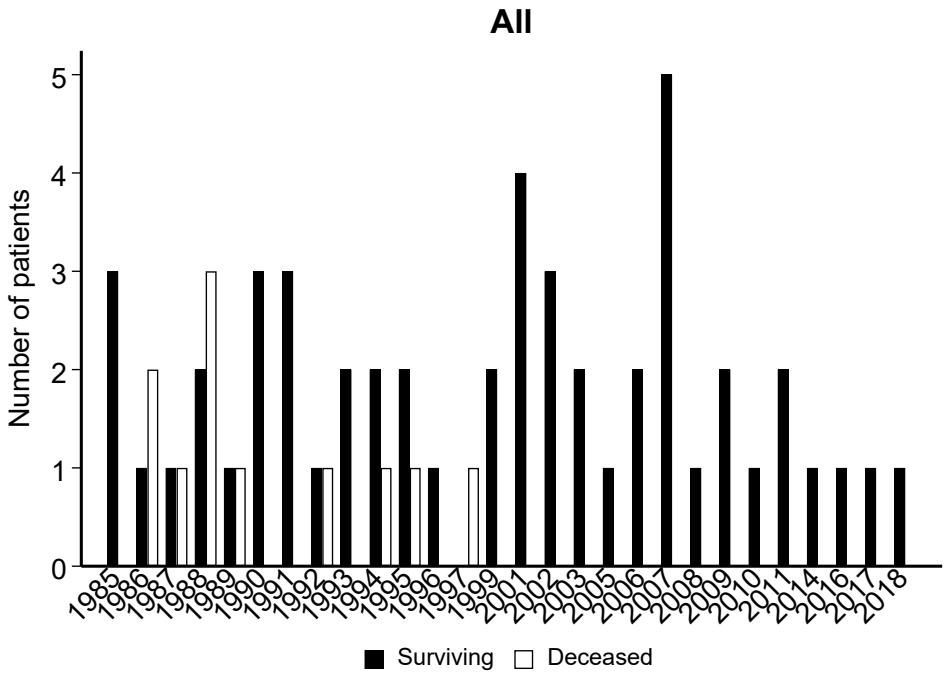


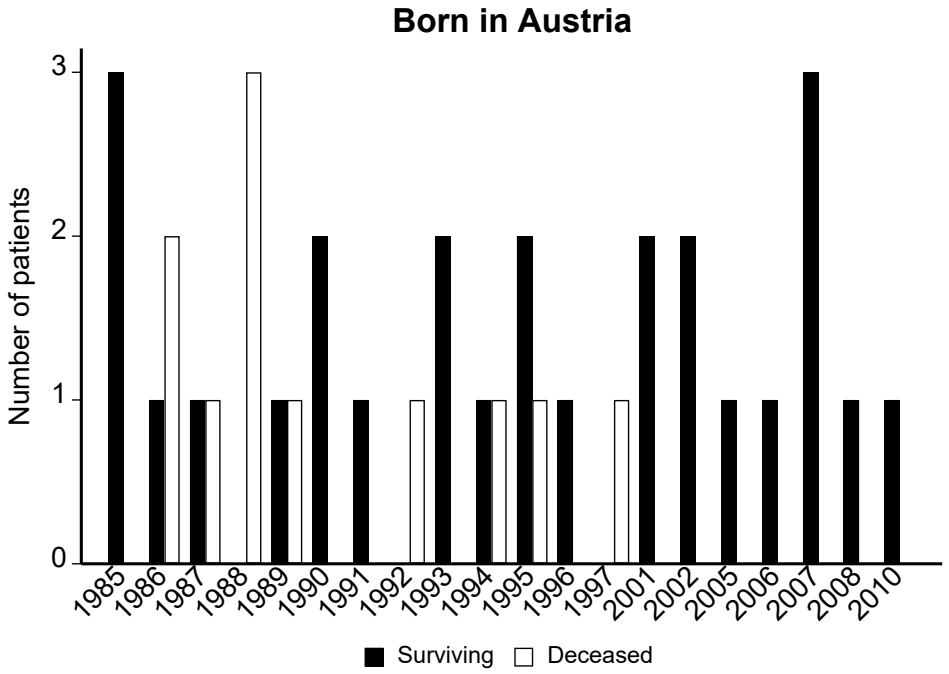
5.2.3 Mother-to-child-transmission

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.

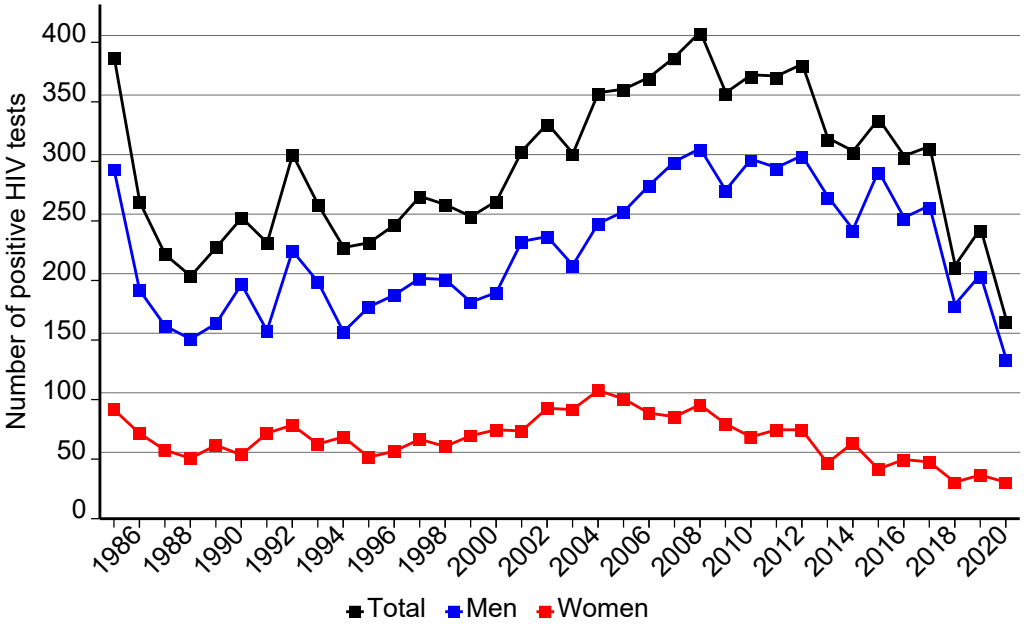
	Living participants		Deceased participants	Total
	<18 years	>18 years		
Burgenland	0	1	0	**1**
Carinthia	0	1	0	**1**
Lower Austria	1	4	0	**5**
Upper Austria	4	7	1	**12**
Salzburg	1	0	0	**1**
Styria	0	3	0	**3**
Tyrol	0	4	4	**8**
Vorarlberg	2	0	3	**5**
Vienna	6	14	3	**23**
Missing residency	0	1	0	**1**
Foreign	0	2	0	**2**
Total	**14**	**37**	**11**	**62**

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
2005
2006
2007
2008
2009
2010
2011
2014
2016
2017
2018
Surviving
Deceased

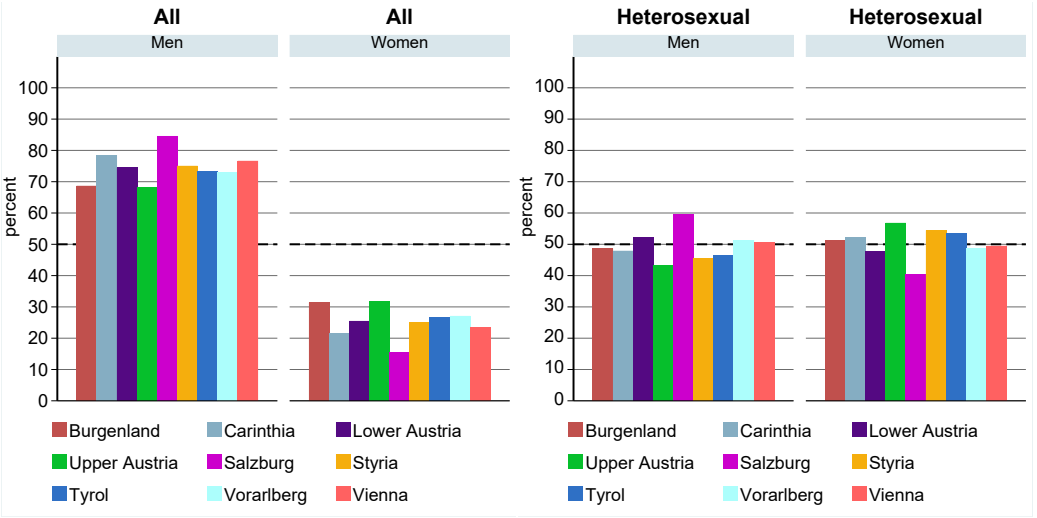

Born in Austria
Number of patients
0
1
2
3
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
2001
2002
2005
2006
2007
2008
2010
Surviving
Deceased

5.3 Sex



24.8% of the patients with a follow-up within the last 12 months are female. The rate is highest in Burgenland (32.9%), Upper Austria (31.9%), Vorarlberg (26.9%) and Tyrol (26.6%).
In the subgroup of heterosexually acquired infections, the rate of the women is 50.9%. It is highest in Upper Austria (56.2%), Tyrol (53.6%), Burgenland (52.8%) and Carinthia (52.7%).

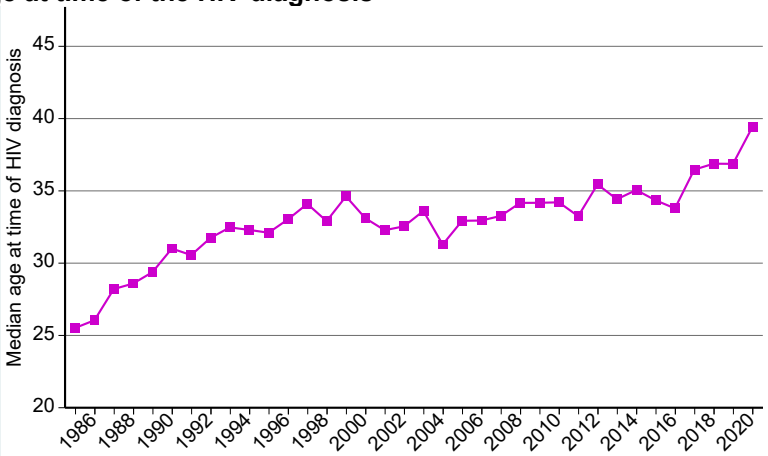
Sex of the patients with a follow-up in the last 12 months

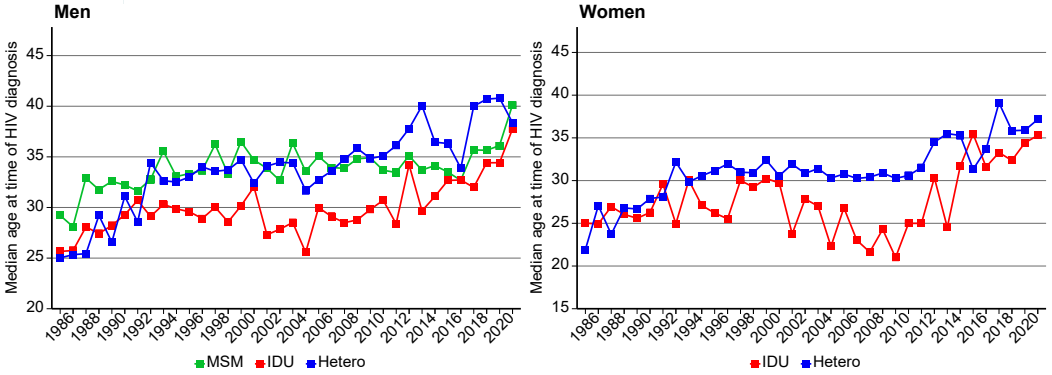


5.4 Age

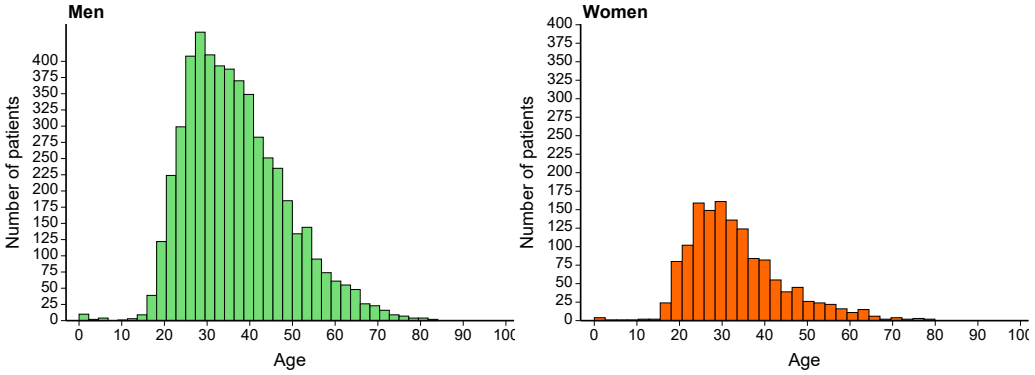
5.4.1 Age at time of HIV diagnosis

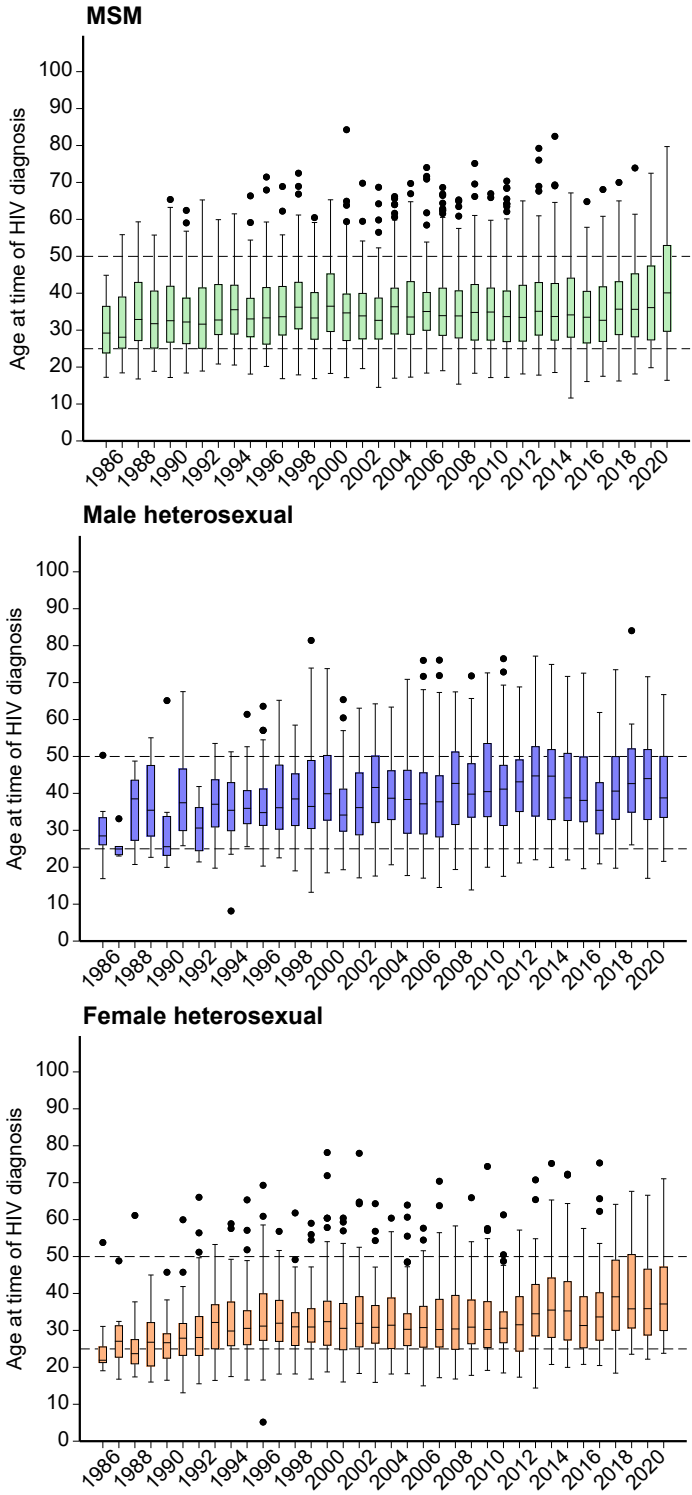
Median age at time of the HIV diagnosis





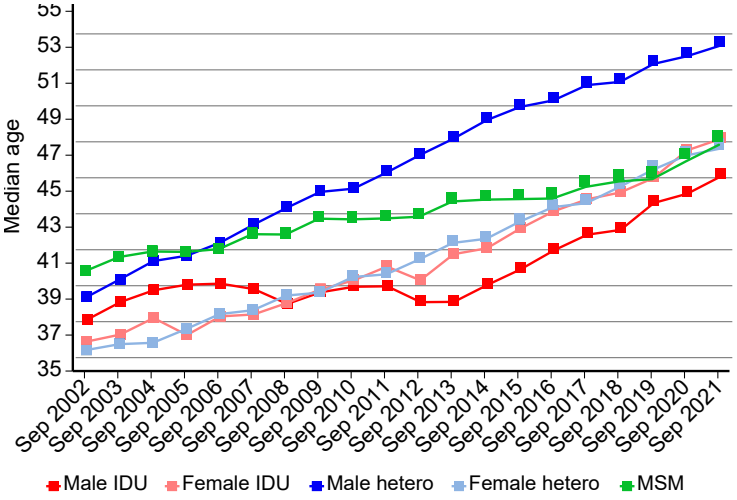
Age at time of the HIV diagnosis



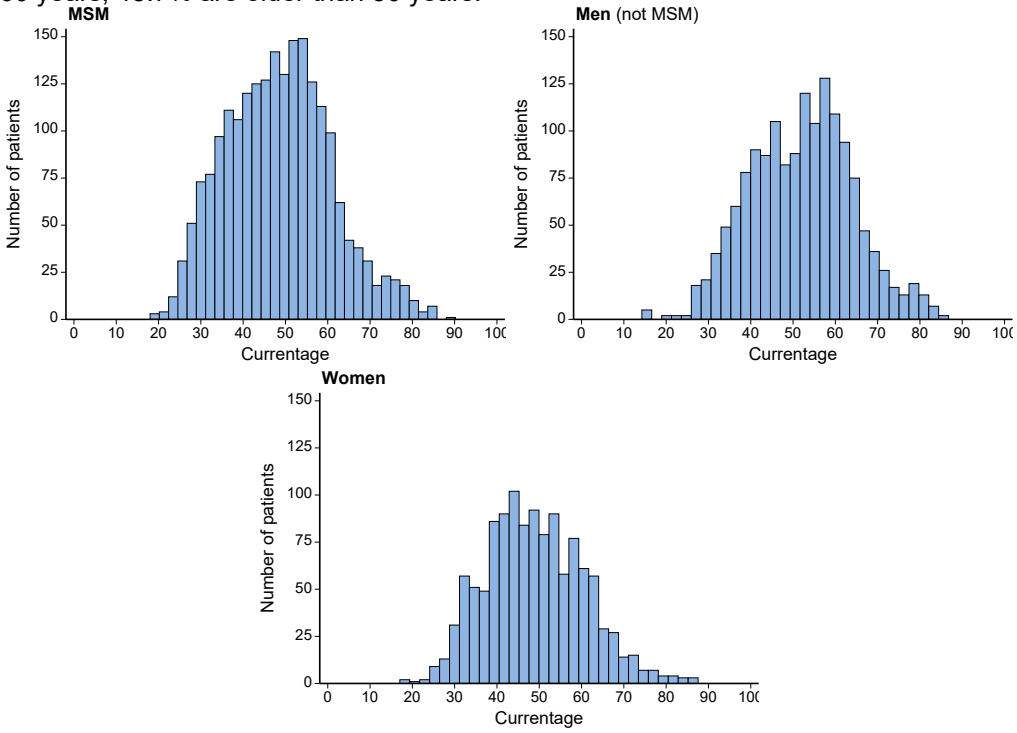

MSM
Age at time of HIV diagnosis
0
10
20
30
40
50
60
70
80
90
100
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Male heterosexual
Age at time of HIV diagnosis
0
10
20
30
40
50
60
70
80
90
100
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Female heterosexual
Age at time of HIV diagnosis
0
10
20
30
40
50
60
70
80
90
100
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020

5.4.2 Age of patients currently in care

Overall, median age increased from 39.1 in September 2002 to 49.1 in September 2021. In MSM, median age increased from 41.1 in September 2002 to 48.1 in September 2021, in men (not MSM) from 39.9 to 52.1 and in women from 37.1 to 48.1.



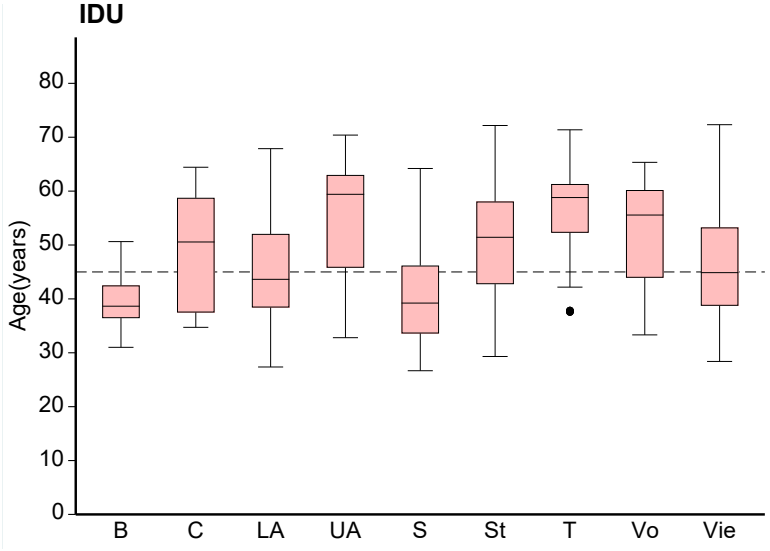
Median and average age are 49.6 and 49.7 years, respectively. 19.9% are older than 60 years, 48.7% are older than 50 years.



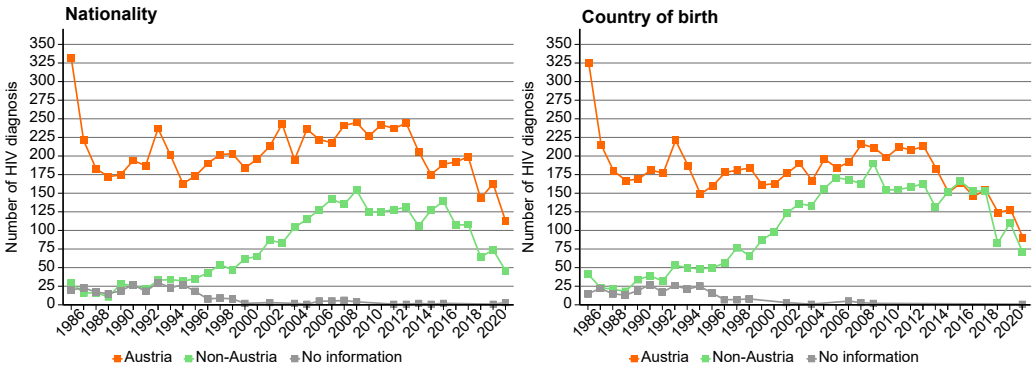
Age across the federal states: follow-up in the last 12 months

Federal state	Median Age years	≥50 years	≥60 years	≥75 years
Burgenland	49.08	45.1	20.7	2.4
Carinthia	50.23	51.0	20.8	1.2
Lower Austria	51.08	53.0	22.5	4.9
Upper Austria	49.62	48.8	23.4	2.5
Salzburg	49.13	46.6	15.8	2.6
Styria	48.51	44.2	15.7	1.1
Tyrol	51.85	55.3	23.5	3.5
Vorarlberg	50.61	51.1	22.9	4.9
Vienna	48.76	46.7	18.2	2.6
Total	**49.57**	**48.7**	**19.9**	**2.8**

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



5.5 Nationality and country of birth

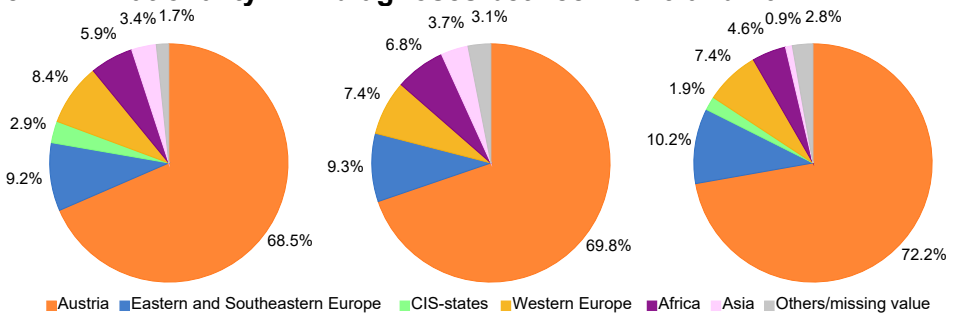


5.5.1 Overview

	BMG	AHIVCOS								
Year	Total	Austria		Low prevalence countries		High prevalence countries		Missing value		Total
1998	313	203	78.68%	29	11.24%	18	6.98%	8	3.10%	258
1999	339	184	74.19%	42	16.94%	20	8.06%	2	0.81%	248
2000	428	196	75.10%	33	12.64%	32	12.26%	0	0.00%	261
2001	402	213	70.30%	48	15.84%	39	12.87%	3	0.99%	303
2002	442	243	74.54%	48	14.72%	35	10.74%	0	0.00%	326
2003	423	195	64.78%	54	17.94%	50	16.61%	2	0.66%	301
2004	470	236	67.05%	57	16.19%	58	16.48%	1	0.28%	352
2005	453	222	62.54%	56	15.77%	72	20.28%	5	1.41%	355
2006	435	218	59.73%	80	21.92%	62	16.99%	5	1.37%	365
2007	515	241	63.09%	72	18.85%	63	16.49%	6	1.57%	382
2008	505	245	60.79%	100	24.81%	54	13.40%	4	0.99%	403
2009	507	227	64.49%	77	21.88%	48	13.64%	0	0.00%	352
2010	487	242	65.94%	94	25.61%	31	8.45%	0	0.00%	367
2011	525	237	64.75%	99	27.05%	29	7.92%	1	0.27%	366
2012	523	244	64.89%	95	25.27%	36	9.57%	1	0.27%	376
2013	481	206	65.61%	84	26.75%	22	7.01%	2	0.64%	314
2014	403	175	57.76%	92	30.36%	35	11.55%	1	0.33%	303
2015	428	189	57.27%	103	31.21%	36	10.91%	2	0.61%	330
2016	447	192	64.21%	79	26.42%	28	9.36%	0	0.00%	299
2017	510	199	64.82%	92	29.97%	16	5.21%	0	0.00%	307
2018	397*	143	69.08%	54	26.09%	10	4.83%	0	0.00%	207
2019	313	163	68.49%	59	24.79%	15	6.30%	1	0.42%	238
2020		113	69.75%	37	22.84%	9	5.56%	3	1.85%	162
2021		78	72.22%	23	21.30%	6	5.56%	1	0.93%	108

*78 of them have been tested anonymously

5.5.2 Nationality: HIV diagnoses between 2019 and 2021

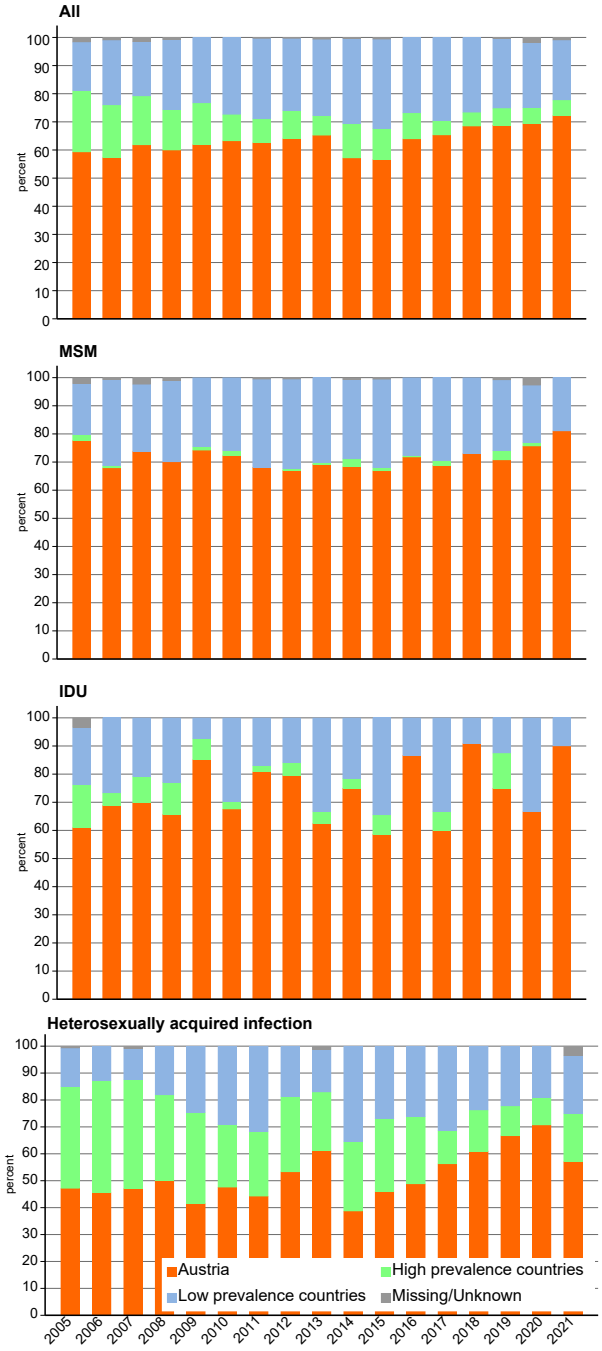


HIV diagnosis 2019 N=238	
Unknown	1
Afghanistan	1
Azerbaijan	1
Austria	163
Bosnia and Herzegovina	3
Brazil	1
Bulgaria	4
Cameroon	2
Congo	1
Ecuador	1
Egypt	1
France	1
Germany	13
Ghana	1
Greece	1
Hungary	2
Iran	2
Italy	5
Kazakhstan	1
Libya	1
Lithuania	1
Mexico	1
Namibia	1
Nigeria	3
Philippines	1
Poland	1
Romania	3
Russian Federation	2
Senegal	1
Serbia	3
Slovakia	1
South Africa	1
Sudan	1
Syrian Arab Republic	1
Thailand	3
Turkey	4
Ukraine	2
Uzbekistan	1
Zimbabwe	1
Unknown	1

HIV diagnosis 2020 N=162	
Unknown	3
Africa	1
Algeria	1
Austria	113
Bosnia and Herzegovina	1
Botswana	1
Brazil	1
Bulgaria	1
Egypt	1
Ethiopia	1
Georgia	1
Gambia	1
Germany	6
Ghana	1
Hungary	2
India	1
Indonesia	1
Italy	1
Lebanon	1
Netherlands	1
Philippines	1
Poland	3
Portugal	1
Guinea-Bissau	2
Romania	2
Serbia	3
Sierra Leone	1
Somalia	1
Spain	2
Syrian Arab Republic	1
Thailand	1
Turkey	2
United Kingdom of Great Britain a	1
Venezuela	1

HIV diagnosis 2021 N=108	
Austria	78
Armenia	1
Chile	1
Croatia	1
Egypt	1
Germany	2
Ghana	1
Hungary	1
Italy	3
Kenya	1
Lithuania	1
Nigeria	1
Portugal	3
Romania	4
Russian Federation	1
Saint Vincent and the Grenad	1
Slovakia	2
Slovenia	1
Zimbabwe	1
Thailand	1
Turkey	1
Unknown	1

5.5.3 Nationality



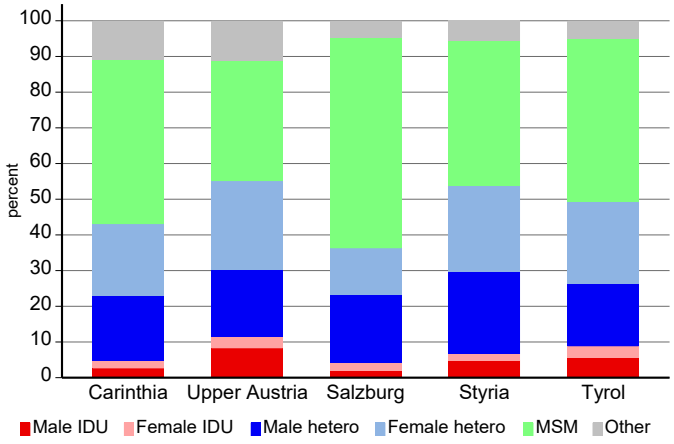
Low prevalence countries are countries with an HIV infection rate of adults <1%, high prevalence countries are countries with an HIV infection rate of adults ≥1%.

5.6 Residence

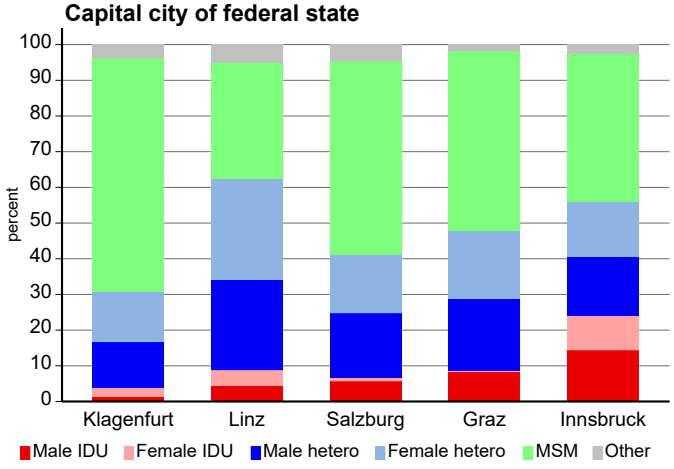
5.6.1 Population size of area of residence

	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	108	30.6%	1		-		20	20.0%	-		-	
C	230	24.3%	78	16.7%	-		20	25.0%	8	12.5%	-	
LA	762	25.7%	-		-		157	18.5%	-		-	
UA	461	30.2%	296	34.1%	-		178	29.8%	190	31.6%	-	
S	193	15.5%	194	18.0%	-		26	19.2%	39	12.8%	-	
St	391	27.1%	266	19.9%	-		58	24.1%	37	18.9%	-	
T	386	26.4%	195	26.2%	-		112	22.3%	131	26.0%	-	
Vo	242	26.4%	-		-		63	28.6%	-		-	
Vie	-		-		3575	21.4%	-		-		1434	20.4%

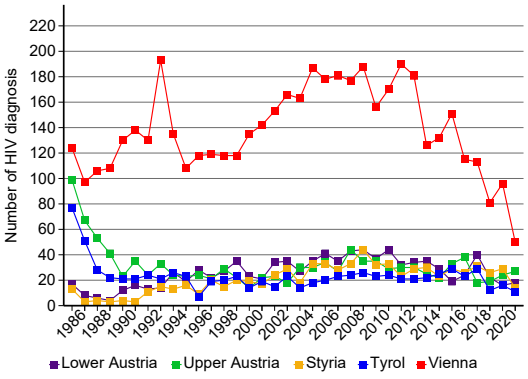
Federal state outside capital city

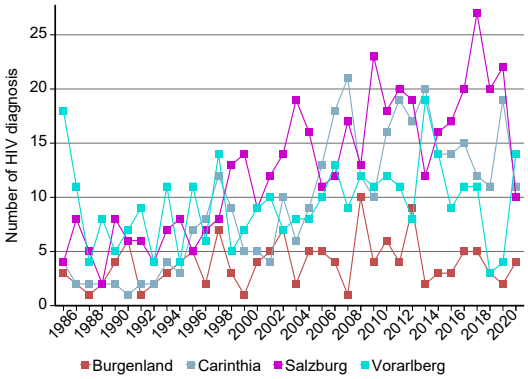


Capital city of federal state



5.6.2 Residence: Federal states

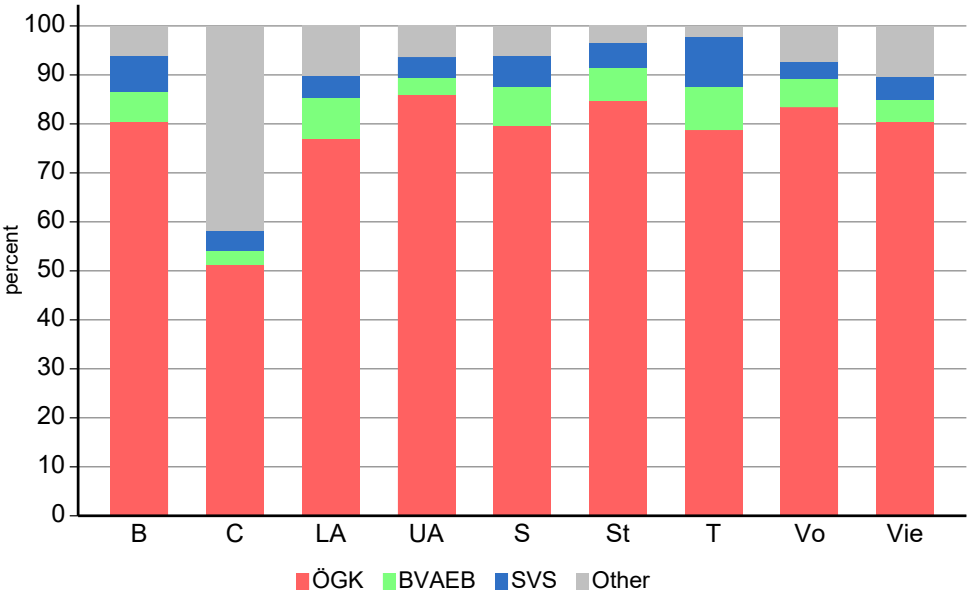




5.7 Health insurance

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

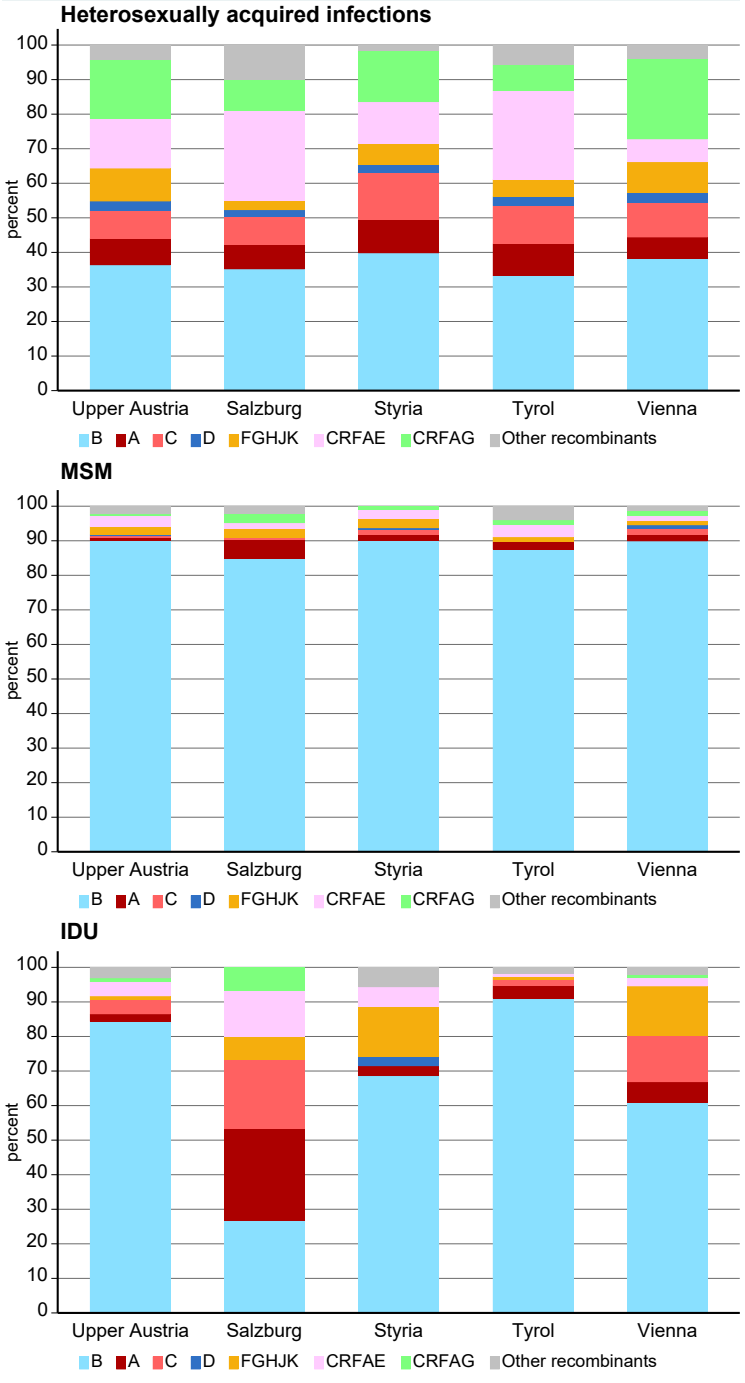
Included are patients from the HIV centers in Linz and Innsbruck with a follow-up in the last 12 months.

	N of patients	General practice		Psychiatry		Internal medicine		Dermatology		Pulmo-nology		Others	
Innsbruck	727	536	73.70%	54	7.40%	41	5.60%	12	1.70%	5	0.70%	85	11.70%
Linz	635	327	51.50%	21	3.30%	47	7.40%	8	1.30%	18	2.80%	143	22.50%
Age < 50	638	345	54.10%	24	3.80%	22	3.40%	9	1.40%	7	1.10%	91	14.30%
Age ≥ 50	724	518	71.50%	51	7.00%	66	9.10%	11	1.50%	16	2.20%	137	18.90%
< 100 000	**899**	586	65.20%	45	5.00%	64	7.10%	12	1.30%	17	1.90%	135	15.00%
≥ 100 000	463	277	59.80%	30	6.50%	24	5.20%	8	1.70%	6	1.30%	93	20.10%
Total	1362	863	63.40%	75	5.50%	88	6.50%	20	1.50%	23	1.70%	228	16.70%

	N of patients	No doctors outside centre		GP, no specialist		Specialist, no GP		GP, + specialist	
Innsbruck	727	156	21.50%	399	54.90%	35	4.80%	137	18.80%
Linz	635	254	40.00%	183	28.80%	54	8.50%	144	22.70%
Patients without ART	7	0	0.00%	5	71.40%	0	0.00%	2	28.60%
Patients with ART	1355	410	30.30%	577	42.60%	89	6.60%	279	20.60%
HIV RNA > 50 (with ART)	77	37	48.10%	23	29.90%	3	3.90%	14	18.20%
HIV RNA ≤ 50 (with ART)	1278	373	29.20%	554	43.30%	86	6.70%	265	20.70%
Chronic hepatitis C	11	8	72.7%	3	27.3%	0		0	
Use of antidepressants	242	43	17.80%	110	45.50%	12	5.00%	77	31.80%
MSM	563	195	34.60%	266	47.20%	25	4.40%	77	13.70%
Male IDU	91	21	23.10%	48	52.70%	5	5.50%	17	18.70%
Female IDU	60	7	11.70%	26	43.30%	4	6.70%	23	38.30%
Male hetero	262	101	38.50%	108	41.20%	8	3.10%	45	17.20%
Female hetero	304	52	17.10%	104	34.20%	40	13.20%	108	35.50%
Age < 50	638	252	39.50%	245	38.40%	41	6.40%	100	15.70%
Age ≥ 50	724	158	21.80%	337	46.50%	48	6.60%	181	25.00%
< 100 000	899	262	29.10%	404	44.90%	51	5.70%	182	20.20%
≥ 100 000	463	148	32.00%	178	38.40%	38	8.20%	99	21.40%
Total	1362	410	30.10%	582	42.70%	89	6.50%	281	20.60%

5.9 HIV-1 subtypes

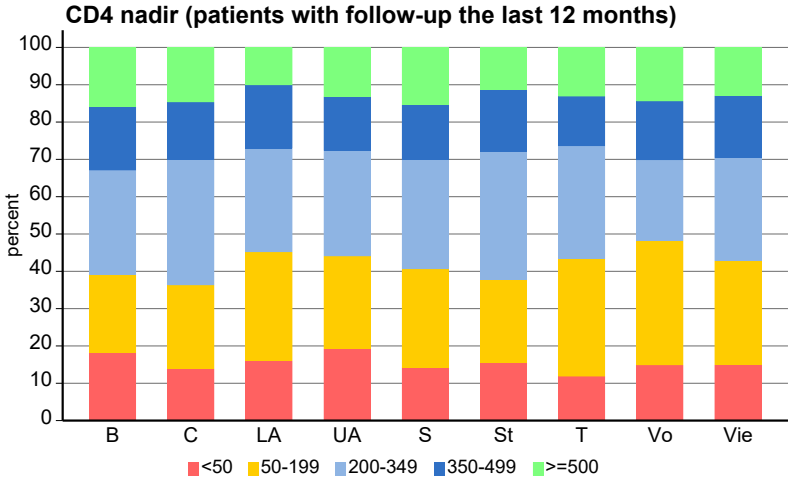
Subtypes were determined by genotypic resistance testing of Reverse Transcriptase and Protease according to Stanford database. Overall 3699 subtypes were available.



5.10 Stage of HIV disease

5.10.1 Lowest ever measured CD4 cell count

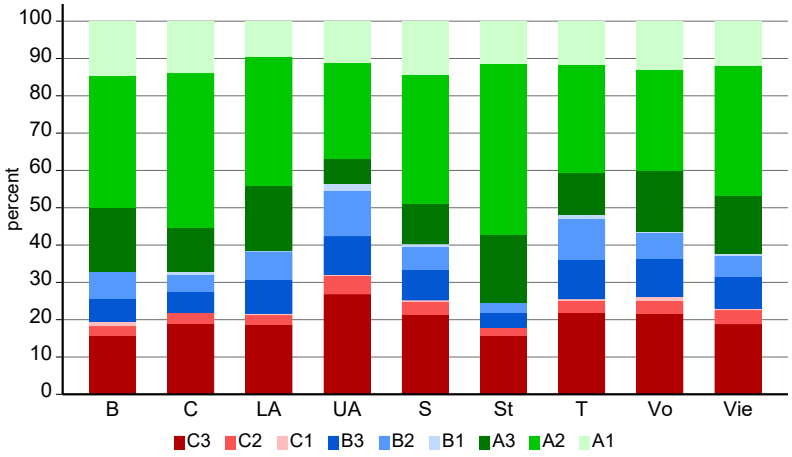
The median of the lowest CD4 cell count ever measured („CD4 nadir“) in the patients with follow-up in the last 12 months is 236/µl.



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.

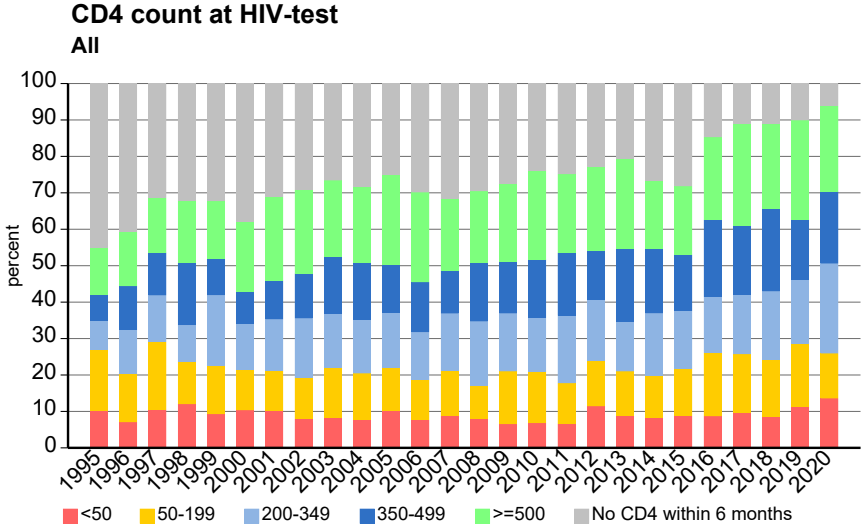
	HIV-infected up to 10 years N=1863		**HIV-infected for over 10 years N=2994**	
Being ART naive	**N**	**%**	**N**	**%**
HIV RNA ≤ 50 copies/ml	9	0.5	3	0.1
HIV RNA < 400 copies/ml	10	0.5	5	0.2
CD4 > 500 cells/µl	4	0.2	6	0.2
CD4 > 500 cells/µl and HIV RNA ≤ 50 copies/ml	3	0.2	2	0.1
CD4 > 500 cells/µl and HIV RNA < 400 copies/ml	4	0.2	4	0.1

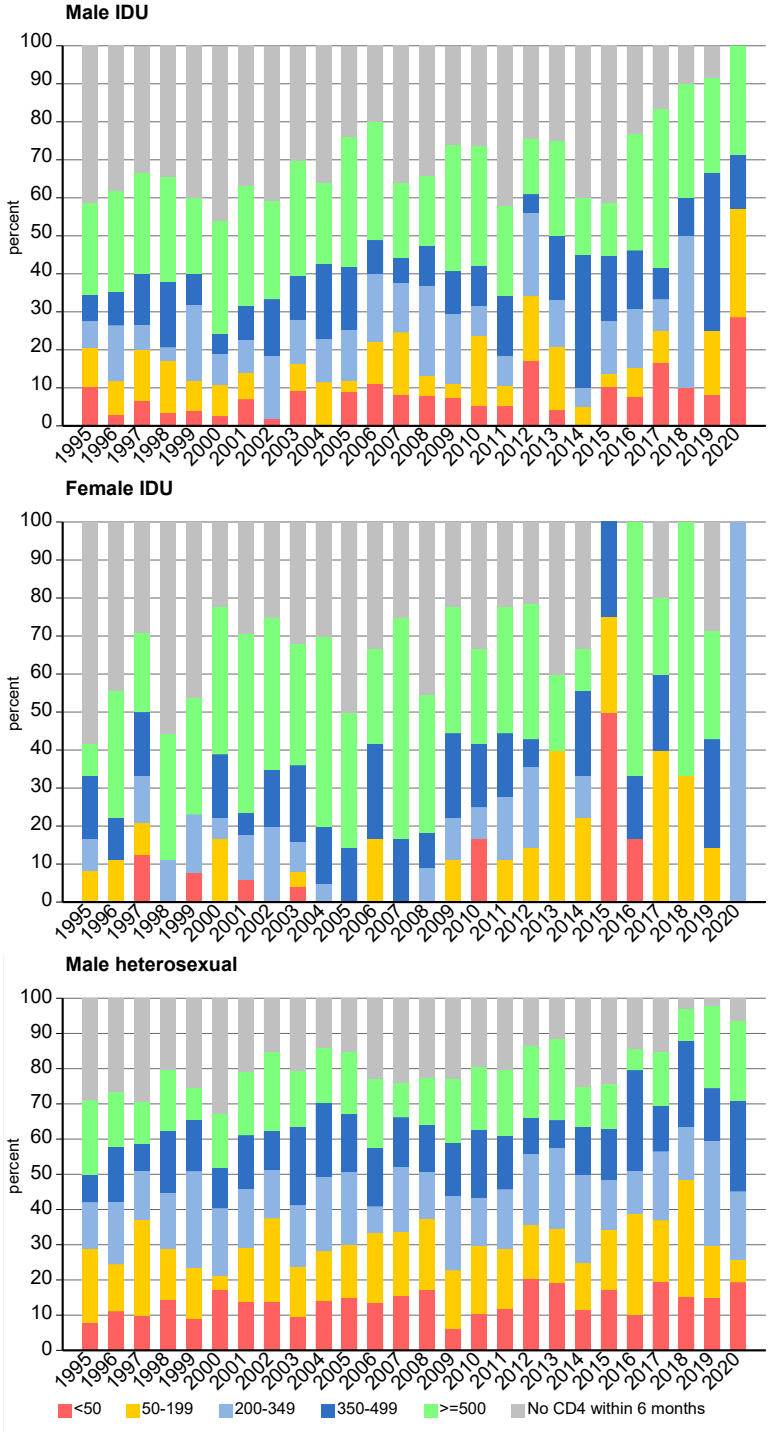
6 Diagnosis of HIV and presentation to an HIV centre

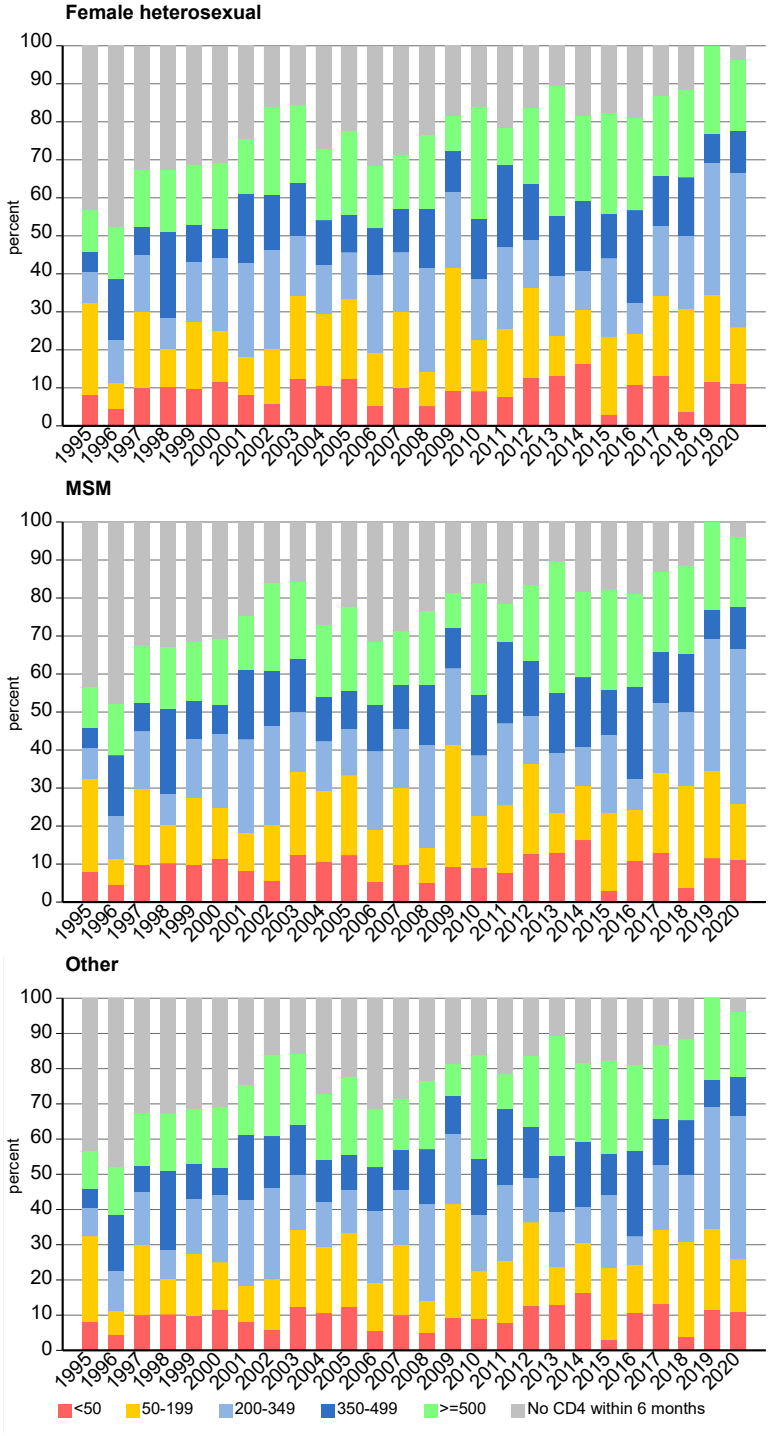
6.1 Presentation to an HIV centre

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, 440 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	19.5	111.1	59	5.3	62.2	250.0	50.0	529.0
1995	216	2.6	100.3	39	4.2	101.4	238.5	86.0	473.0
2000	254	1.0	130.4	55	2.2	92.0	360.5	139.0	563.0
2005	349	0.7	76.3	81	1.1	34.5	351.0	147.0	533.0
2006	355	0.7	64.7	57	1.1	30.6	370.0	193.0	580.0
2007	371	0.7	73.4	72	1.8	52.9	325.0	152.0	544.0
2008	395	0.8	67.9	49	1.7	88.3	395.0	228.0	568.0
2009	342	0.6	69.9	36	0.9	49.0	342.5	197.0	538.0
2010	356	0.5	58.8	50	0.6	55.5	389.5	196.5	625.0
2011	355	0.5	49.7	54	1.5	38.8	377.0	218.0	561.0
2012	371	0.5	39.5	55	0.9	47.0	364.0	154.0	584.0
2013	302	0.5	30.4	28	1.5	40.9	399.5	198.0	621.0
2014	293	0.6	28.2	29	2.0	48.0	377.0	195.0	560.0
2015	315	0.5	27.6	33	1.6	38.5	366.0	178.0	564.0
2016	290	0.4	7.5	18	0.7	7.7	367.0	157.0	555.0
2017	299	0.4	5.3	17	1.2	9.4	380.0	180.0	572.0
2018	202	0.3	4.0	12	0.4	3.6	362.5	196.0	559.0
2019	233	0.4	4.4	19	0.9	7.5	357.0	145.0	569.0
2020	159	0.3	2.5	9	0.7	4.0	337.0	179.0	523.0
2021	105	0.3	1.0	9	0.3	2.7	257.0	100.0	506.0




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


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

6.2 Patients diagnosed since 2001

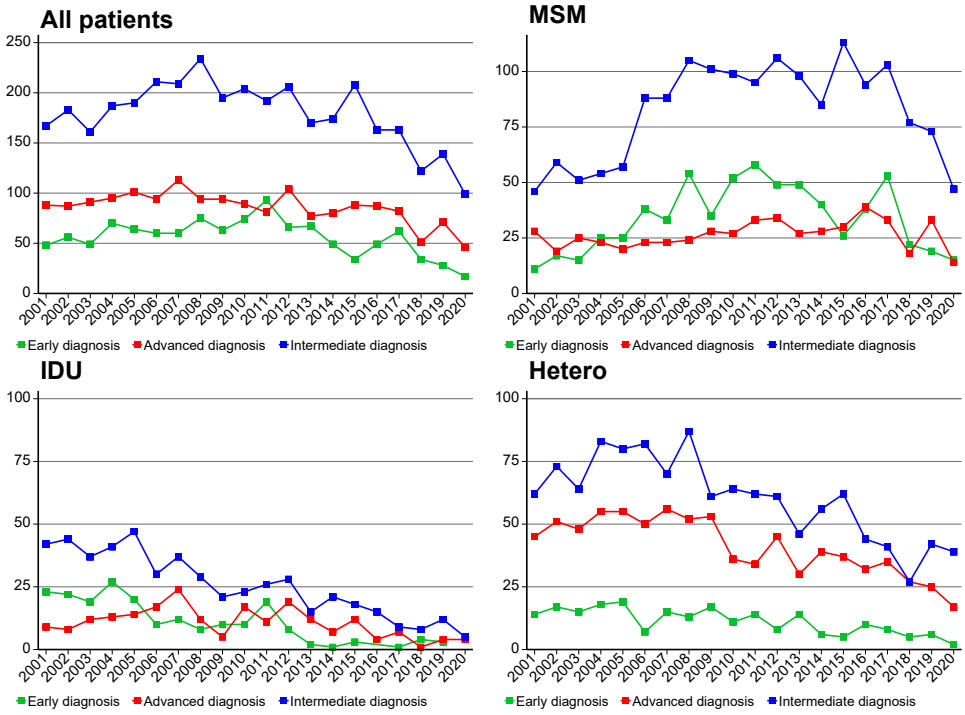
6.2.1 Frequency of early and late diagnoses

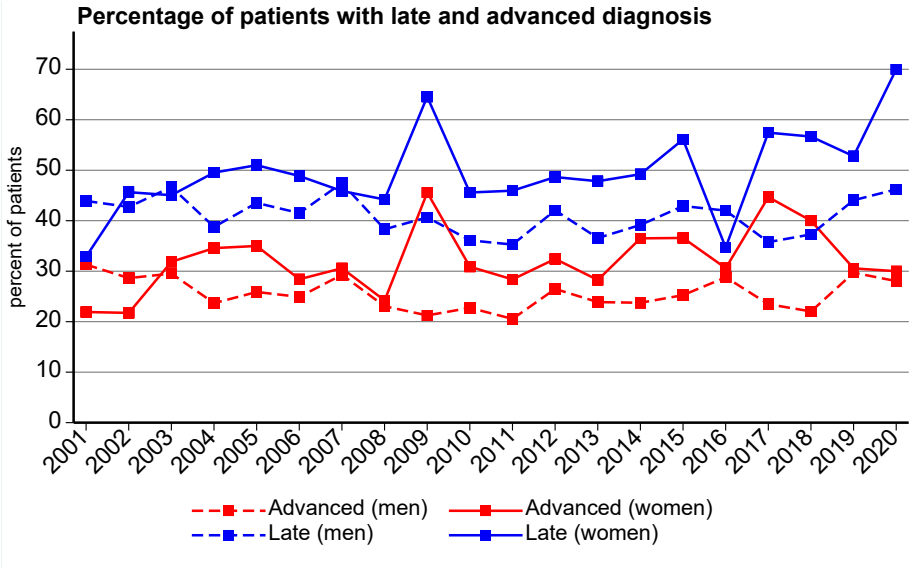
“Early” diagnosis or **„recent“ infection** is defined as: acute HIV infection (westernblot pattern or antigen/HIV RNA combined with clinical presentation) or documented seroconversion with negative HIV test not more than 3 years before the first positive test.

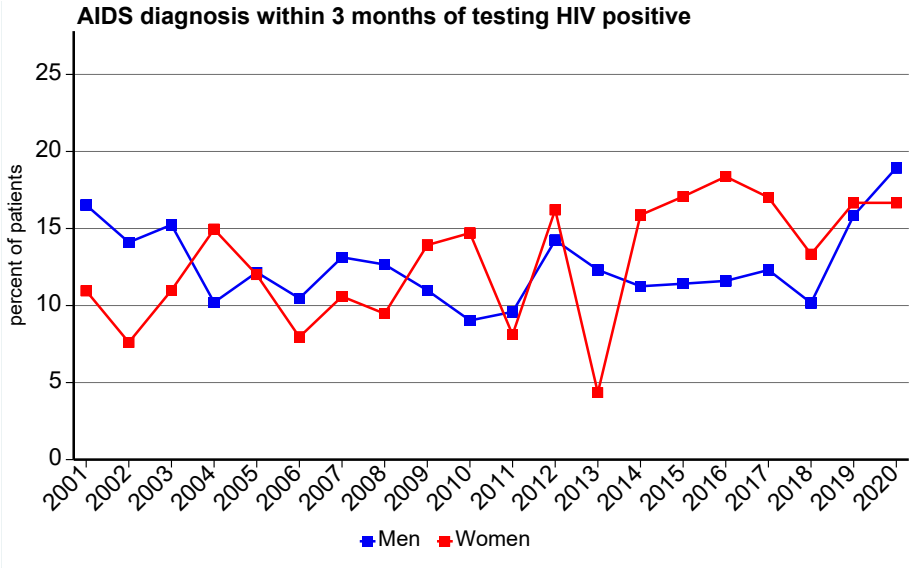
“Late” diagnosis is defined as: CD4 cell count below 350 at time of HIV diagnosis and/or AIDS within 3 months of HIV diagnosis

“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
70
60
50
40
30
20
10
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Advanced (men)
Advanced (women)
Late (men)
Late (women)


AIDS diagnosis within 3 months of testing HIV positive
percent of patients
25
20
15
10
5
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
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	1133	6516	17.39%	**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	462	2275	20.31%	1.89	[1.49,2.39]	0.000	1.86	[1.44,2.39]	0.000
30-50 years	573	3417	16.77%	1.49	[1.19,1.88]	0.001	1.41	[1.11,1.79]	0.005
≥ 50	98	824	11.89%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	137	704	19.46%	0.78	[0.63,0.95]	0.016	0.78	[0.63,0.97]	0.025
Female IDU	66	228	28.95%	1.31	[0.97,1.77]	0.077	1.15	[0.84,1.57]	0.394
Male heterosexual	115	1210	9.50%	0.34	[0.27,0.42]	0.000	0.39	[0.31,0.49]	0.000
Female heterosexual	109	1070	10.19%	0.36	[0.29,0.45]	0.000	0.43	[0.34,0.54]	0.000
Other	18	404	4.46%	0.15	[0.09,0.24]	0.000	0.17	[0.11,0.28]	0.000
MSM	688	2900	23.72%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Federal state									
Carinthia	29	278	10.43%	0.66	[0.45,0.99]	0.042			
Upper Austria	109	582	18.73%	1.31	[1.04,1.65]	0.022			
Salzburg	87	346	25.14%	1.91	[1.47,2.49]	0.000			
Styria	91	584	15.58%	1.05	[0.82,1.34]	0.696			
Tyrol	146	428	34.11%	2.95	[2.36,3.68]	0.000			
Other federal states	183	953	19.20%	1.35	[1.12,1.63]	0.002			
Missing	0	7	0.00%	1.00	[1.00,1.00]	.			
Foreign countries	41	348	11.78%	0.76	[0.54,1.07]	0.114			
Vienna	447	2990	14.95%	1.00	[1.00,1.00]	.			
Population size of area of residence									
Missing value	4	86	4.65%	0.28	[0.10,0.77]	0.013	0.44	[0.16,1.21]	0.111
< 100 000	507	2535	20.00%	1.43	[1.25,1.65]	0.000	1.76	[1.52,2.04]	0.000
≥ 100 000	173	870	19.89%	1.42	[1.17,1.73]	0.000	1.77	[1.44,2.17]	0.000
> 1 million	449	3025	14.84%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
Missing value	5	38	13.16%	0.56	[0.22,1.44]	0.232	0.59	[0.22,1.57]	0.293
Low prevalence countries	192	1503	12.77%	0.54	[0.46,0.64]	0.000	0.54	[0.46,0.65]	0.000
High prevalence countries	40	754	5.31%	0.21	[0.15,0.29]	0.000	0.31	[0.22,0.44]	0.000
Austria	896	4221	21.23%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Calendar period of HIV test									
2005-2008	259	1505	17.21%	0.99	[0.81,1.20]	0.897	0.96	[0.78,1.18]	0.705
2009-2012	296	1461	20.26%	1.21	[1.00,1.46]	0.056	1.09	[0.89,1.33]	0.421
2013-2016	199	1246	15.97%	0.90	[0.73,1.11]	0.337	0.80	[0.64,1.00]	0.047
≥ 2017	156	1022	15.26%	0.86	[0.68,1.07]	0.171	0.73	[0.57,0.92]	0.009
2001-2004	223	1282	17.39%	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

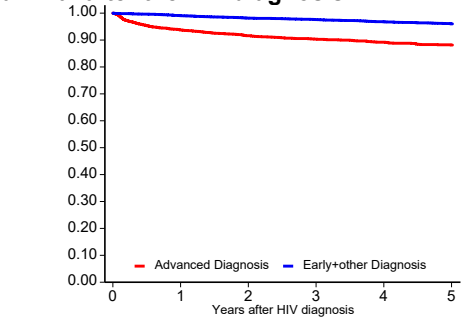
All centres	2778	6516	42.63%	**Univariable logistic Regression**			**Multivariable logistic Regression**		
	Frequencies		**%**	**OR**	**[95% CI]**	**p value**	**OR**	**[95% CI]**	**p value**
Demographic characteristics									
Age at time of HIV diagnosis									
< 30 years	732	2275	32.18%	0.33	[0.28,0.39]	0.000	0.34	[0.29,0.41]	0.000
30-50 years	1561	3417	45.68%	0.59	[0.50,0.69]	0.000	0.62	[0.53,0.73]	0.000
≥ 50	485	824	58.86%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	284	704	40.34%	1.34	[1.13,1.59]	0.001	1.48	[1.24,1.76]	0.000
Female IDU	60	228	26.32%	0.71	[0.52,0.96]	0.026	0.89	[0.65,1.22]	0.487
Male heterosexual	683	1210	56.45%	2.57	[2.24,2.94]	0.000	2.06	[1.78,2.39]	0.000
Female heterosexual	560	1070	52.34%	2.17	[1.89,2.51]	0.000	1.98	[1.69,2.31]	0.000
Other	218	404	53.96%	2.32	[1.88,2.86]	0.000	2.04	[1.64,2.54]	0.000
MSM	973	2900	33.55%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Federal state									
Carinthia	130	278	46.76%	1.24	[0.97,1.59]	0.082			
Upper Austria	268	582	46.05%	1.21	[1.01,1.45]	0.037			
Salzburg	147	346	42.49%	1.05	[0.84,1.31]	0.690			
Styria	267	584	45.72%	1.19	[1.00,1.43]	0.052			
Tyrol	166	428	38.79%	0.90	[0.73,1.11]	0.309			
Other federal states	427	953	44.81%	1.15	[0.99,1.33]	0.062			
Missing	1	7	14.29%	0.24	[0.03,1.96]	0.182			
Foreign countries	135	348	38.79%	0.90	[0.72,1.13]	0.355			
Vienna	1237	2990	41.37%	1.00	[1.00,1.00]	.			
Population size of area of residence									
Missing value	30	86	34.88%	0.76	[0.48,1.19]	0.228	0.64	[0.40,1.02]	0.062
< 100 000	1138	2535	44.89%	1.15	[1.04,1.28]	0.009	1.00	[0.90,1.12]	0.963
≥ 100 000	358	870	41.15%	0.99	[0.85,1.15]	0.900	0.88	[0.75,1.03]	0.110
> 1 million	1252	3025	41.39%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
Missing/Unknown	7	38	18.42%	0.33	[0.14,0.75]	0.008	0.32	[0.13,0.74]	0.008
Low prevalence countries	617	1503	41.05%	1.01	[0.90,1.14]	0.825	1.11	[0.98,1.26]	0.115
High prevalence countries	435	754	57.69%	1.98	[1.70,2.32]	0.000	1.65	[1.39,1.98]	0.000
Austria	1719	4221	40.72%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Calendar period of HIV test									
2005-2008	660	1505	43.85%	1.03	[0.88,1.19]	0.734	1.04	[0.89,1.21]	0.638
2009-2012	601	1461	41.14%	0.92	[0.79,1.07]	0.272	0.97	[0.82,1.13]	0.681
2013-2016	514	1246	41.25%	0.92	[0.79,1.08]	0.318	0.97	[0.82,1.14]	0.702
≥ 2017	449	1022	43.93%	1.03	[0.87,1.22]	0.729	1.04	[0.87,1.24]	0.672
2001-2004	554	1282	43.21%	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 (29 missing)

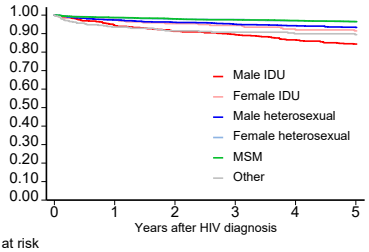
All centres	661	6516	10.14%	**Univariable Cox Regression**			**Multivariable Cox Regression**		
	Frequencies		**%**	**HR**	**[95% CI]**	**p value**	**HR**	**[95% CI]**	**p value**
Demographic characteristics									
Age at time of HIV diagnosis									
< 30 years	165	2275	7.25%	0.25	[0.20,0.30]	0.000	0.17	[0.13,0.21]	0.000
30-50 years	304	3417	8.90%	0.31	[0.26,0.38]	0.000	0.27	[0.22,0.33]	0.000
≥ 50	192	824	23.30%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	188	704	26.70%	3.92	[3.18,4.84]	0.000	4.54	[3.64,5.67]	0.000
Female IDU	56	228	24.56%	3.22	[2.37,4.36]	0.000	4.07	[2.95,5.61]	0.000
Male heterosexual	139	1210	11.49%	1.77	[1.41,2.22]	0.000	1.18	[0.93,1.49]	0.172
Female heterosexual	61	1070	5.70%	0.80	[0.59,1.07]	0.127	0.79	[0.58,1.07]	0.123
Other	51	404	12.62%	2.65	[1.93,3.62]	0.000	1.92	[1.39,2.66]	0.000
MSM	166	2900	5.72%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Population size of area of residence									
Missing value	6	86	6.98%	1.05	[0.47,2.35]	0.906	1.37	[0.59,3.16]	0.464
< 100 000	202	2535	7.97%	0.62	[0.52,0.73]	0.000	0.67	[0.56,0.80]	0.000
≥ 100 000	70	870	8.05%	0.61	[0.48,0.79]	0.000	0.78	[0.60,1.02]	0.065
> 1 million	383	3025	12.66%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
Missing/Unknown	4	38	10.53%	0.95	[0.36,2.55]	0.922	1.12	[0.40,3.11]	0.827
Low prevalence countries	81	1503	5.39%	0.52	[0.41,0.66]	0.000	0.68	[0.54,0.86]	0.001
High prevalence countries	40	754	5.31%	0.43	[0.31,0.60]	0.000	0.74	[0.53,1.05]	0.090
Austria	536	4221	12.70%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Stage of disease									
Advanced diagnosis									
Yes	283	1753	16.14%	2.16	[1.85,2.52]	0.000	1.98	[1.69,2.33]	0.000
No	378	4763	7.94%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Calendar period of HIV test									
2005-2008	188	1505	12.49%	0.71	[0.59,0.86]	0.000	0.80	[0.66,0.97]	0.021
2009-2012	122	1461	8.35%	0.63	[0.50,0.78]	0.000	0.69	[0.55,0.87]	0.002
2013-2016	60	1246	4.82%	0.53	[0.40,0.72]	0.000	0.60	[0.44,0.80]	0.001
≥ 2017	23	1022	2.25%	0.46	[0.30,0.72]	0.001	0.50	[0.32,0.78]	0.002
2001-2004	268	1282	20.90%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

Survival after the HIV diagnosis



Number at risk

Advanced	1752	1459	1333	1232	1138	1038
Early	4746	4233	3917	3635	3334	3047



Number at risk

Male IDU 701	623	579	544	506	472
Female IDU 228	211	201	194	184	177
Male heterosexual1209	1045	959	887	831	759
Female heterosexual1069	942	892	842	798	757
MSM2893	2577	2363	2167	1944	1732
Other 398	294	256	233	209	188

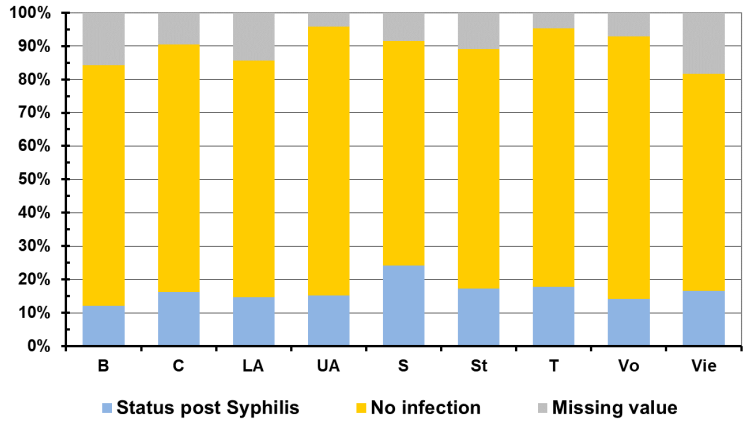
7 Co-infections

7.1 Syphilis

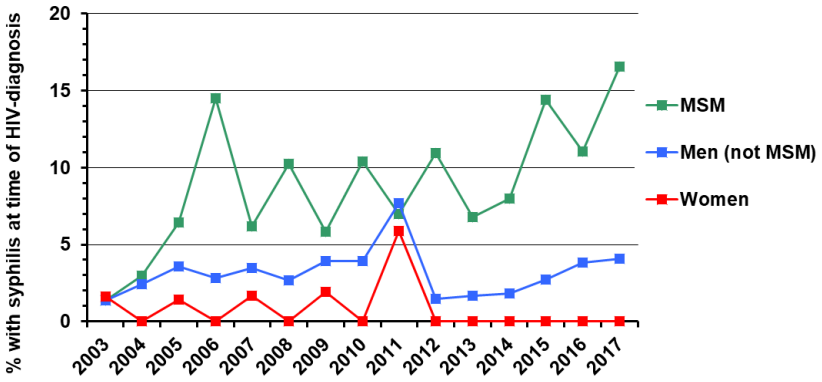
Syphilis can persist for several years when it is not treated, and reinfection with syphilis is possible because there is no protective immunity.

7.1.1 Status post syphilis diagnoses

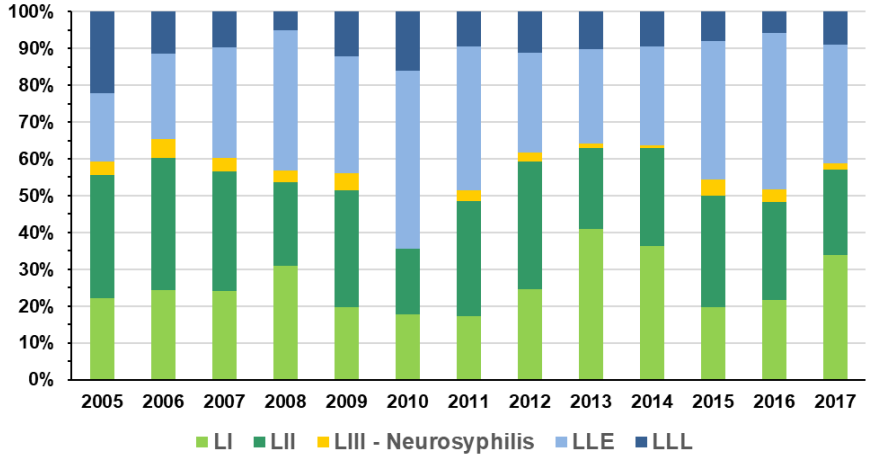
Included are all patients seen since 1.1.2001.



7.1.2 Syphilis at time of HIV diagnosis

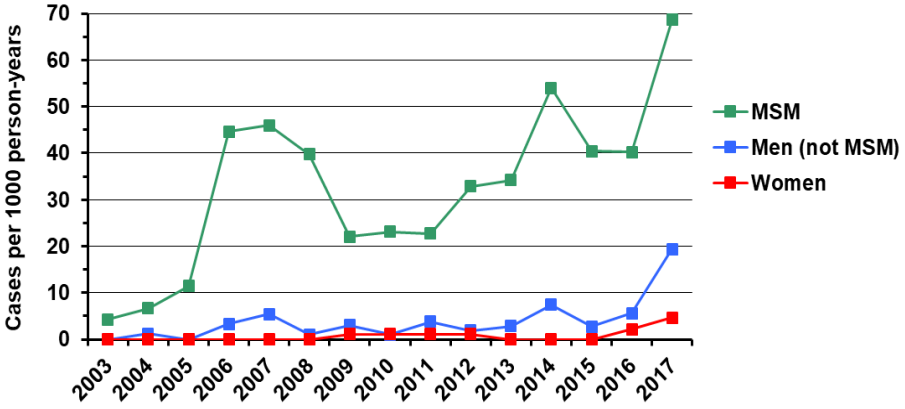


7.1.3 Stages of syphilis among HIV-infected MSM



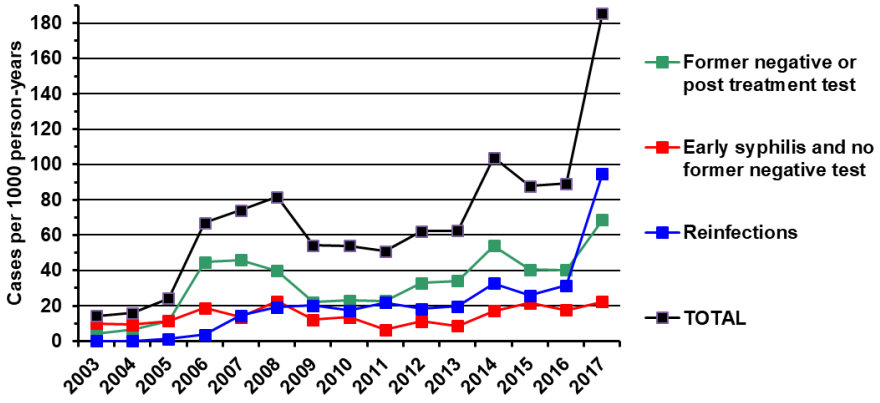
7.1.4 „Recent“ syphilis infections: Incidence

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).



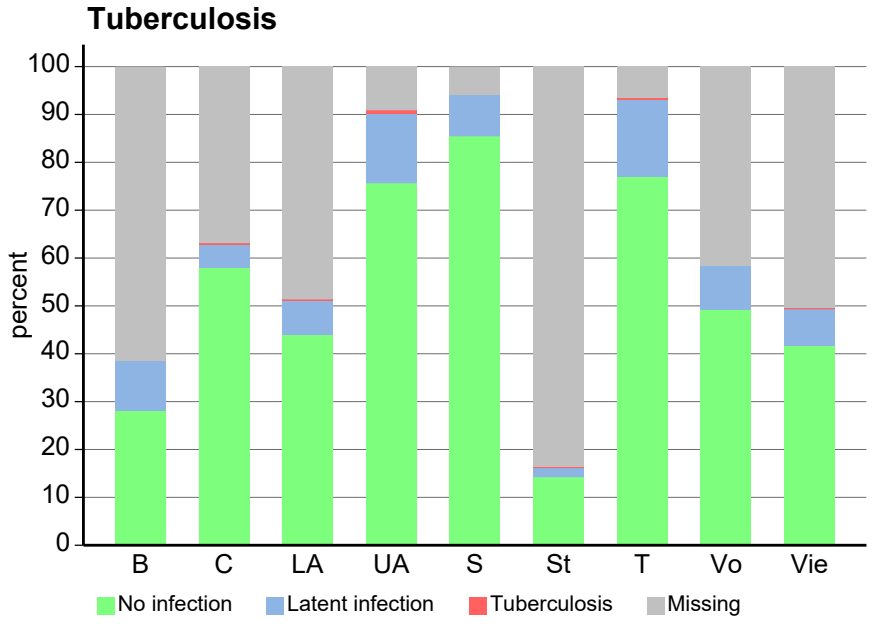
	MSM with incident syphilis	MSM without syphilis	Odds ratio	± 95% C.I.
N	533 (100.0%)	1825 (100.0%)		
Patients not on ART	105 (19.7%)	313 (17.2%)		
Patients on ART	428 (80.3%)	1512 (82.8%)	0.84	0.66 to 1.08
ART interruptions	95 (22.2%)	274 (18.1%)	1.29	0.99 to 1.68
Mean duration of ART in months (± SD)	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



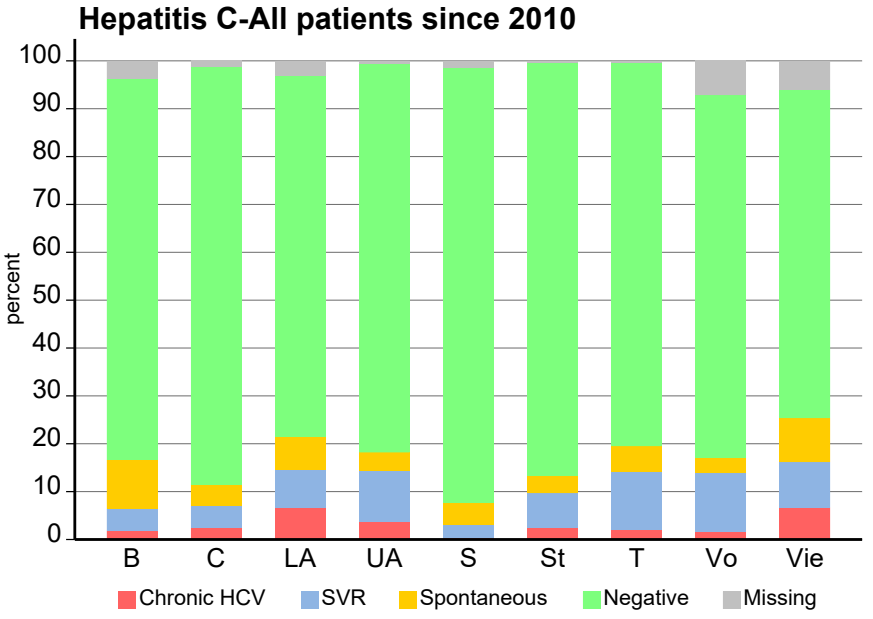
7.2 Tuberculosis in patients seen since 1.1.2010

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



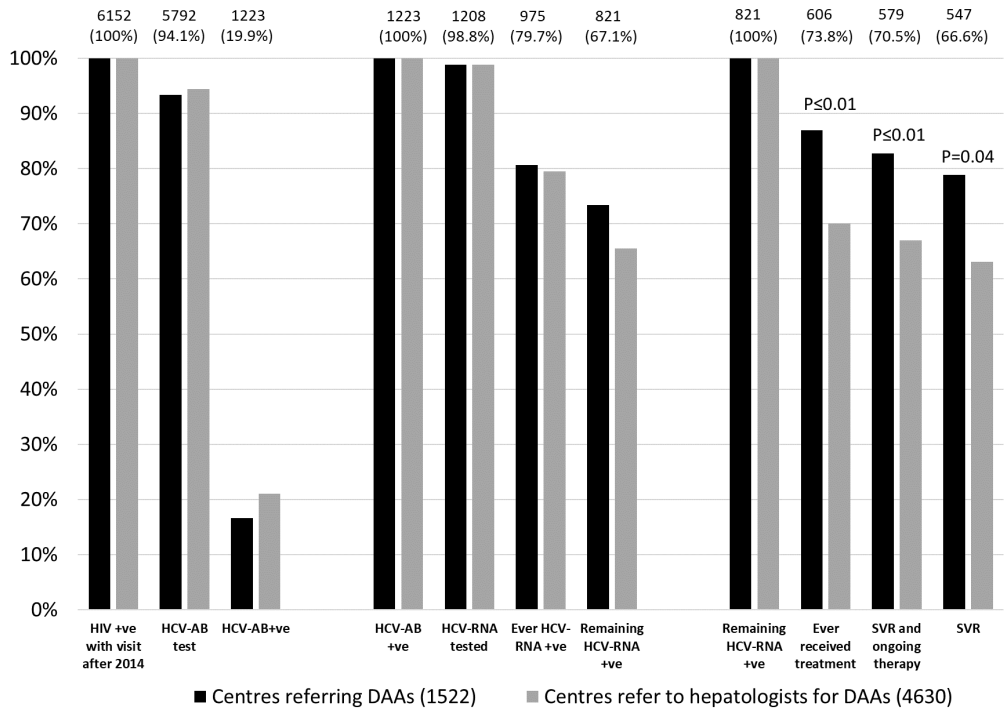
7.3 Hepatitis C

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



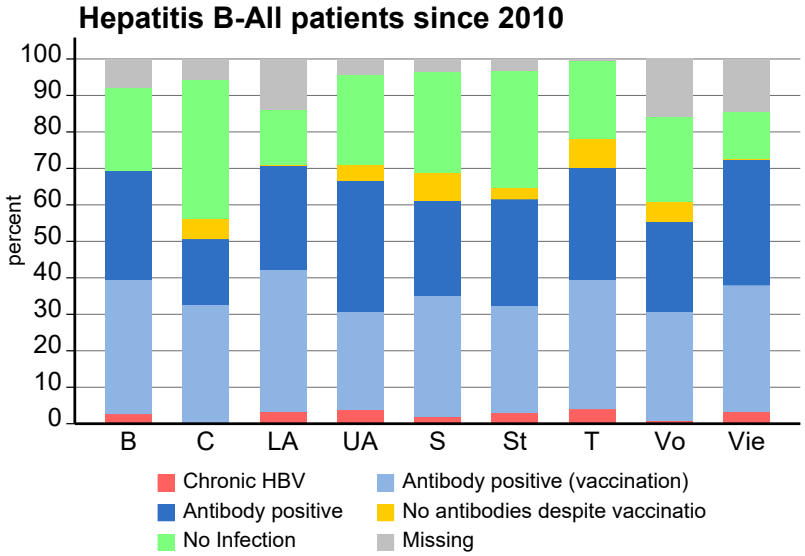
7.3.1 Cascade of Care in patients seen since 1.1.2014

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)



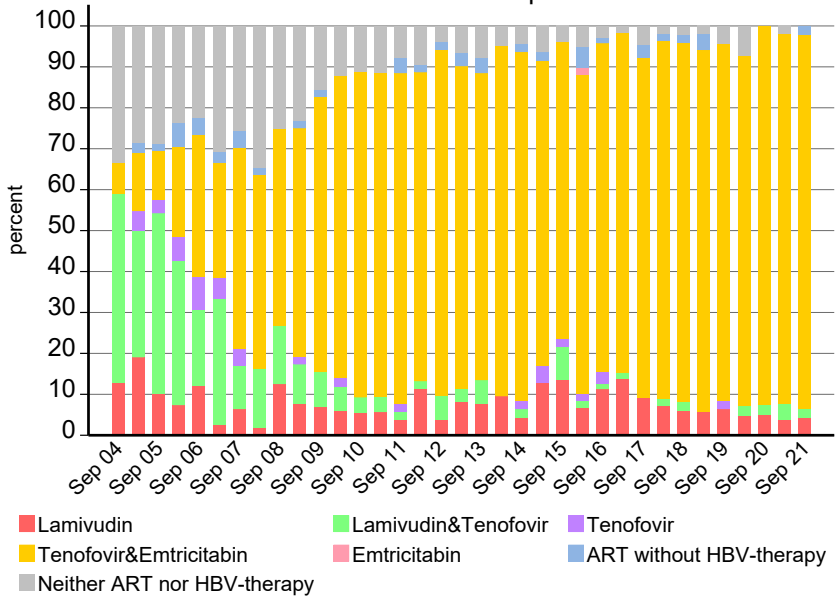
7.4 Hepatitis B in patients seen since 1.1.2010

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: 03/2021)

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 2020 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 3633 of 5744 patients had an amplifiable resistance test. The overall prevalence of TDR was 7.1 (259 of 3633 patients; 95% CI: 6.3%-8.0%). The prevalence of NRTI resistance was 3.0% (2.5%-3.6%), the prevalence of NNRTI resistance was 2.8% (2.3%-3.4%), and the prevalence of PI resistance was 1.8% (1.4%-2.3%). The relative risk of TDR in men who have sex with men compared to heterosexual contacts was 1.5 (95% CI: 1.1-1.9). The prevalence rate of TDR in the 1071 patients with acute/recent infection was 7.7% (62 of 809 patients; 6.0%-9.7%). One patient (0.1%) showed TDR against 3 drug classes (K70R; K103N; L90M). The prevalence rate of TDR in the 4649 patients with chronic infection was 7.0% (197 of 2824 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 2003-2020 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	1568	1200	37	605	125	810	13	233	66	**4657**
2003-2020	1150	1954	200	571	383	606	99	545	236	**5744**

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	301	61	249
2004	349	64	277
2005	355	76	287
2006	364	57	302
2007	382	83	309
2008	400	65	323
2009	351	68	285
2010	368	96	283
2011	364	97	263
2012	371	62	299
2013	311	66	238
2014	302	46	249
2015	329	48	292
2016	297	54	246
2017	305	49	239
2018	207	42	172
2019	233	28	199
2020	155	9	137
Total	**5744**	**1095**	**4649**

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

„Recent" infection means:

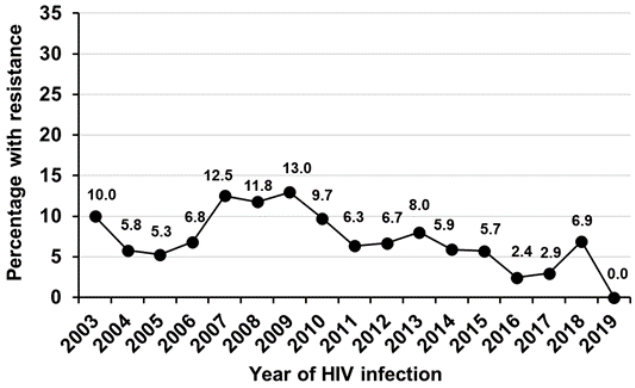
- Acute HIV infection (westernblot pattern or antigen/HIV RNA with clinical symptoms)
- Documented seroconversion with a negative HIV test not more than 3 years before the first positive test

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	76	57	3
2006	57	44	3
2007	83	64	8
2008	65	51	6
2009	68	54	7
2010	96	72	7
2011	97	79	5
2012	62	45	3
2013	66	50	4
2014	46	34	2
2015	48	35	2
2016	54	41	1
2017	49	34	1
2018	42	29	2
2019	28	12	-
2020	9	6	-
Sex/ mode of transmission			
MSM	686	525	49
Male IDU	111	79	3
Female IDU	45	29	2
Male heterosexual	108	87	6
Female heterosexual	99	78	2
Other	22	11	-
Total	**1071**	**809**	**62**

Overall rate of transmitted drug resistance in recent infection was 7.7% (62 of 809).



The year 2020 is not shown in the graph, as because of the definition of recent infection only a limited number of patients can be defined.

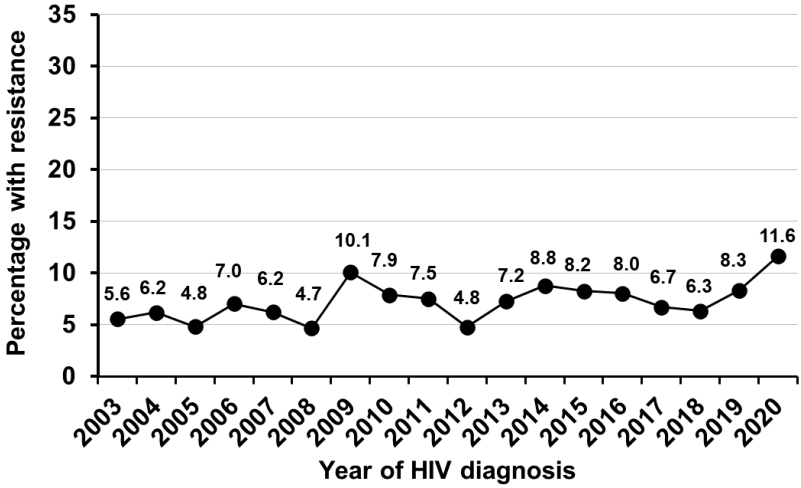
	Number of HIV infections	Available resistance tests	Wild type	Resistance to: Any resistance	NRTI	NNRTI	PI	NRTI and PI	NRTI and NNRTI	NNRTI and PI	3-class-resistance
Year of HIV infection											
2003	61	50	45	5	4	1	-	-	-	-	-
2004	64	52	49	3	-	3	-	-	-	-	-
2005	76	57	54	3	1	2	-	-	-	-	-
2006	57	44	41	3	1	2	-	-	-	-	-
2007	83	64	56	8	4	4	3	1	2	1	1
2008	65	51	45	6	3	1	3	1	-	-	-
2009	68	54	47	7	2	3	4	1	-	1	-
2010	96	72	65	7	1	5	1	-	-	-	-
2011	97	79	74	5	1	4	1	-	-	1	-
2012	62	45	42	3	3	-	-	-	-	-	-
2013	66	50	46	4	1	2	1	-	-	-	-
2014	46	34	32	2	2	-	-	-	-	-	-
2015	48	35	33	2	1	1	-	-	-	-	-
2016	54	41	40	1	-	1	-	-	-	-	-
2017	49	34	33	1	-	-	1	-	-	-	-
2018	42	29	27	2	-	1	1	-	-	-	-
2019	28	12	12	-	-	-	-	-	-	-	-
2020	9	6	6	-	-	-	-	-	-	-	-
Population size of area of residence											
Rural areas	473	369	341	28	11	15	6	1	1	3	1
Capital cities	166	135	122	13	3	5	6	1	-	-	-
Vienna	429	304	283	21	10	10	3	1	1	-	-
Missing value	3	1	1	-	-	-	-	-	-	-	-
Sex/ mode of transmission											
MSM	686	525	476	49	18	24	14	3	2	3	1
Male IDU	111	79	76	3	2	1	-	-	-	-	-
Female IDU	45	29	27	2	-	2	-	-	-	-	-
Male heterosexual	108	87	81	6	2	3	1	-	-	-	-
Female heterosexual	99	78	76	2	2	-	-	-	-	-	-
Others	22	11	11	-	-	-	-	-	-	-	-
Age at time of HIV-test											
< 35 years	619	457	413	44	16	23	8	1	1	1	-
≥ 35 years	452	352	334	18	8	7	7	2	1	2	1
Total	**1071**	**809**	**741**	**62**	**24**	**30**	**15**	**3**	**2**	**3**	**1**

Younger patients (<35 years) had a higher risk for transmitted resistance (OR=2.2, 95% CI: 1.2-4.0).

8.5 Unknown time of infection (not "recent")

Men who had been infected through intravenous drug use (OR=0.3, 95% CI: 0.2-0.7) or heterosexually (OR=0.6, 95% CI: 0.4-0.9) had a lower risk of transmitted resistance.

	Number of HIV diagnoses	Available resistance tests before ART	Any resistance
Year of HIV diagnosis			
2003	249	144	8
2004	277	178	11
2005	287	187	9
2006	302	185	13
2007	309	193	12
2008	323	193	9
2009	285	189	19
2010	283	190	15
2011	263	173	13
2012	299	189	9
2013	238	152	11
2014	249	148	13
2015	292	170	14
2016	246	162	13
2017	239	149	10
2018	172	95	6
2019	199	84	7
2020	137	43	5
Mode of transmission			
MSM	1945	1217	103
Male IDU	469	296	9
Female IDU	136	78	7
Male heterosexual	934	578	26
Female heterosexual	833	528	40
Other	332	127	12
Total	**4649**	**2824**	**197**

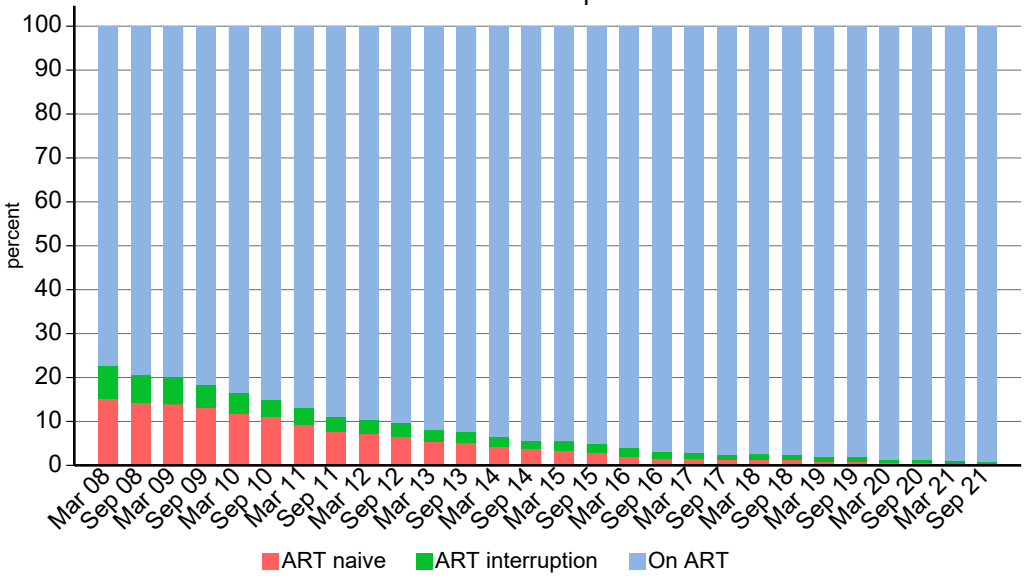


	Number of HIV diagnoses	Available resistance tests	Wild type	Resistance to							
				Any resistance	NRTI	NNRTI	PI	NRTI and PI	NRTI and NNRTI	NNRTI and PI	3-class-resistance
Year of HIV diagnosis											
2003	249	144	136	8	4	3	1	-	-	-	-
2004	277	178	167	11	6	2	4	1	-	-	-
2005	287	187	178	9	7	1	4	3	-	-	-
2006	302	185	172	13	6	2	5	-	-	-	-
2007	309	193	181	12	7	2	3	-	-	-	-
2008	323	193	184	9	4	2	3	-	-	-	-
2009	285	189	170	19	7	4	9	-	1	-	-
2010	283	190	175	15	4	8	4	1	-	-	-
2011	263	173	160	13	3	6	4	-	-	-	-
2012	299	189	180	9	7	2	1	-	1	-	-
2013	238	152	141	11	7	4	-	-	-	-	-
2014	249	148	135	13	3	6	4	-	-	-	-
2015	292	170	156	14	5	6	4	-	-	1	-
2016	246	162	149	13	3	9	1	-	-	-	-
2017	239	149	139	10	4	6	-	-	-	-	-
2018	172	95	89	6	4	1	2	1	-	-	-
2019	199	84	77	7	2	4	1	-	-	-	-
2020	137	43	38	5	2	4	-	-	1	-	-
Population size of area of residence											
Rural areas	1756	1114	1028	86	40	27	21	1	1	-	-
Capital cities	616	453	420	33	9	18	8	-	2	-	-
Vienna	2214	1240	1165	75	35	26	20	5	-	1	-
Missing value	63	17	14	3	1	1	1	-	-	-	-
Sex/ mode of transmission											
MSM	1945	1217	1114	103	41	37	28	2	-	1	-
Male IDU	469	296	287	9	2	7	-	-	-	-	-
Female IDU	136	78	71	7	2	4	1	-	-	-	-
Male heterosexual	934	578	552	26	13	6	9	1	1	-	-
Female heterosexual	833	528	488	40	23	12	10	3	2	-	-
Others	332	127	115	12	4	6	2	-	-	-	-
Age at time of HIV-test											
< 35 years	2361	1368	1263	105	46	43	24	6	2	-	-
≥ 35 years	2288	1456	1364	92	39	29	26	-	1	1	-
Total	**4649**	**2824**	**2627**	**197**	**85**	**72**	**50**	**6**	**3**	**1**	**0**

9 Antiretroviral therapy (ART)

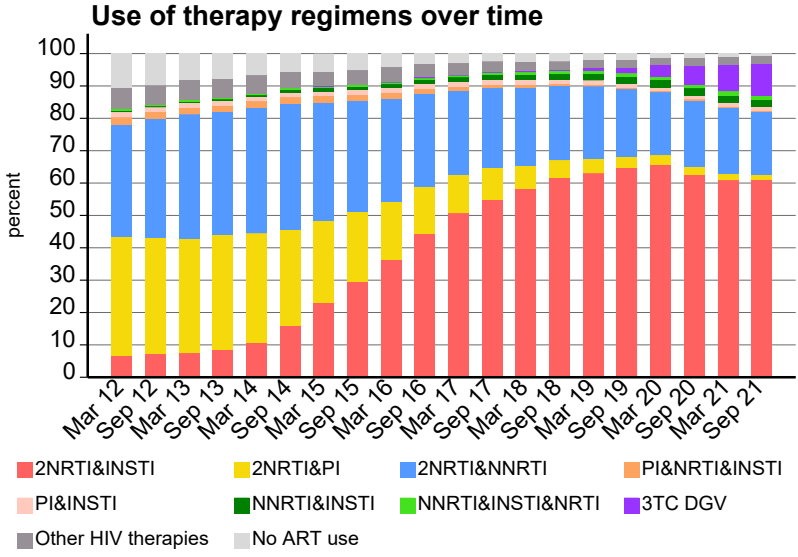
9.1 Patients currently in care regarding treatment status

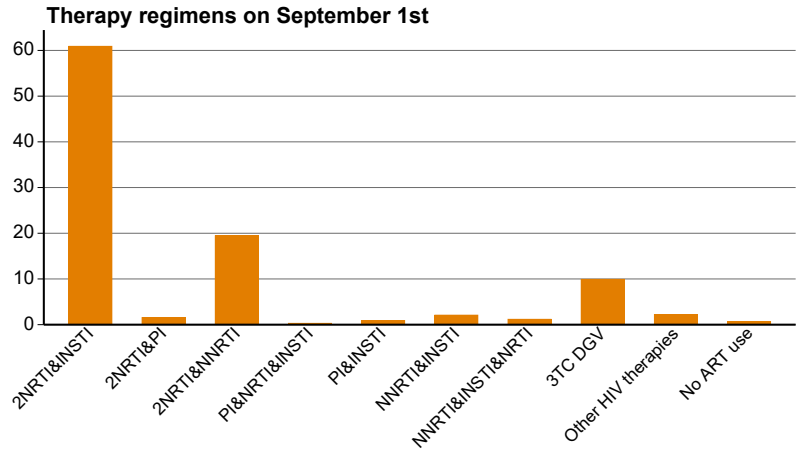
On September 1st, 2021 4486 (99.3%) patients were on antiretroviral therapy in the 9 HIV treatment centres. Of the 33 patients not on treatment on September 1st, 2021, 13 had received antiretroviral treatment at an earlier point in time.

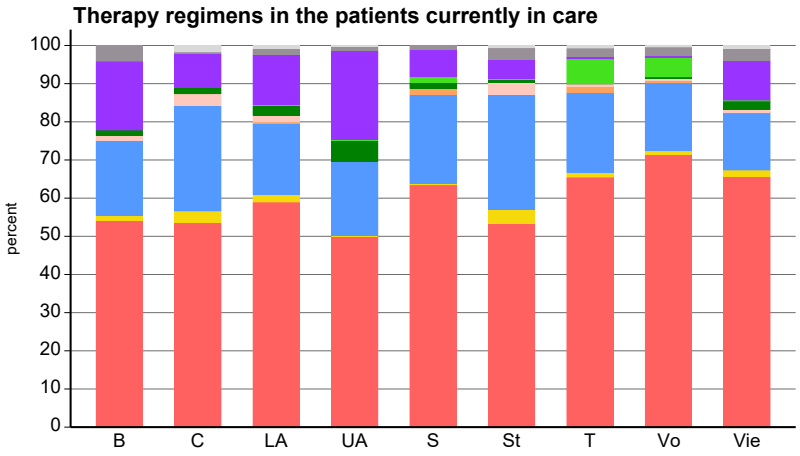


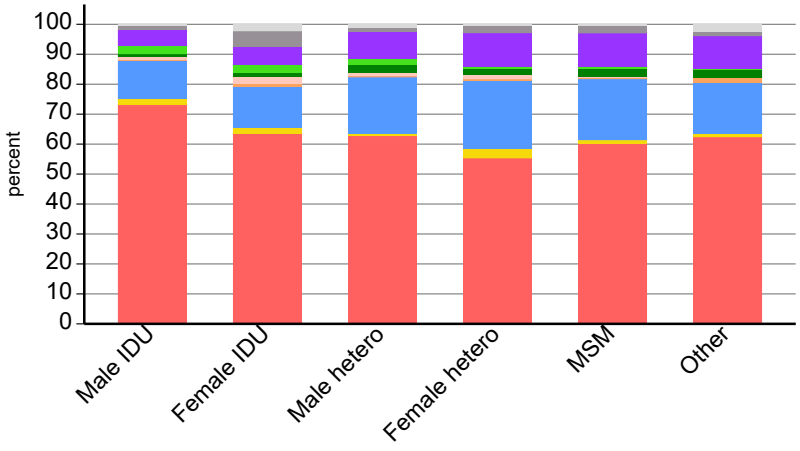
9.2 Regimens of antiretroviral therapy

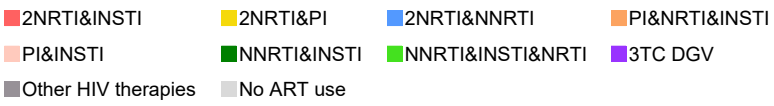
0 patients have currently PI monotherapy.




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

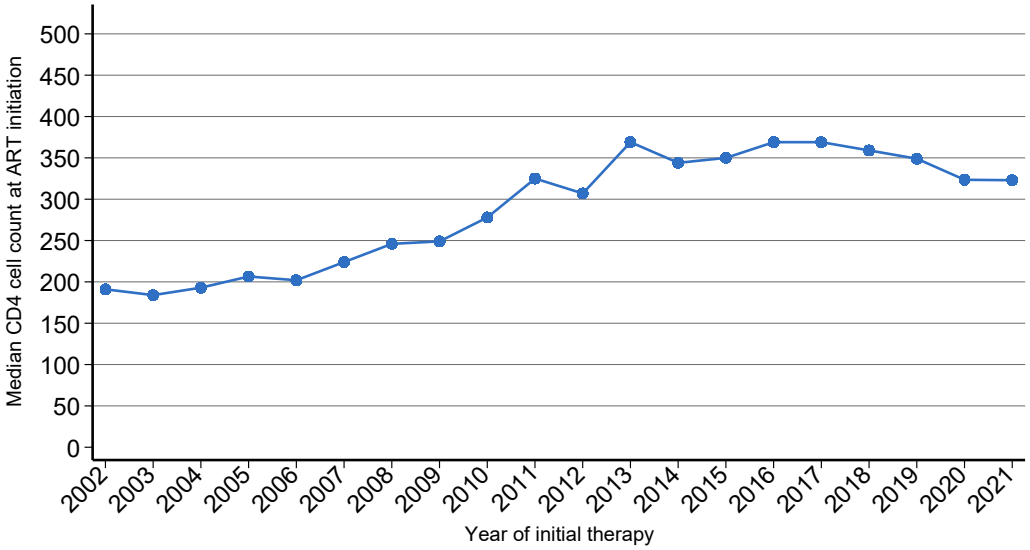

percent
100
90
80
70
60
50
40
30
20
10
0
Male IDU
Female IDU
Male hetero
Female hetero
MSM
Other


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

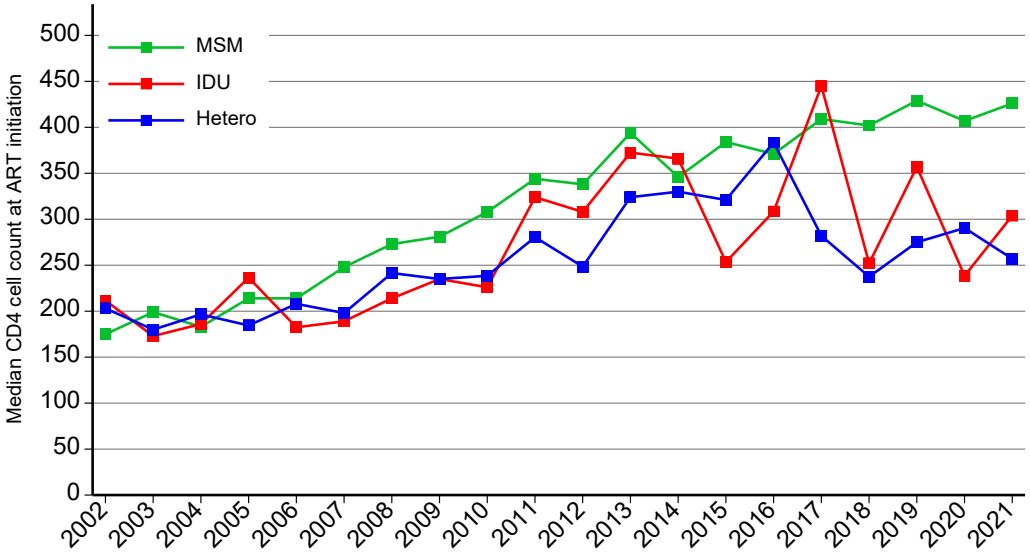
9.3.1 CD4 cell counts at initiation of ART

Median CD4 cell count-last measurement before ART start

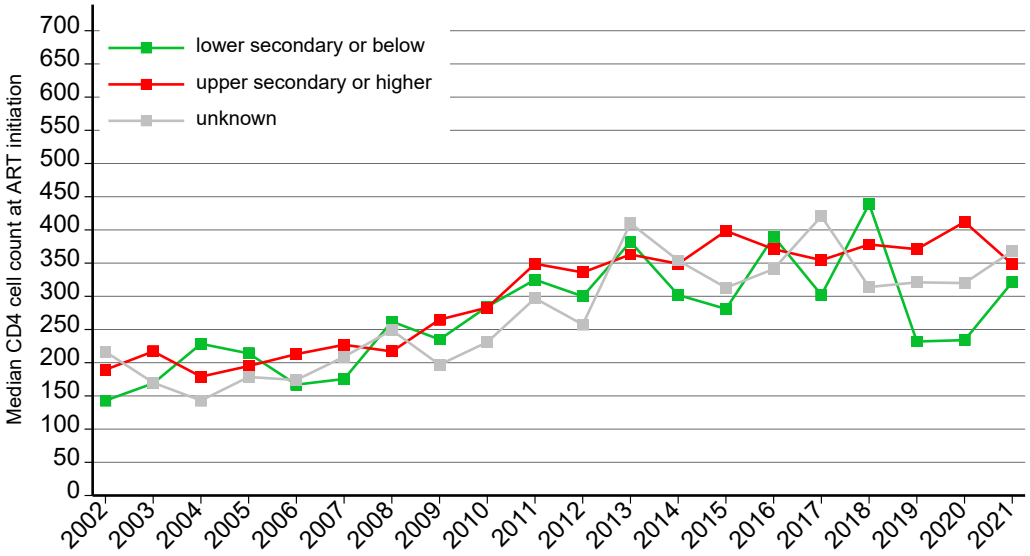


9.3.2 Median CD4 count at ART initiation

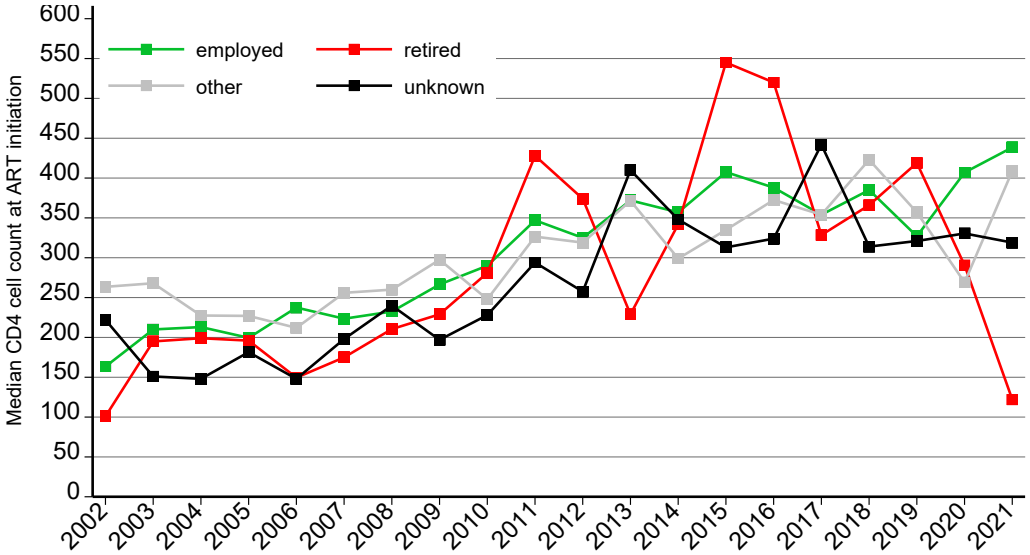
Transmission category



Level of education

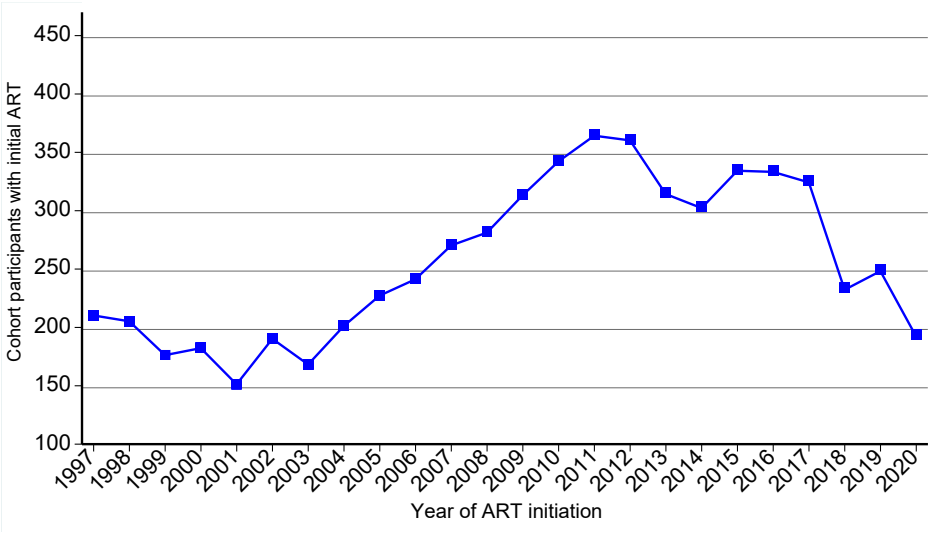


Status of employment



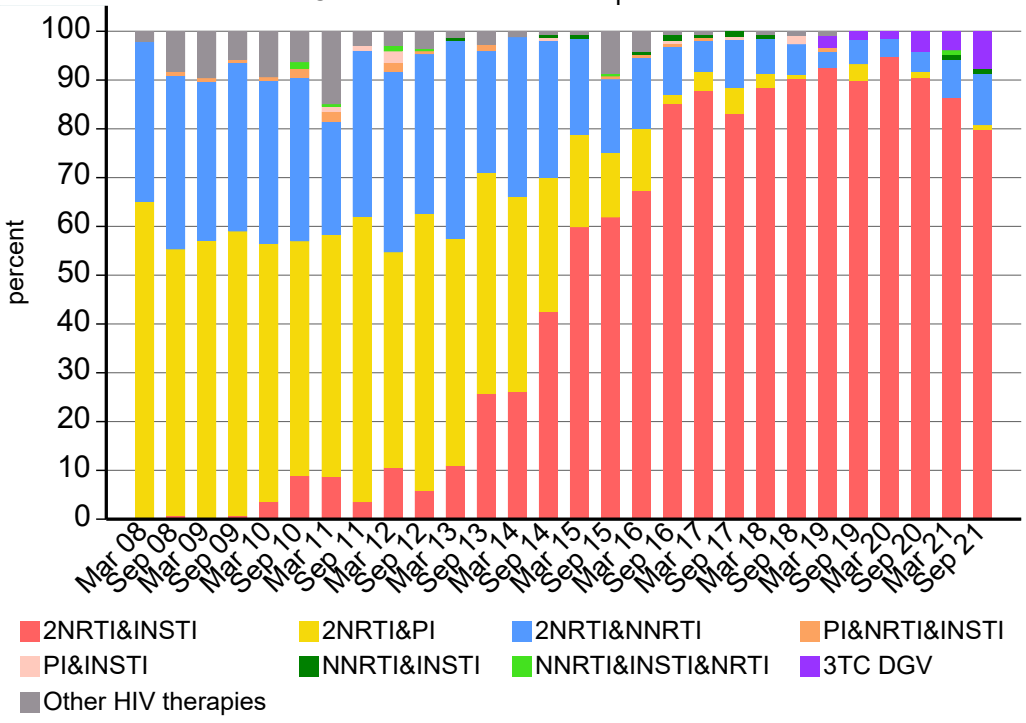
9.4 Initial therapy

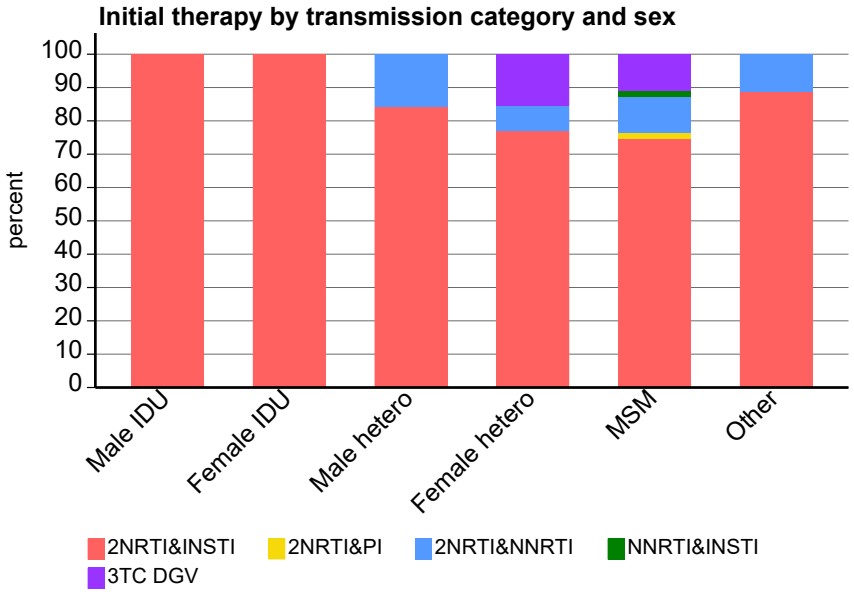
9.4.1 Number of persons who started ART in the respective year



9.4.2 Regimens of the initial therapy

After March 1st, 2021, 104 patients started antiretroviral therapy. 84 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&PI
2NRTI&NNRTI
NNRTI&INSTI
3TC DGV

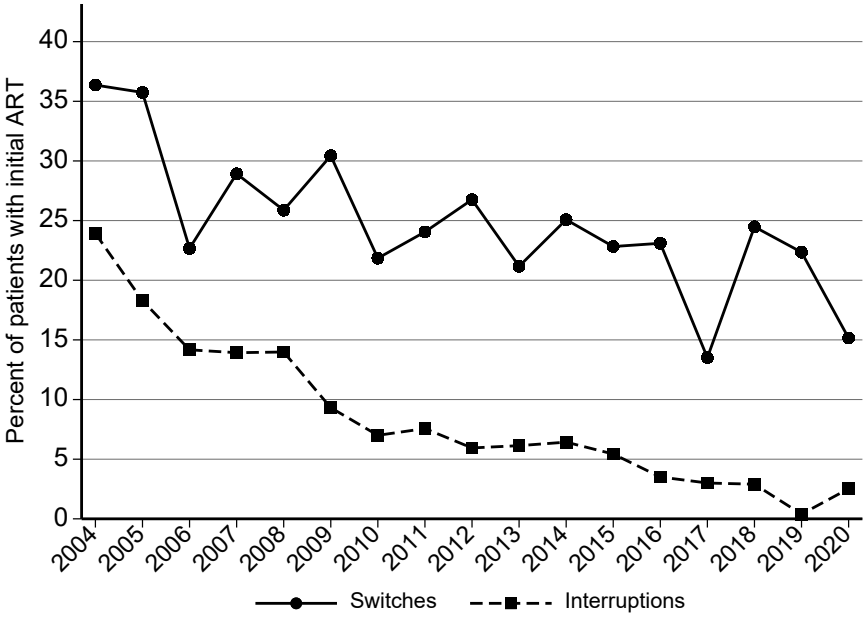
9.5 ART switches and interruptions

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

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

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

Year of ART initiation	% of patients with ART switches	% of patients with ART interruptions
2004	36.4	23.9
2005	35.7	18.3
2006	22.7	14.2
2007	28.9	13.9
2008	25.9	14.0
2009	30.4	9.3
2010	21.8	7.0
2011	24.1	7.6
2012	26.8	5.9
2013	21.2	6.1
2014	25.1	6.4
2015	22.8	5.4
2016	23.1	3.5
2017	13.5	3.0
2018	24.5	2.9
2019	22.4	0.4
2020	15.2	2.5

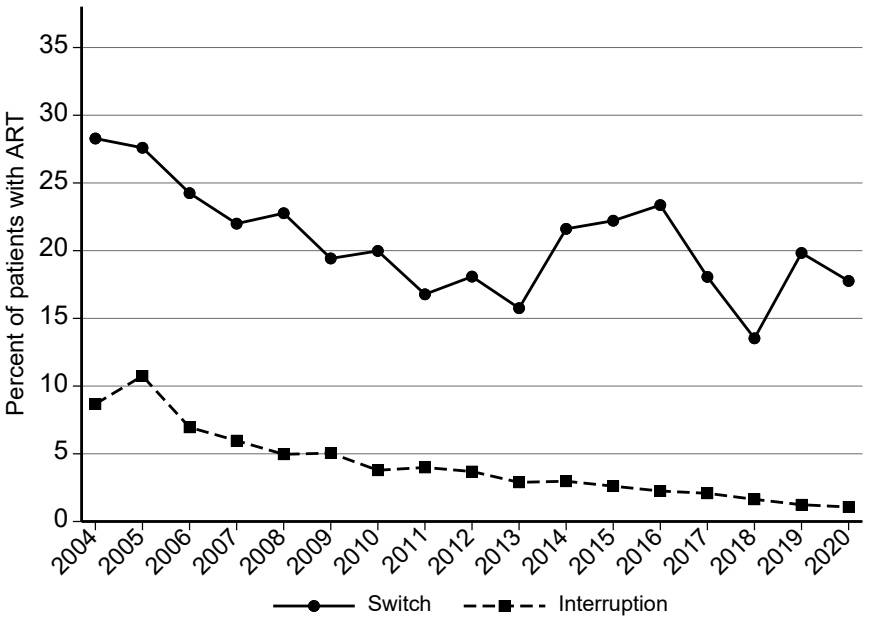


9.5.2 ART switches and interruptions per calendar year

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

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

Year of ART initiation	% of patients with ART switches	% of patients with ART interruptions
2004	28.3	8.7
2005	27.6	10.7
2006	24.2	7.0
2007	22.0	6.0
2008	22.8	5.0
2009	19.4	5.0
2010	20.0	3.8
2011	16.8	4.0
2012	18.1	3.7
2013	15.8	2.9
2014	21.6	3.0
2015	22.2	2.6
2016	23.4	2.3
2017	18.1	2.1
2018	13.5	1.6
2019	19.8	1.2
2020	17.8	1.1



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		
	1236	5050	24.48%	OR	[95% CI]	p value	OR	[95% CI]	p value
HIV transmission category									
Male IDU	124	555	22.34%	1.00	[0.80,1.25]	0.975	0.89	[0.71,1.12]	0.334
Female IDU	42	200	21.00%	0.92	[0.65,1.31]	0.647	0.86	[0.60,1.23]	0.409
Male heterosexual	220	936	23.50%	1.06	[0.89,1.27]	0.500	0.88	[0.73,1.06]	0.175
Female heterosexual	279	847	32.94%	1.70	[1.43,2.02]	0.000	1.51	[1.26,1.80]	0.000
Other	66	258	25.58%	1.19	[0.88,1.60]	0.249	1.02	[0.75,1.39]	0.887
MSM	505	2254	22.40%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Age at baseline									
< 30 years	288	1276	22.57%	0.75	[0.62,0.92]	0.006	0.79	[0.64,0.97]	0.026
30-50 years	721	2961	24.35%	0.83	[0.70,0.99]	0.038	0.81	[0.68,0.98]	0.026
≥ 50	227	813	27.92%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
AIDS at baseline									
Yes	274	761	36.01%	1.95	[1.65,2.29]	0.000			
No	962	4289	22.43%	1.00	[1.00,1.00]	.			
CD4 count at baseline									
< 50	195	562	34.70%	2.20	[1.78,2.72]	0.000	2.04	[1.64,2.54]	0.000
50-199	293	996	29.42%	1.73	[1.44,2.07]	0.000	1.58	[1.31,1.91]	0.000
200-349	296	1341	22.07%	1.17	[0.99,1.40]	0.073	1.08	[0.90,1.30]	0.403
Missing	116	422	27.49%	1.57	[1.23,2.01]	0.000	1.65	[1.29,2.12]	0.000
≥ 350	336	1729	19.43%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV-RNA at baseline									
10.000-99.999	364	1787	20.37%	0.87	[0.71,1.06]	0.176			
≥ 100.000	505	1796	28.12%	1.33	[1.10,1.62]	0.003			
Missing	178	634	28.08%	1.33	[1.05,1.69]	0.018			
≤ 9.999	189	833	22.69%	1.00	[1.00,1.00]	.			
Nationality									
High prevalence countries	193	666	28.98%	1.31	[1.09,1.57]	0.004			
Low prevalence countries	1043	4384	23.79%	1.00	[1.00,1.00]	.			
Population size of area of residence									
Rural areas	493	1970	25.03%	1.13	[0.98,1.30]	0.088	1.13	[0.98,1.31]	0.100
Capital cities	197	687	28.68%	1.36	[1.12,1.65]	0.002	1.38	[1.13,1.68]	0.001
Vienna	546	2393	22.82%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Year of ART Initiation									
2004-2007	297	971	30.59%	1.79	[1.48,2.17]	0.000	1.66	[1.36,2.04]	0.000
2008-2011	339	1335	25.39%	1.39	[1.16,1.66]	0.000	1.41	[1.17,1.70]	0.000
2012-2015	330	1375	24.00%	1.29	[1.07,1.54]	0.007	1.32	[1.10,1.59]	0.003
2016-2020	270	1369	19.72%	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

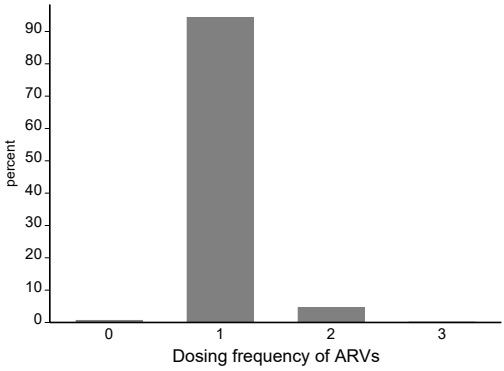
	TI	All		Univariable logistic regression			Multivariable logistic regression		
	407	5050	8.06%	OR	[95% CI]	p value	OR	[95% CI]	p value
HIV transmission category									
Male IDU	87	555	15.68%	4.86	[3.54,6.68]	0.000	3.53	[2.54,4.91]	0.000
Female IDU	50	200	25.00%	8.72	[5.92,12.85]	0.000	6.22	[4.13,9.37]	0.000
Male heterosexual	71	936	7.59%	2.15	[1.55,2.98]	0.000	1.76	[1.24,2.50]	0.002
Female heterosexual	104	847	12.28%	3.66	[2.71,4.94]	0.000	2.53	[1.80,3.55]	0.000
Other	12	258	4.65%	1.28	[0.69,2.37]	0.441	1.27	[0.67,2.40]	0.468
MSM	83	2254	3.68%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Age at baseline									
< 30 years	164	1276	12.85%	2.46	[1.75,3.45]	0.000	1.70	[1.17,2.47]	0.005
30-50 years	197	2961	6.65%	1.19	[0.85,1.65]	0.306	0.90	[0.63,1.27]	0.541
≥ 50	46	813	5.66%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
AIDS at baseline									
Yes	63	761	8.28%	1.04	[0.78,1.37]	0.810			
No	344	4289	8.02%	1.00	[1.00,1.00]	.			
CD4 count at baseline									
< 50	46	562	8.19%	1.08	[0.76,1.53]	0.672			
50-199	85	996	8.53%	1.13	[0.85,1.50]	0.404			
200-349	111	1341	8.28%	1.09	[0.84,1.42]	0.513			
Missing	33	422	7.82%	1.03	[0.69,1.53]	0.898			
≥ 350	132	1729	7.63%	1.00	[1.00,1.00]	.			
HIV-RNA at baseline									
10.000-99.999	140	1787	7.83%	0.82	[0.62,1.10]	0.187			
≥ 100.000	132	1796	7.35%	0.77	[0.57,1.03]	0.077			
Missing	57	634	8.99%	0.96	[0.67,1.37]	0.806			
≤ 9.999	78	833	9.36%	1.00	[1.00,1.00]	.			
Nationality									
High prevalence countries	86	666	12.91%	1.88	[1.46,2.42]	0.000	1.32	[0.97,1.80]	0.074
Low prevalence countries	321	4384	7.32%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Population size of area of residence									
Rural areas	117	1970	5.94%	0.63	[0.50,0.80]	0.000	0.82	[0.64,1.05]	0.113
Capital cities	72	687	10.48%	1.17	[0.88,1.55]	0.279	1.48	[1.10,2.00]	0.011
Vienna	218	2393	9.11%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Year of ART Initiation									
2004-2007	167	971	17.20%	7.92	[5.44,11.52]	0.000	5.71	[3.89,8.39]	0.000
2008-2011	123	1335	9.21%	3.87	[2.64,5.68]	0.000	3.03	[2.05,4.48]	0.000
2012-2015	82	1375	5.96%	2.42	[1.62,3.62]	0.000	2.15	[1.43,3.24]	0.000
2016-2020	35	1369	2.56%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

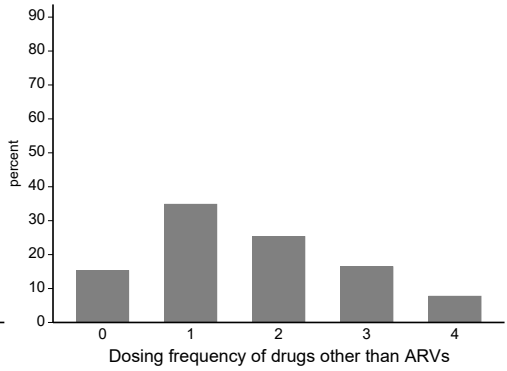
9.7 Frequency of drug dosing

9.7.1 Overview

12 of 4519 (0.3%) patients do not take any drugs at all and 21 (0.5%) patients have no ART but take other drugs. 682 (15.1%) patients are receiving ART only.

	Number of patients					
Dosing frequency	**0**	**1**	**2**	**3**	**4**	**Total**
Antiretrovirals (ARVs)	33	4268	214	4	0	4519
Drugs other than ARVs	694	1578	1148	746	353	4519
Overall dosing frequency	12	1494	1677	918	418	4519
Overall dosing frequency in patients with once daily ARVs	0	1488	1554	847	379	4268





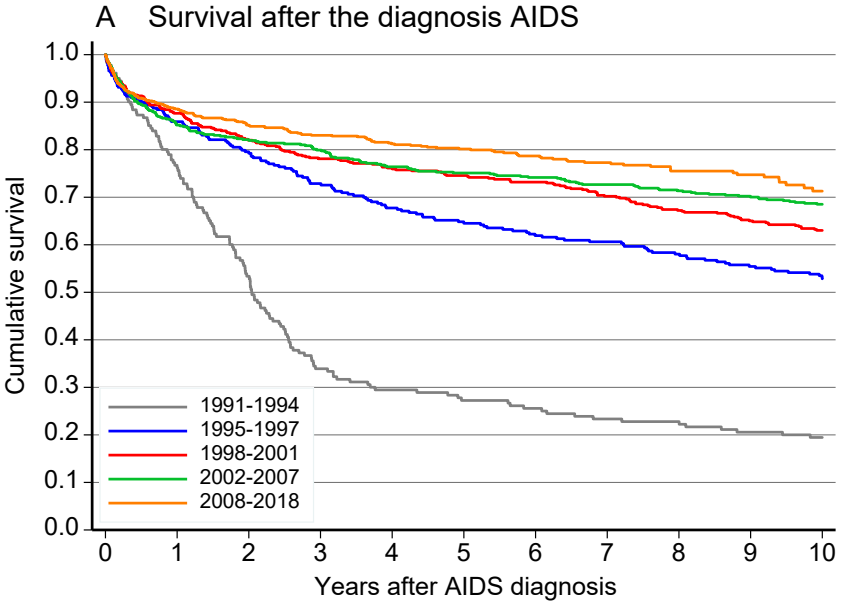
9.7.2 Most frequent used regimen to treat HIV (September 2021)

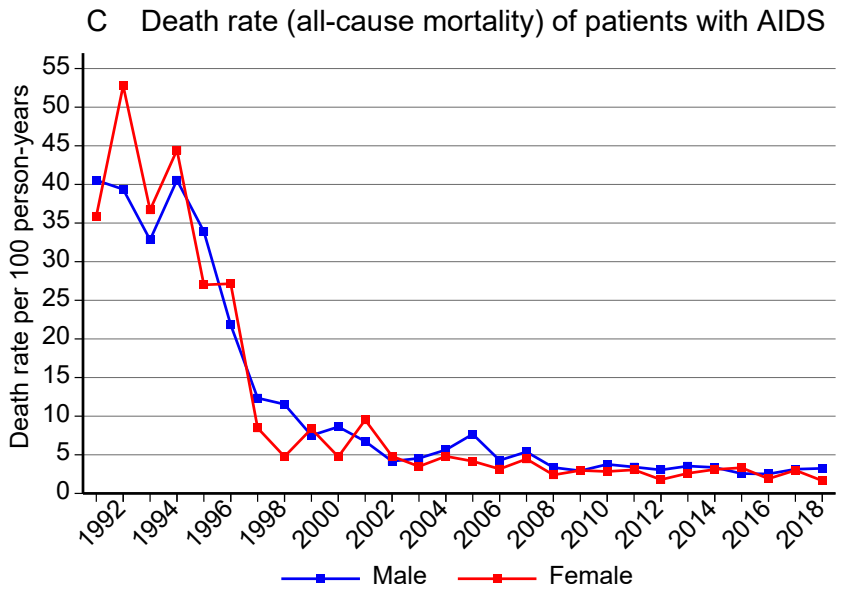
Regimen	Frequency	Percent
BGV FTC TAF	1,175	26.19
3TC ABC DGV	576	12.84
3TC DGV	452	10.08
DGV FTC TAF	438	9.76
FTC RPV TAF	420	9.36
EVG FTC TAF	227	5.06
3TC DOR TDF	169	3.77
DGV FTC TDF	116	2.59
FTC RAL TAF	88	1.96
DGV RPV	75	1.67
3TC ABC RAL	74	1.65
3TC ABC NVP	73	1.63
FTC RAL TDF	59	1.32
FTC NVP TAF	54	1.20
FTC RPV TDF	47	1.05
Other	443	9.87
Total	**4486**	**100.00**

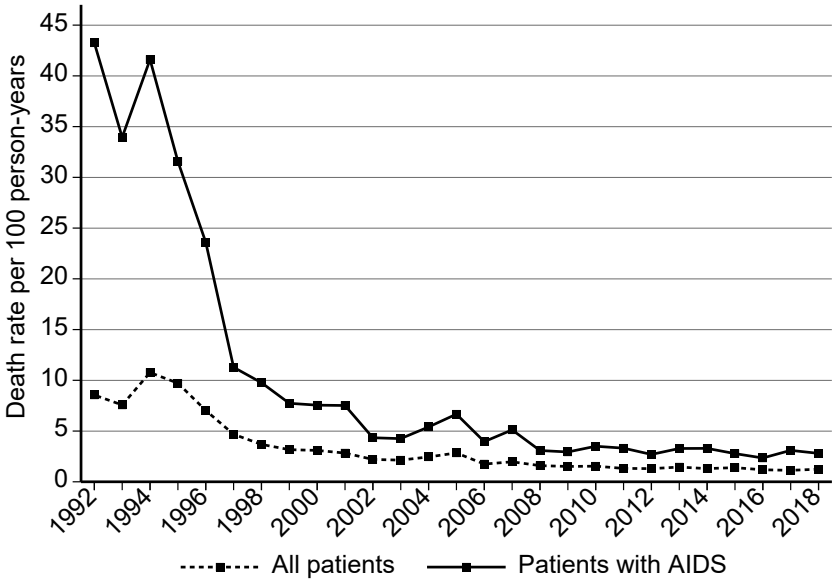
10 Disease progression and Response to ART

10.1 Mortality of patients with AIDS since 1985

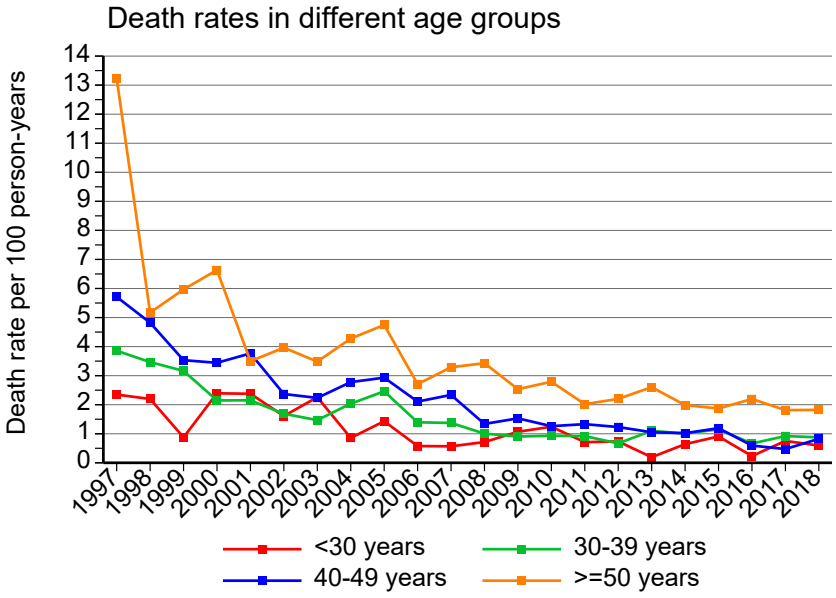
The documentation of death is partially incomplete in the HIV Patient Management System (e.g. considerable proportion of patients without follow-up since 2001 are not documented dead but presumed dead, see chapter 4).



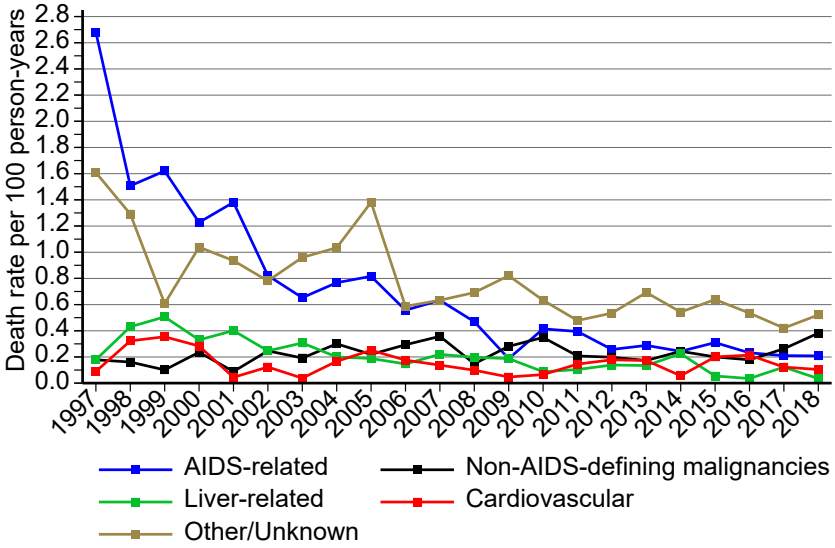




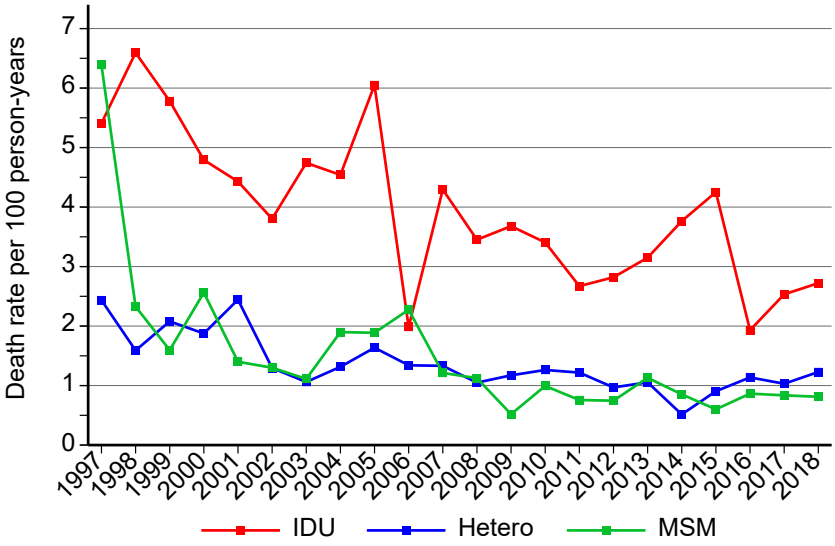
10.2 Mortality in combination ART era (years 1997-2017)



Death rates according to causes of death



Death rates according to transmission category

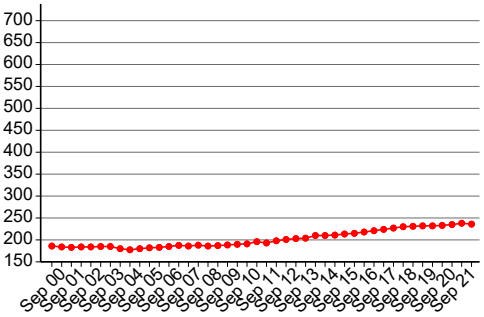


10.3 CD4 cell counts

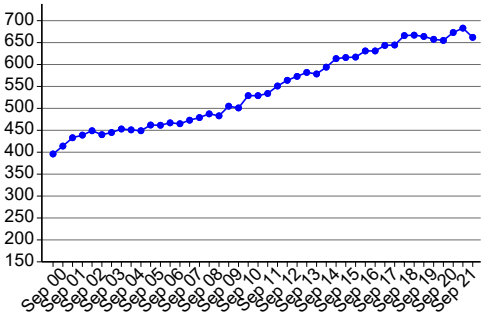
10.3.1 CD4 cell counts: nadir and most recent

Median CD4 cell counts

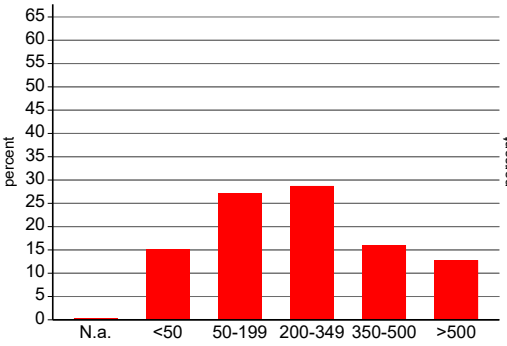
CD4 Nadir



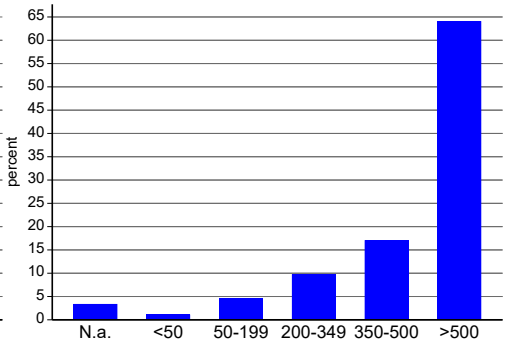
Recent CD4 cell count



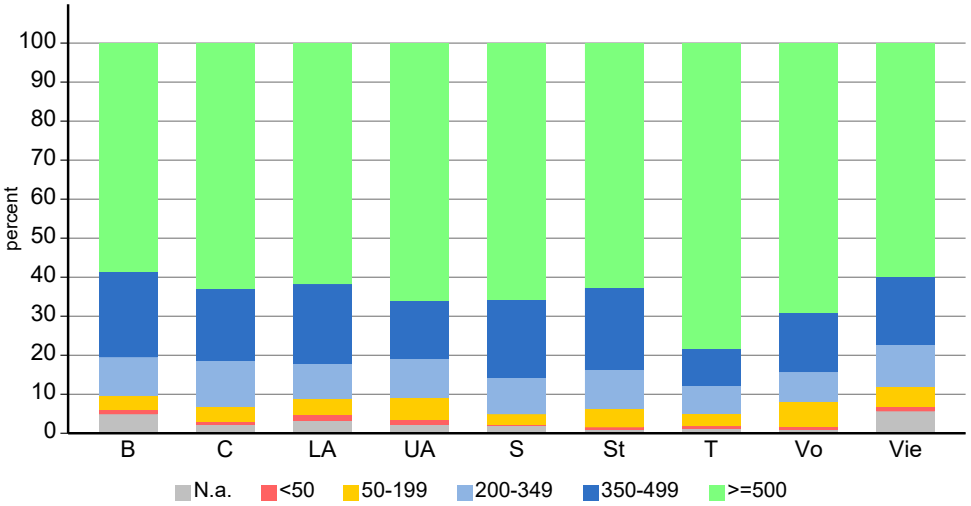
CD4 nadir (last 12 months)



Recent CD4 cell count (last 12 months)



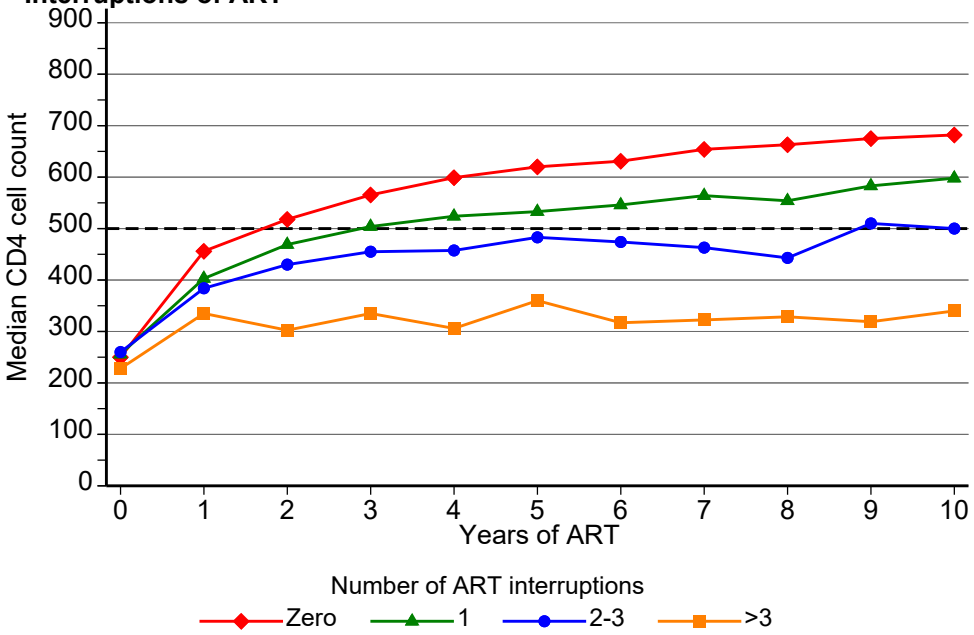
Most recent CD4 cell count



10.3.2 Median CD4 cell counts after initiating ART

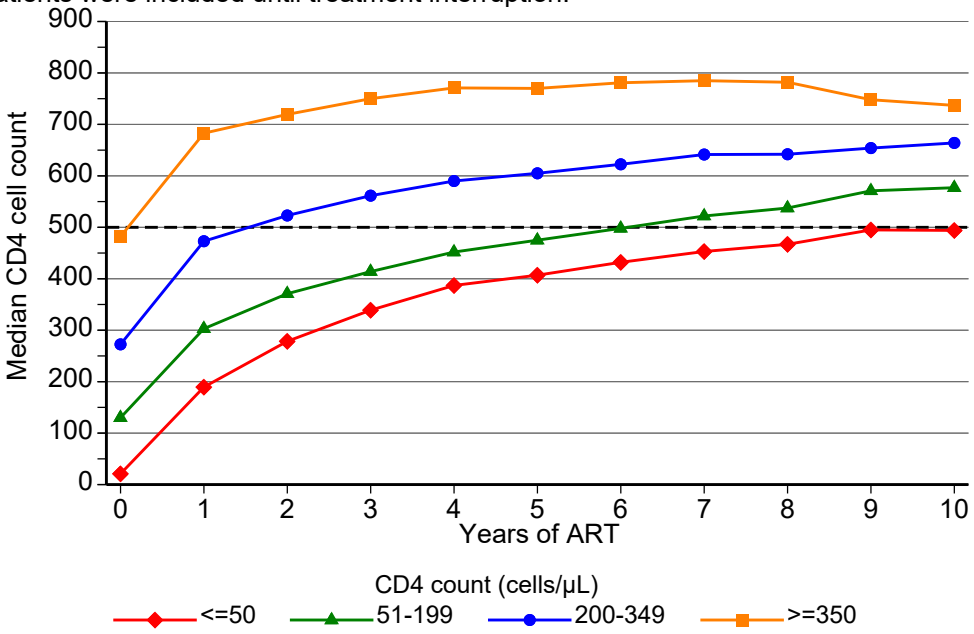
The analyses include only patients who initiated ART after January 1, 1997.

a) Interruptions of ART



b) Baseline CD4 count

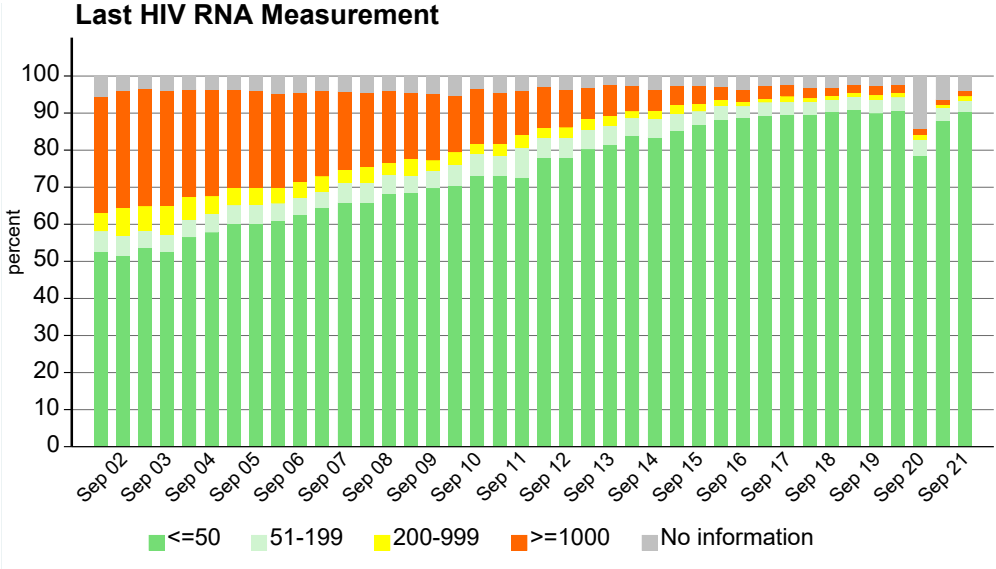
Patients were included until treatment interruption.

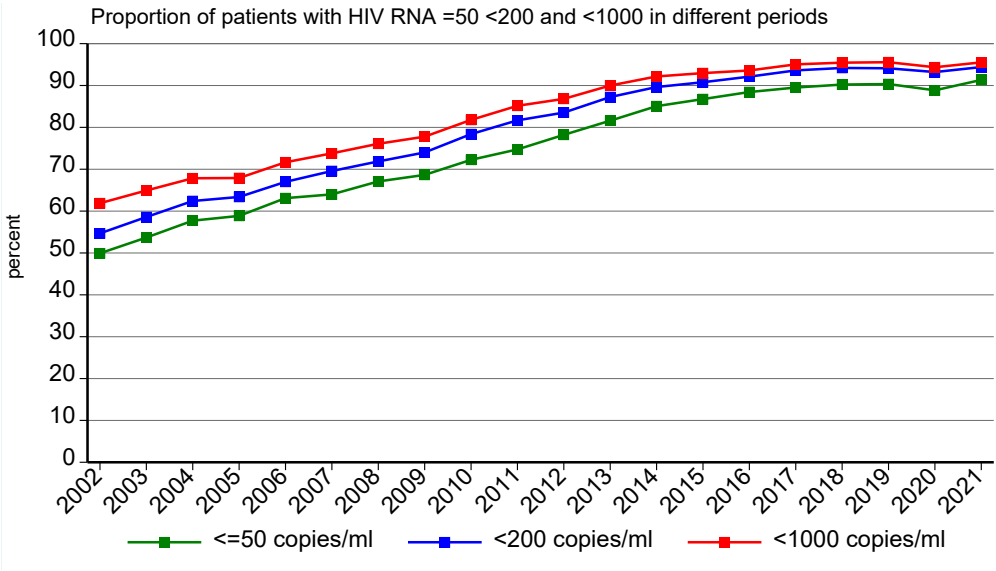


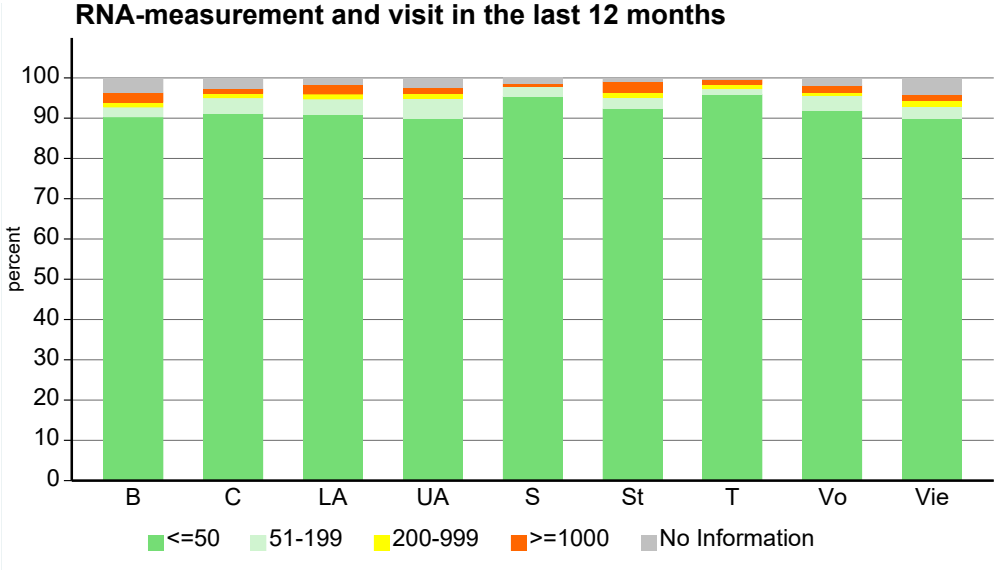
10.4 HIV RNA (viral load)

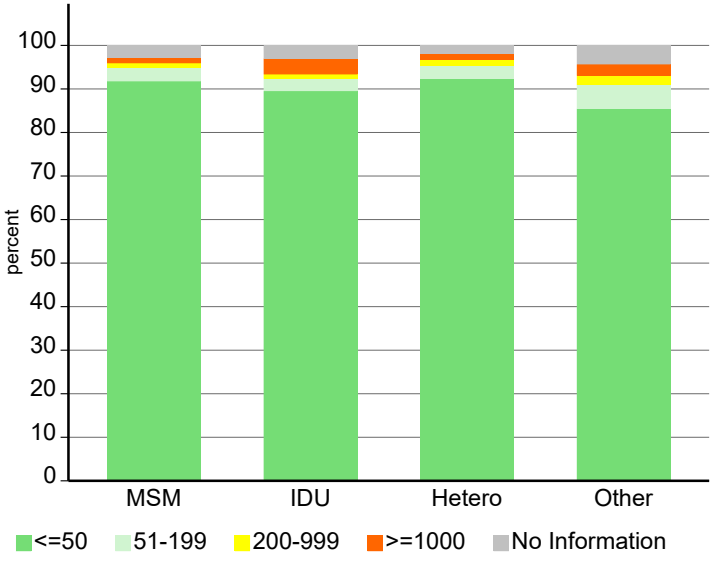
10.4.1 Last HIV RNA in patients currently in care regardless of ART

94.2% of the patients currently in care (4257 of 4519) 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

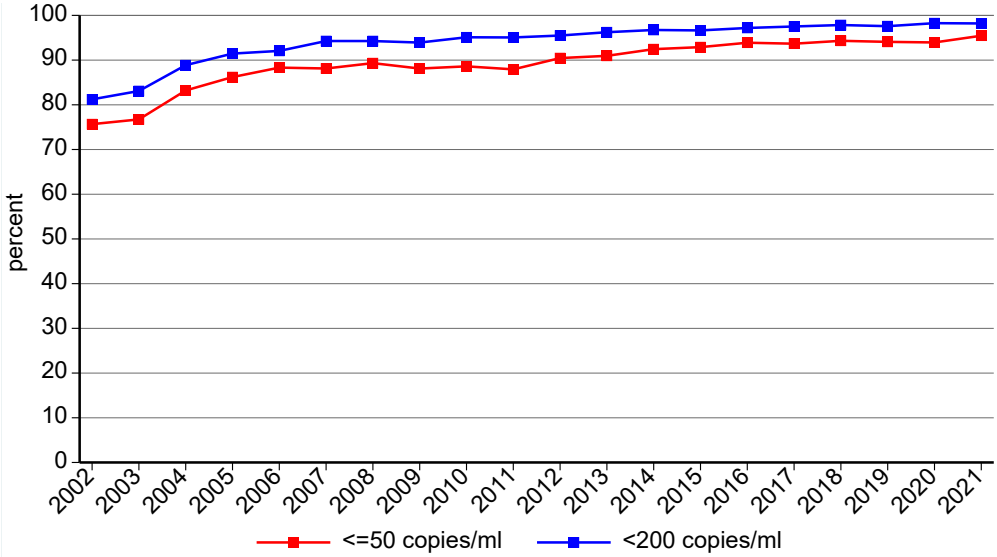
For high estimates patients lost to follow-up (LTFU, no contact 1.5 years before the end of the respective year) were excluded and for low estimates they were included. The preferred estimate was the mid-point between the high and low estimate.
Missing HIV-RNA was considered as unsuppressed.

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.

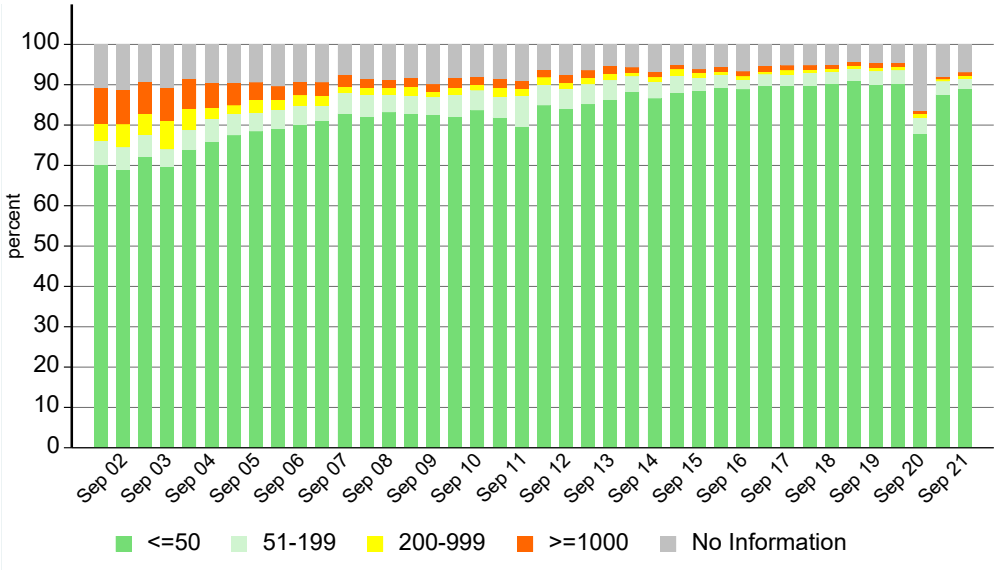
10.4.3 Last HIV RNA in patients on ART

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



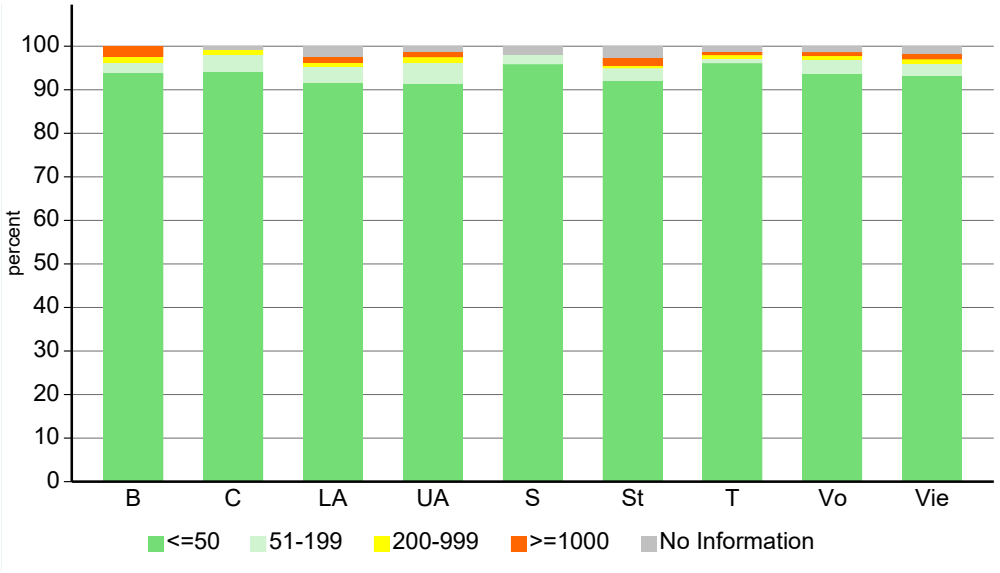
10.4.3.1 Last HIV RNA of patients on ART at different points in time

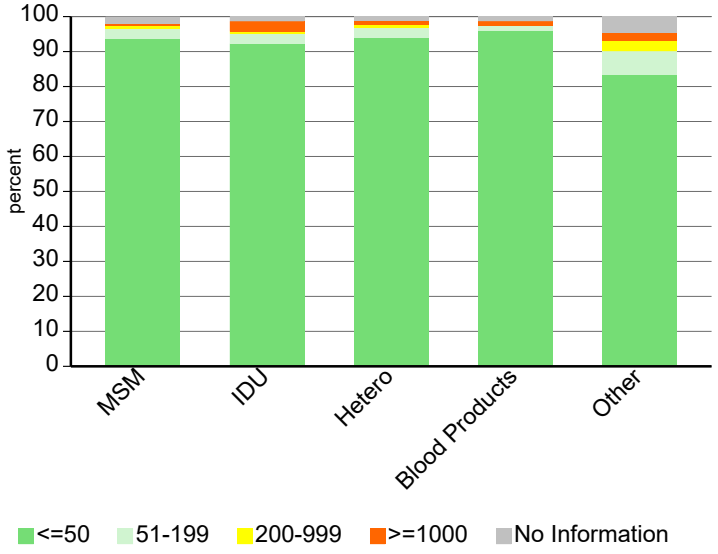
Patients currently in care, currently on ART and measurement of viral load at least 2.5 months after ART initiation



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		
	99	4743	2.09%	OR	[95% CI]	p value	OR	[95% CI]	p value
Age									
< 30 years	9	180	5.00%	3.75	[1.77,7.96]	0.001	5.44	[2.38,12.46]	0.000
30-50 years	57	2179	2.62%	1.91	[1.24,2.95]	0.003	2.00	[1.25,3.19]	0.004
≥ 50	33	2384	1.38%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	15	398	3.77%	2.76	[1.46,5.19]	0.002	1.69	[0.86,3.33]	0.127
Female IDU	6	189	3.17%	2.31	[0.95,5.63]	0.066	1.32	[0.52,3.36]	0.566
Male heterosexual	19	897	2.12%	1.52	[0.85,2.73]	0.158	1.41	[0.76,2.63]	0.275
Female heterosexual	19	931	2.04%	1.47	[0.82,2.63]	0.199	0.97	[0.50,1.86]	0.923
Other	11	258	4.26%	3.13	[1.55,6.35]	0.002	2.33	[1.11,4.89]	0.025
MSM	29	2070	1.40%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
Missing/unknown	0	16	0.00%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
High prevalence	16	418	3.83%	2.02	[1.16,3.51]	0.013	1.50	[0.79,2.85]	0.217
Low prevalence	15	795	1.89%	0.97	[0.55,1.71]	0.929	0.91	[0.51,1.64]	0.754
Austria	68	3514	1.94%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Population size of area of residence									
Rural areas	43	2106	2.04%	0.86	[0.56,1.32]	0.488			
Capital cities	12	777	1.54%	0.65	[0.34,1.23]	0.186			
Vienna	44	1860	2.37%	1.00	[1.00,1.00]	.			
AIDS									
Yes	18	759	2.37%	1.17	[0.70,1.96]	0.550			
No	81	3984	2.03%	1.00	[1.00,1.00]	.			
CD4 Nadir									
<50	25	738	3.39%	2.47	[1.48,4.12]	0.001	2.35	[1.36,4.05]	0.002
50-199	36	1286	2.80%	2.03	[1.28,3.22]	0.003	1.98	[1.21,3.24]	0.007
≥200	38	2717	1.40%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
ART initiation									
Before 1.1.1997	5	396	1.26%	0.58	[0.23,1.43]	0.236	0.34	[0.13,0.91]	0.031
After 1.1.1997	94	4347	2.16%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Ever ART interruptions									
None	54	3550	1.52%	0.27	[0.17,0.42]	0.000	0.22	[0.13,0.38]	0.000
1	16	662	2.42%	0.43	[0.23,0.80]	0.008	0.42	[0.22,0.79]	0.008
≥2	29	531	5.46%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Art duration									
< 9 months	2	79	2.53%	1.27	[0.31,5.25]	0.740	1.47	[0.34,6.26]	0.604
9-18 months	6	120	5.00%	2.58	[1.10,6.01]	0.029	3.00	[1.24,7.29]	0.015
> 18 months	91	4544	2.00%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

12 Development of resistance to ART (data: 03/2021)

12.1 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 4420 patients have ever received ART, 1208 had a resistance test after ART (27.3%). The overall prevalence of development of drug resistance was 70.4% (850 of 1208 patients), the prevalence of NRTI resistance was 34.0%, the prevalence of NNRTI resistance was 27.8%, and the prevalence of PI resistance was 63.4%. The prevalence of 3-class-resistance was 17.1% (206 of 1208 patients). The risk factors for developing a 3-class-resistance were a CD4 nadir <50 (OR=3.8; 95% CI: 2.5-5.8), a CD4 nadir between 50 and 200 (OR=2.2; 95% CI: 1.5-3.3) and initial therapy before 1997 (OR=26.4; 95% CI: 17.5-39.7) as well as from 1997 to 2003 (OR=7.3; 95% CI: 4.8-11.1) and an age at ART-start <30 (OR=2.1; 95% CI: 1.1-4.3). 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: 0.1-0.9).
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.

12.2 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

12.3 Frequency of resistance

12.3.1 Frequency of NRTI-associated resistance mutations

12.3.1.1 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 N = 1300	Patients currently in care and NRTI use ever N = 4413
Resistance to NRTI	213 (16.4%)	411 (9.3%)
Codon 41	79 (6.1%)	152 (3.4%)
Codon 62	10 (0.8%)	18 (0.4%)
Codon 65	11 (0.8%)	27 (0.6%)
Codon 67	67 (5.2%)	136 (3.1%)
Codon 69	3 (0.2%)	3 (0.1%)
Codon 70	48 (3.7%)	111 (2.5%)
Codon 74	29 (2.2%)	36 (0.8%)
Codon 75	5 (0.4%)	6 (0.1%)
Codon 77	2 (0.2%)	7 (0.2%)
Codon 115	5 (0.4%)	12 (0.3%)
Codon 116	2 (0.2%)	4 (0.1%)
Codon 151	2 (0.2%)	5 (0.1%)
Codon 184	164 (12.6%)	288 (6.5%)
Codon 210	51 (3.9%)	80 (1.8%)
Codon 215	88 (6.8%)	164 (3.7%)
Codon 219	43 (3.3%)	69 (1.6%)

12.3.1.2 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 = 8224)**		
	Frequencies N=		Univariable regression			**Multivariable regression***		
Variable	45 / 8224	(0.5%)	OR (95% CI)		p-value	**OR (95% CI)**		**p-value**
Demographic characteristics								
Age at ART start								
<30 years	11 / 2217	(0.5%)	1.9	0.5 - 6.7	0.337			
30-50 years	31 / 4878	(0.6%)	2.4	0.7 - 7.9	0.148			
>50 years	3 / 1129	(0.3%)	1					
Sex/ mode of transmission								
Male IDU	7 / 985	(0.7%)	2.5	0.9 - 6.5	0.068	**1.5**	**0.6 – 4.1**	**0.401**
Female IDU	6 / 426	(1.4%)	4.9	1.8 - 13.6	0.002	**3.0**	**1.1 – 8.6**	**0.037**
Male heterosexual	10 / 1462	(0.7%)	2.4	1.0 - 5.7	0.054	**1.9**	**0.8 – 4.7**	**0.151**
Female heterosexual	12 / 1402	(0.9%)	3.0	1.3 - 6.9	0.011	**2.6**	**1.1 – 6.1**	**0.030**
Other	0 / 492	(0.0%)	-	-	-	**-**	**-**	**-**
MSM	10 / 3457	(0.3%)	1			**1**		
Population size of area of residence								
Missing value	0 / 74	(0.0%)	-	-	-			
Rural areas	16 / 3128	(0.5%)	0.8	0.4 - 1.5	0.466			
Capital cities	4 / 1150	(0.3%)	0.5	0.2 - 1.5	0.249			
Vienna	25 / 3872	(0.6%)	1					
Stage of disease								
AIDS								
Yes	25 / 2345	(1.1%)	3.2	1.7 - 5.7	<0.001			
No	20 / 5879	(0.3%)	1					
CD4 nadir								
Missing value	0 / 78	(0.0%)	-	-	-	**-**	**-**	**-**
<50 cells/µl	21 / 1471	(1.4%)	7.8	3.4 - 17.6	<0.001	**6.3**	**2.7 – 14.6**	**<0.001**
50-199 cells/µl	16 / 2374	(0.7%)	3.6	1.6 - 8.5	0.003	**2.9**	**1.2 – 6.9**	**0.016**
≥200 cells/µl	8 / 4301	(0.2%)	1			**1**		
ART								
Abacavir use ever								
Yes	18 / 3263	(0.6%)	1.0	0.6 - 1.8	0.965			
No	27 / 4961	(0.5%)	1					
Tenofovir use ever								
Yes	42 / 5756	(0.7%)	6.0	1.9 - 19.5	0.003	**5.2**	**1.6 – 16.8**	**0.006**
No	3 / 2468	(0.1%)	1			**1**		
ART initiation								
Before 1.1.1997	9 / 815	(1.1%)	2.3	1.1 - 4.8	0.027			
After 1.1.1997	36 / 7409	(0.5%)	1					

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

12.3.2 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 = 767	N = 2458
Resistance to NNRTI	158 (20.6%)	290 (11.8%)
Codon 90	5 (0.7%)	23 (0.9%)
Codon 98	16 (2.1%)	16 (0.7%)
Codon 100	3 (0.4%)	11 (0.4%)
Codon 101	26 (3.4%)	34 (1.4%)
Codon 103	78 (10.2%)	146 (5.9%)
Codon 106	14 (1.8%)	27 (1.1%)
Codon 108	24 (3.1%)	31 (1.3%)
Codon 138	6 (0.8%)	30 (1.2%)
Codon 179	6 (0.8%)	17 (0.7%)
Codon 181	63 (8.2%)	88 (3.6%)
Codon 188	9 (1.2%)	17 (0.7%)
Codon 190	41 (5.3%)	48 (2.0%)
Codon 221	9 (1.2%)	16 (0.7%)
Codon 225	5 (0.7%)	10 (0.4%)
Codon 227	3 (0.4%)	8 (0.3%)
Codon 230	3 (0.4%)	6 (0.2%)
Codon 234	0 (0.0%)	0 (0.0%)

12.3.3 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 = 1029	Patients currently in care and PI use ever N = 2317
Any minor resistance to PI	373 (36.2%)	682 (29.4%)
Codon 10	97 (9.4%)	195 (8.4%)
Codon 11	5 (0.5%)	4 (0.2%)
Codon 16	6 (0.6%)	41 (1.8%)
Codon 20	65 (6.3%)	131 (5.7%)
Codon 24	7 (0.7%)	14 (0.6%)
Codon 33	23 (2.2%)	52 (2.2%)
Codon 34	1 (0.1%)	0 (0.0%)
Codon 36	152 (14.8%)	296 (12.8%)
Codon 43	3 (0.3%)	7 (0.3%)
Codon 53	10 (1.0%)	12 (0.5%)
Codon 60	8 (0.8%)	22 (0.9%)
Codon 62	36 (3.5%)	84 (3.6%)
Codon 63	245 (23.8%)	365 (15.8%)
Codon 64	22 (2.1%)	83 (3.6%)
Codon 69	24 (2.3%)	105 (4.5%)
Codon 71	133 (12.9%)	166 (7.2%)
Codon 73	18 (1.7%)	16 (0.7%)
Codon 77	114 (11.1%)	210 (9.1%)
Codon 85	0 (0.0%)	2 (0.1%)
Codon 89	23 (2.2%)	104 (4.5%)
Codon 93	51 (5.0%)	116 (5.0%)

Major mutations:	All centers	Deceased since 1997, PI use N = 1029	Patients currently in care and PI use ever N = 2317
	Any major resistance to PI	112 (10.9%)	172 (7.4%)
	Codon 30	10 (1.0%)	30 (1.3%)
	Codon 32	11 (1.1%)	5 (0.2%)
	Codon 46	56 (5.4%)	74 (3.2%)
	Codon 47	7 (0.7%)	7 (0.3%)
	Codon 48	4 (0.4%)	6 (0.3%)
	Codon 50	1 (0.1%)	5 (0.2%)
	Codon 54	34 (3.3%)	49 (2.1%)
	Codon 58	6 (0.6%)	10 (0.4%)
	Codon 74	0 (0.0%)	2 (0.1%)
	Codon 76	1 (0.1%)	0 (0.0%)
	Codon 82	43 (4.2%)	64 (2.8%)
	Codon 83	1 (0.1%)	1 (0.0%)
	Codon 84	18 (1.7%)	18 (0.8%)
	Codon 88	14 (1.4%)	23 (1.0%)
	Codon 90	56 (5.4%)	73 (3.2%)

12.3.4 Resistance to single or multiple drug classes

All centres	Deceased since 1997, ever ART N = 1308	Patients currently in care and ever ART N = 4420
Resistance test available	560 (42.8%)	1208 (27.3%)
Wild type	130 (9.9%)	358 (8.1%)
"Any" resistance	430 (32.9%)	850 (19.2%)
NRTI	214 (16.4%)	411 (9.3%)
NNRTI	181 (13.8%)	336 (7.6%)
PI	397 (30.4%)	766 (17.3%)
NRTI and PI	189 (14.4%)	350 (7.9%)
NRTI and NNRTI	126 (9.6%)	231 (5.2%)
NNRTI and PI	167 (12.8%)	288 (6.5%)
3-class-resistance	120 (9.2%)	206 (4.7%)

All patients	Number of patients	Resistance test available	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											
Up to 1995	233	190	9	181	151	90	162	132	83	85	78
1996	139	96	17	79	58	32	73	54	29	29	28
1997	108	69	13	56	28	25	50	24	18	21	16
1998	105	55	3	52	23	18	46	17	12	15	9
1999	89	47	7	40	14	15	35	9	7	14	6
2000	101	55	10	45	18	13	43	16	9	13	9
2001	82	36	8	28	11	9	28	11	7	9	7
2002	110	51	16	35	18	14	34	17	11	14	11
2003	102	42	18	24	3	6	23	3	2	5	2
2004	124	43	16	27	8	10	27	8	4	10	4
2005	128	45	11	34	11	10	31	10	6	7	5
2006	162	49	20	29	9	10	26	7	8	7	6
2007	162	45	16	29	10	10	26	8	5	8	4
2008	169	40	23	17	8	8	14	6	5	6	4
2009	221	53	26	27	10	13	23	8	7	9	5
2010	224	44	19	25	5	9	20	3	3	5	2
2011	245	41	23	18	5	6	15	3	4	3	2
2012	225	41	19	22	10	9	20	8	7	7	5
2013	229	41	22	19	2	4	16	-	-	3	-
2014	222	26	13	13	2	3	12	2	1	2	1
2015	241	27	16	11	4	4	8	2	2	2	1
2016	233	20	7	13	3	5	11	2	1	4	1
2017	236	21	8	13	-	8	12	-	-	7	-
2018	172	12	9	3	-	2	2	-	-	1	-
2019	188	7	5	2	-	-	2	-	-	-	-
2020	170	12	5	7	-	3	6	-	-	2	-
Federal state											
Burgenland	73	17	6	11	6	5	9	4	4	4	3
Carinthia	243	36	11	25	11	6	23	9	4	5	3
Lower Austria	426	108	26	82	45	37	74	38	27	34	25
Upper Austria	574	180	48	132	85	54	114	70	50	43	42
Salzburg	250	71	20	51	22	28	44	17	14	24	12
Styria	423	102	39	63	20	24	57	19	15	19	15
Tyrol	527	174	29	145	77	48	135	69	30	44	28
Vorarlberg	208	49	8	41	14	12	37	10	7	11	6
Vienna	1645	458	167	291	128	119	266	113	77	103	71
Foreign countries	51	13	5	8	3	3	6	1	3	1	1
Missing value	-	-	-	-	-	-	-	-	-	-	-
Total	**4420**	**1208**	**359**	**849**	**411**	**336**	**765**	**350**	**231**	**288**	**206**

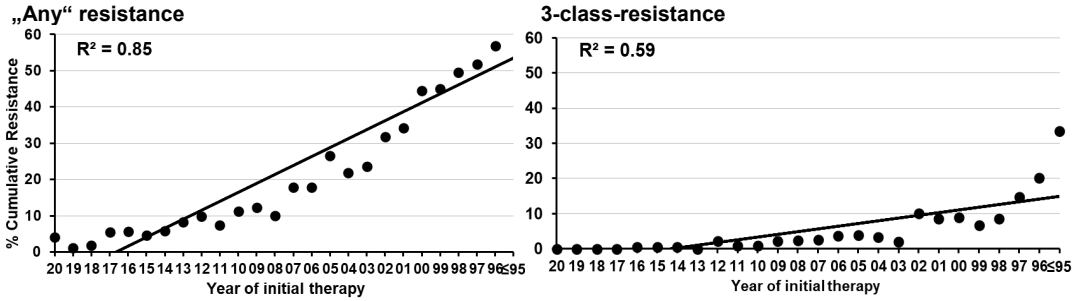
Patients who initiated ART after 2000	Number of patients	Resistance test available	Wild type	Resistance to							
				Any resistance	NRTI	NNRTI	PI	NRTI and PI	NRTI and NNRTI	NNRTI and PI	3-class-resistance
Year of ART initiation											
2001	82	36	8	28	11	9	28	11	7	9	7
2002	110	51	16	35	18	14	34	17	11	14	11
2003	102	42	18	24	3	6	23	3	2	5	2
2004	124	43	16	27	8	10	27	8	4	10	4
2005	128	45	11	34	11	10	31	10	6	7	5
2006	162	49	20	29	9	10	26	7	8	7	6
2007	162	45	16	29	10	10	26	8	5	8	4
2008	169	40	23	17	8	8	14	6	5	6	4
2009	221	53	26	27	10	13	23	8	7	9	5
2010	224	44	19	25	5	9	20	3	3	5	2
2011	245	41	23	18	5	6	15	3	4	3	2
2012	225	41	19	22	10	9	20	8	7	7	5
2013	229	41	22	19	2	4	16	-	-	3	-
2014	222	26	13	13	2	3	12	2	1	2	1
2015	241	27	16	11	4	4	8	2	2	2	1
2016	233	20	7	13	3	5	11	2	1	4	1
2017	236	21	8	13	-	8	12	-	-	7	-
2018	172	12	9	3	-	2	2	-	-	1	-
2019	188	7	5	2	-	-	2	-	-	-	-
2020	170	12	5	7	-	3	6	-	-	2	-
Population size of area of residence											
Missing value	-	-	-	-	-	-	-	-	-	-	-
Rural areas	1670	285	116	169	59	70	151	48	38	56	31
Capital cities	602	125	39	86	21	21	77	16	9	14	6
Vienna	1373	286	145	141	39	52	128	34	26	41	23
Sex/ mode of transmission											
MSM	1656	211	100	111	25	44	92	18	16	28	12
Male IDU	275	99	44	55	17	19	52	16	11	16	10
Female IDU	105	41	15	26	3	7	26	3	1	7	1
Male heterosexual	726	131	55	76	32	27	71	28	20	23	17
Female heterosexual	700	184	73	111	36	39	100	29	21	31	17
Others	183	30	13	17	6	7	15	4	4	6	3
Age at time of HIV-test											
< 35 years	1859	462	198	264	77	100	239	63	52	79	42
≥ 35 years	1786	234	102	132	42	43	117	35	21	32	18
Total	**3645**	**684**	**295**	**389**	**119**	**140**	**350**	**98**	**73**	**109**	**60**

12.3.6 Cumulative resistance related to different time periods of ART initiation

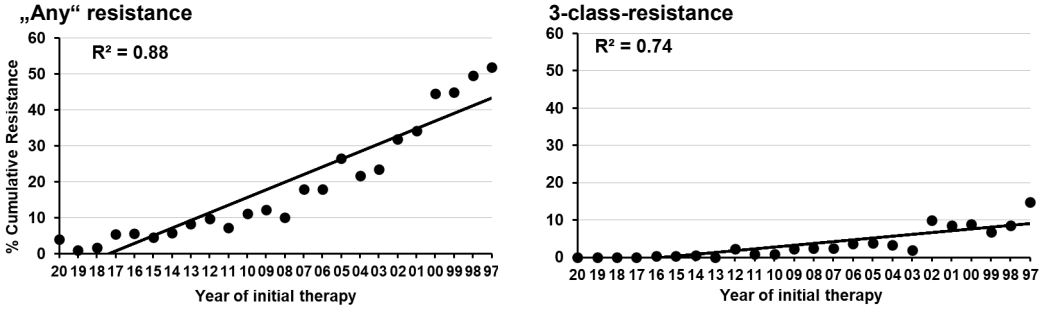
	Initial therapy before 1.1.1997		Initial therapy between 1.1.1997 and 31.12.2002		Initial therapy after 1.1.2003	
	N	%	N	%	N	%
Ever HIV RNA ≥ 200 copies/ml	355	95.4%	433	72.9%	970	28.2%
At least 5 HIV RNA ≥ 200 copies/ml	305	82.0%	242	40.7%	277	8.0%
No resistance test after ART	86	23.1%	282	47.5%	2839	82.4%
Resistance test after ART	286	76.9%	312	52.5%	606	17.6%
Total	**372**	**100%**	**594**	**100%**	**3445**	**100%**
Number of NRTI-associated resistance mutations						
0 mutations	77	20.7%	200	33.7%	516	15.0%
1 mutation	35	9.4%	58	9.8%	61	1.8%
2 mutations	29	7.8%	20	3.4%	17	0.5%
3 mutations	34	9.1%	12	2.0%	7	0.2%
4 mutations	47	12.6%	11	1.9%	3	0.1%
5 mutations	34	9.1%	11	1.9%	1	0.0%
6 mutations	19	5.1%			1	0.0%
7 mutations	9	2.4%				
8 mutations	2	0.5%				
9 mutations	0	0.0%				
Number of NNRTI-associated resistance mutations						
0 mutations	164	44.1%	218	36.7%	487	14.1%
1 mutation	56	15.1%	46	7.7%	68	2.0%
2 mutations	39	10.5%	39	6.6%	32	0.9%
3 mutations	14	3.8%	7	1.2%	11	0.3%
4 mutations	7	1.9%	2	0.3%	7	0.2%
5 mutations	3	0.8%			1	0.0%
6 mutations	2	0.5%				
7 mutations	1	0.3%				
Number of PI-associated resistance mutations						
0 mutations	51	13.7%	77	13.0%	314	9.1%
1 mutation	46	12.4%	55	9.3%	60	1.7%
2 mutations	56	15.1%	66	11.1%	43	1.2%
3 mutations	34	9.1%	42	7.1%	49	1.4%
4 mutations	16	4.3%	35	5.9%	62	1.8%
5 mutations	21	5.6%	18	3.0%	39	1.1%
6 mutations	19	5.1%	9	1.5%	23	0.7%
7 mutations	14	3.8%	3	0.5%	11	0.3%
8 mutations	5	1.3%	1	0.2%	1	0.0%
9 mutations	3	0.8%	3	0.5%	2	0.1%
10 mutations	5	1.3%	2	0.3%	0	0.0%
11 mutations	4	1.1%	1	0.2%	1	0.0%
12 mutations	3	0.8%			0	0.0%
13 mutations	1	0.3%			1	
14 mutations	5	1.3%				
15 mutations	2	0.5%				
16 mutations	1	0.3%				

12.3.7 Probability of development of resistance

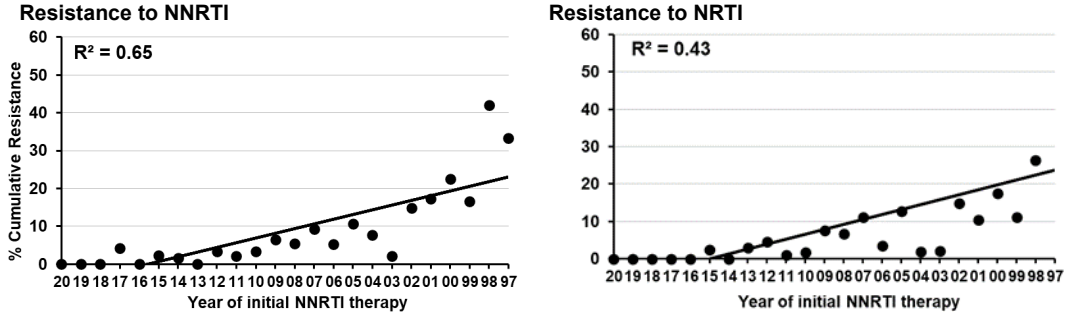
12.3.7.1 Any ART regimen



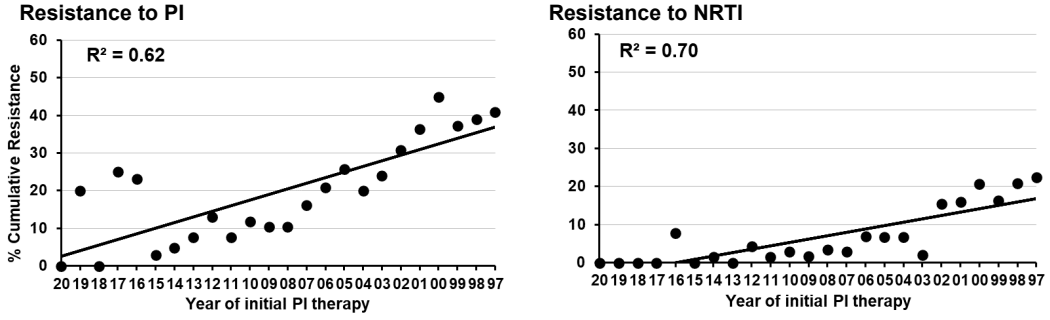
12.3.7.2 Any ART regimen and initial ART after January 1, 1997



12.3.7.3 Initial ART with 2 NRTI + 1 NNRTI



12.3.7.4 Initial ART with 2 NRTI + 1 PI



12.3.8 Risk factors for the development of resistance

12.3.8.1 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 = 1667	N = 474	N = 404	N = 4420
3-class-resistance	120 (7.2%)	34 (7.2%)	34 (8.4%)	206 (4.7%)

3-class-resistance	Patients currently in care and ART use ever N = 206
Age (years; mean ± S. D.)	55.2 ± 11.1
Federal states	
Carinthia	3 (1.5%)
Upper Austria	42 (20.4%)
Salzburg	12 (5.8%)
Styria	15 (7.3%)
Tyrol	28 (13.6%)
Vienna	71 (34.5%)
Other federal states	34 (16.5%)
Foreign countries	1 (0.5%)
Sex/ Mode of transmission	
MSM	66 (32.0%)
Male IDU	21 (10.2%)
Female IDU	12 (5.8%)
Male heterosexual	44 (21.4%)
Female heterosexual	47 (22.8%)
Others	16 (7.8%)
AIDS	107 (51.9%)
CD4 nadir (cells/µl; mean ± S. D.)	123.3 ± 126.7
Current CD4 cell counts (cells/µl; mean ± S. D.)	640.7 ± 324.3
Last HIV-RNA	
≤50 copies/ml	181 ± (87.9%)
51-199 copies/ml	13 (9.2%)
≥200 copies/ml	20 (2.9%)
Duration of ART (months; mean ± S. D.)	269.6 ± 71.0

All centres						**Model 1 (N = 4420)**		
	Frequencies N=			Univariable regression			**Multivariable regression***	
Variable	206 /	4420	(4.7%)	OR (95% CI)		p-value	**OR (95% CI)**	**p-value**
Demographic characteristics								
Age at ART start								
<30 years	76 /	1137	(6.7%)	3.9	2.0 - 7.3	<0.001	**2.1**	**1.1 - 4.3**	**0.031**
30-50 years	119 /	2677	(4.4%)	2.5	1.3 - 4.7	0.004	**1.5**	**0.8 - 2.9**	**0.239**
>50 years	11 /	606	(1.8%)	1			**1**		
Sex/ mode of transmission								
Male IDU	21 /	362	(5.8%)	1.7	1.0 - 2.9	0.034			
Female IDU	12 /	166	(7.2%)	2.2	1.2 - 4.1	0.016			
Male heterosexual	44 /	858	(5.1%)	1.5	1.0 - 2.2	0.036			
Female heterosexual	47 /	878	(5.4%)	1.6	1.1 - 2.3	0.018			
Other	16 /	238	(6.7%)	2.0	1.2 - 3.6	0.014			
MSM	66 /	1918	(3.4%)	1					
Population size of area of residence								
Missing value	0 /	0	(0.0%)	-	-	-			
Rural areas	86 /	2012	(4.3%)	1.0	0.7 - 1.4	0.969			
Capital cities	49 /	757	(6.5%)	1.5	1.1 - 2.2	0.024			
Vienna	71 /	1651	(4.3%)	1					
Stage of disease								
AIDS								
Yes	107 /	1072	(10.0%)	3.6	2.7 - 4.8	<0.001			
No	99 /	3348	(3.0%)	1					
CD4 nadir								
Missing value	0 /	6	(0.0%)	-	-	-	**-**	**-**	**-**
<50 cells/µl	75 /	674	(11.1%)	6.9	4.7 - 10.2	<0.001	**3.8**	**2.5 - 5.8**	**<0.001**
50-199 cells/µl	86 /	1199	(7.2%)	4.3	3.0 - 6.2	<0.001	**2.2**	**1.5 - 3.3**	**<0.001**
≥200 cells/µl	45 /	2541	(1.8%)	1			**1**		
Current HIV RNA								
Missing value	0 /	6	(0.0%)	-	-	-	**-**	**-**	**-**
≤50 copies/ml	181 /	4175	(4.3%)	0.5	0.2 - 1.1	0.101	**0.3**	**0.1 - 0.9**	**0.036**
51-199 copies/ml	19 /	168	(11.3%)	1.4	0.5 - 3.6	0.511	**1.5**	**0.5 - 4.6**	**0.522**
≥200 copies/ml	6 /	71	(8.5%)	1			**1**		
ART								
ART initiation								
Before 1.1.1997	106 /	372	(28.5%)	32.4	22.2 - 47.3	<0.001	**26.4**	**17.5 - 39.7**	**<0.001**
1.1.1997 to 31.12.2002	58 /	595	(9.7%)	8.8	5.8 - 13.2	<0.001	**7.3**	**4.8 - 11.1**	**<0.001**
Since 1.1.2003	42 /	3453	(1.2%)	1			**1**		

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

12.3.8.2 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 = 1341		N = 390		N = 321		N = 4048	
Any resistance	263	(19.6%)	75	(19.2%)	75	(23.4%)	590	(14.6%)

Any resistance	Patients currently in care and ART use ever after 1996 N = 590	
Age (years; mean ± S. D.)	34.4 ± 9.6	
Federal states		
Carinthia	21	(3.6%)
Upper Austria	87	(14.7%)
Salzburg	43	(7.3%)
Styria	52	(8.8%)
Tyrol	82	(13.9%)
Vienna	212	(35.9%)
Other federal states	87	(14.7%)
Foreign countries/ missing	6	(1.0%)
Sex/ Mode of transmission		
MSM	174	(29.5%)
Male IDU	80	(13.6%)
Female IDU		
Male heterosexual	114	(19.3%)
Female heterosexual	159	(26.9%)
Others	25	(4.2%)
AIDS	214	(36.3%)
CD4 nadir (cells/µl; mean ± S. D.)	115.8 ± 150.3	
Current CD4 cell counts (cells/µl; mean ± S. D.)	654.0 ± 331.4	
Last HIV-RNA		
≤50 copies/ml	524	(88.8%)
51-199 copies/ml	41	(6.9%)
≥200 copies/ml	25	(4.2%)
Duration of ART (months; mean ± S. D.)	190.1 ± 73.6	

All centres						Model 1 (N = 4048)		
	Frequencies N=			Univariable regression			Multivariable regression	
Variable	590 /	4048	(14.6%)	OR (95% CI)		p-value	OR (95% CI)	p-value
Demographic characteristics								
Age at ART start								
<30 years	201 /	1003	(20.0%)	3.5	2.5 - 5.0	<0.001	**3.1** **2.1 - 4.6**	**<0.001**
30-50 years	350 /	2459	(14.2%)	2.3	1.7 - 3.3	<0.001	**1.9** **1.3 - 2.7**	**<0.001**
>50 years	39 /	586	(6.7%)	1			**1**	
Sex/ mode of transmission								
Male IDU	80 /	315	(25.4%)	3.2	2.3 - 4.3	<0.001	**2.4** **1.7 - 3.3**	**<0.001**
Female IDU	38 /	130	(29.2%)	3.8	2.5 - 5.8	<0.001	**2.6** **1.6 - 4.0**	**<0.001**
Male heterosexual	114 /	809	(14.1%)	1.5	1.2 - 2.0	0.001	**1.3** **1.0 - 1.7**	**0.067**
Female heterosexual	159 /	801	(19.9%)	2.3	1.8 - 2.9	<0.001	**1.8** **1.4 - 2.3**	**<0.001**
Other	25 /	205	(12.2%)	1.3	0.8 - 2.0	0.266	**0.9** **0.6 - 1.5**	**0.799**
MSM	174 /	1788	(9.7%)	1			**1**	
Population size of area of residence								
Missing value	0 /	0	(0.0%)	-	-	-	**-** **-**	**-**
Rural areas	254 /	1848	(13.7%)	1.0	0.8 - 1.2	0.859	**1.1** **0.8 - 1.3**	**0.660**
Capital cities	124 /	681	(18.2%)	1.4	1.1 - 1.7	0.011	**1.5** **1.2 - 2.0**	**0.002**
Vienna	212 /	1519	(14.0%)	1			**1**	
Stage of disease								
AIDS								
Yes	214 /	900	(23.8%)	2.3	1.9 - 2.8	<0.001		
No	376 /	3148	(11.9%)	1				
CD4 nadir								
Missing value	0 /	6	(0.0%)	-	-	-	**-** **-**	**-**
<50 cells/µl	149 /	579	(25.7%)	3.3	2.6 - 4.1	<0.001	**2.7** **2.1 - 3.4**	**<0.001**
50-199 cells/µl	207 /	1031	(20.1%)	2.4	1.9 - 2.9	<0.001	**1.7** **1.3 - 2.1**	**<0.001**
≥200 cells/µl	234 /	2432	(9.6%)	1			**1**	
Current HIV RNA								
Missing value	0 /	6	(0.0%)	-	-	-	**-** **-**	**-**
≤50 copies/ml	524 /	3819	(13.7%)	0	0.2 - 0.4	<0.001	**0.2** **0.1 - 0.4**	**<0.001**
51-199 copies/ml	41 /	156	(26.3%)	1	0.3 - 1.1	0.100	**0.7** **0.3 - 1.3**	**0.215**
≥200 copies/ml	25 /	67	(37.3%)	1			**1**	
ART								
ART initiation								
1.1.1997 to 31.12.2002	256 /	595	(43.0%)	7.1	5.8 - 8.6	<0.001	**6.2** **5.0 - 7.7**	**<0.001**
Since 1.1.2003	334 /	3453	(9.7%)	1			**1**	

13 Co-morbidities and Co-medication

13.1 Co-morbidities

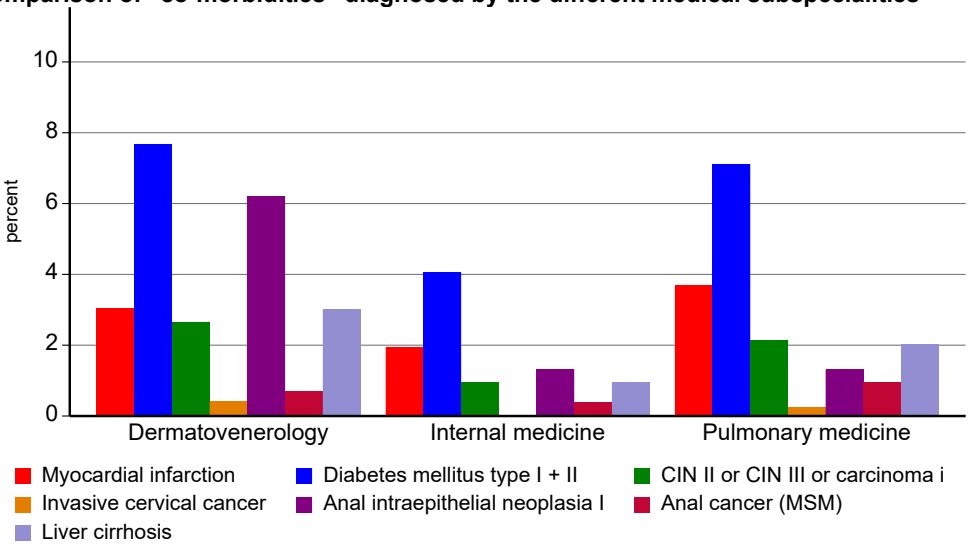
One aim of the Austrian HIV Cohort Study is to document co-morbidities and adverse drug reactions, as well as to investigate possible associations with ART. As a first step, important co-morbidities are illustrated.

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	228	%	99	%	322	%	524	%	1160	%
Hypertension	23	10.1	3	3.0	49	15.2	62	11.8	98	8.4
Coronary heart disease	2	0.9	1	1.0	4	1.2	1	0.2	11	0.9
Myocardial infarction	1	0.4			5	1.6			14	1.2
Stroke	3	1.3	1	1.0	2	0.6	4	0.8	3	0.3
Diabetes mellitus type I + II	6	2.6	3	3.0	18	5.6	14	2.7	19	1.6
CIN II or CIN III or carcinoma in situ			6	6.1			40	7.6		
Invasive cervical cancer							3	0.6		
St. p. hysterectomy			2	2.0			4	0.8		
Anal intraepithelial neoplasia II, III	2	0.9			6	1.9	2	0.4	98	8.4
Anal cancer									3	0.3
Osteoporosis	5	2.2	2	2.0	4	1.2	10	1.9	20	1.7
Liver cirrhosis	8	3.5	1	1.0	1	0.3	2	0.4	7	0.6
Attempted suicide or suicide	8	3.5	1	1.0	1	0.3	2	0.4	16	1.4
Drug overdose (mainly opiates)	10	4.4	5	5.1	1	0.3	1	0.2	6	0.5
Renal failure stage 3, 4, 5	3	1.3	4	4.0	11	3.4	12	2.3	12	1.0

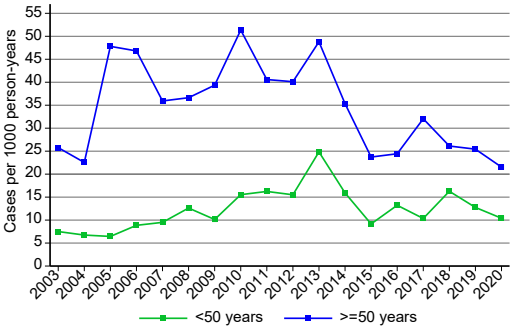
	≥ 50 years									
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Number of patients	178	%	95	%	593	%	424	%	959	%
Hypertension	49	27.5	19	20.0	213	35.9	124	29.2	299	31.2
Coronary heart disease	28	15.7	12	12.6	70	11.8	24	5.7	115	12.0
Myocardial infarction	12	6.7	6	6.3	25	4.2	11	2.6	57	5.9
Stroke	14	7.9	4	4.2	19	3.2	12	2.8	19	2.0
Diabetes mellitus type I + II	16	9.0	3	3.2	91	15.3	42	9.9	87	9.1
CIN II or CIN III or carcinoma in situ			16	16.8			38	9.0		
Invasive cervical cancer			5	5.3			4	0.9		
St. p. hysterectomy			11	11.6			29	6.8		
Anal intraepithelial neoplasia II, III	2	1.1	3	3.2	14	2.4	6	1.4	99	10.3
Anal cancer			5	5.3	4	0.7	1	0.2	29	3.0
Osteoporosis	34	19.1	29	30.5	66	11.1	84	19.8	99	10.3
Liver cirrhosis	27	15.2	18	18.9	10	1.7	7	1.7	25	2.6
Attempted suicide or suicide	8	4.5	4	4.2	7	1.2	1	0.2	10	1.0
Drug overdose (mainly opiates)	6	3.4	5	5.3	3	0.5	1	0.2	4	0.4
Renal failure stage 3, 4, 5	8	4.5	20	21.1	40	6.7	58	13.7	50	5.2

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

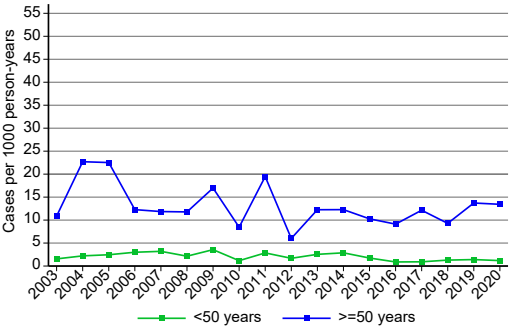


13.2 Incidence of Co-morbidities related to age

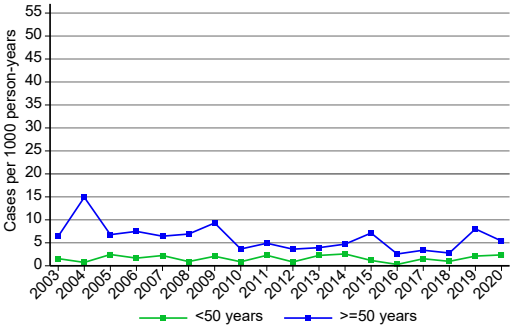
Hypertension



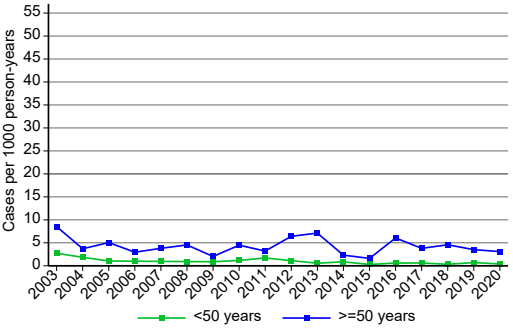
Coronary heart disease

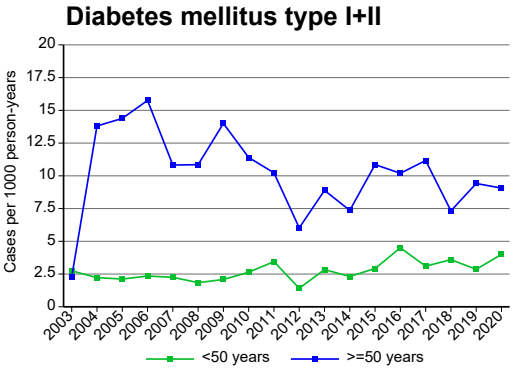


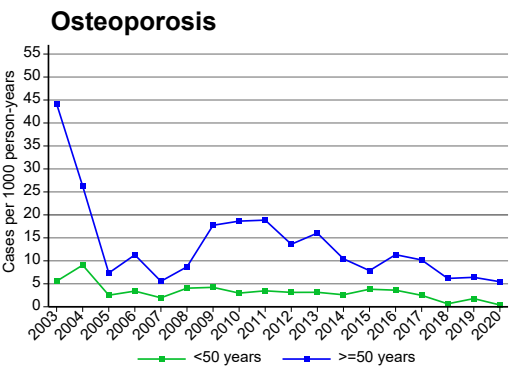
Myocardial infarction

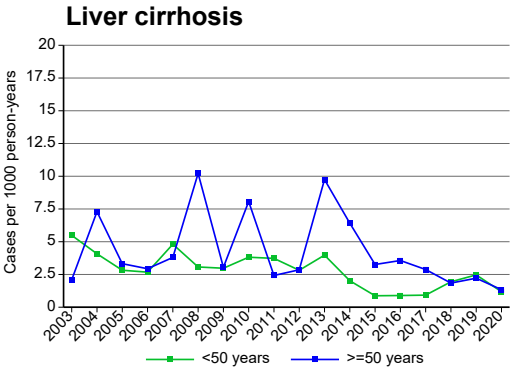


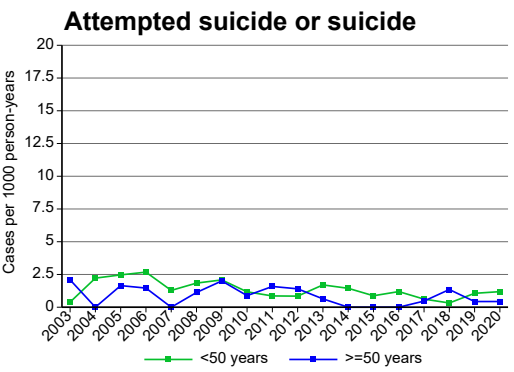
Stroke

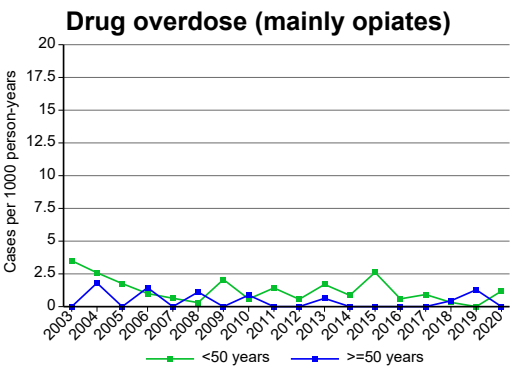


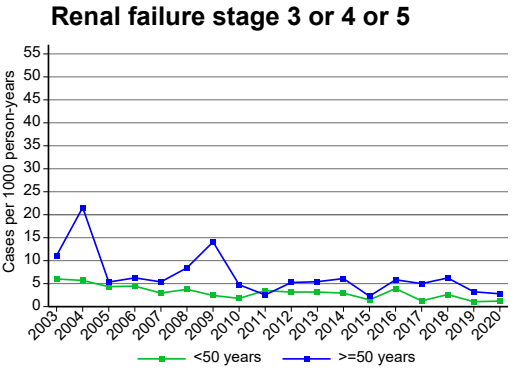

Diabetes mellitus type I+II
Cases per 1000 person-years
<50 years
>=50 years


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

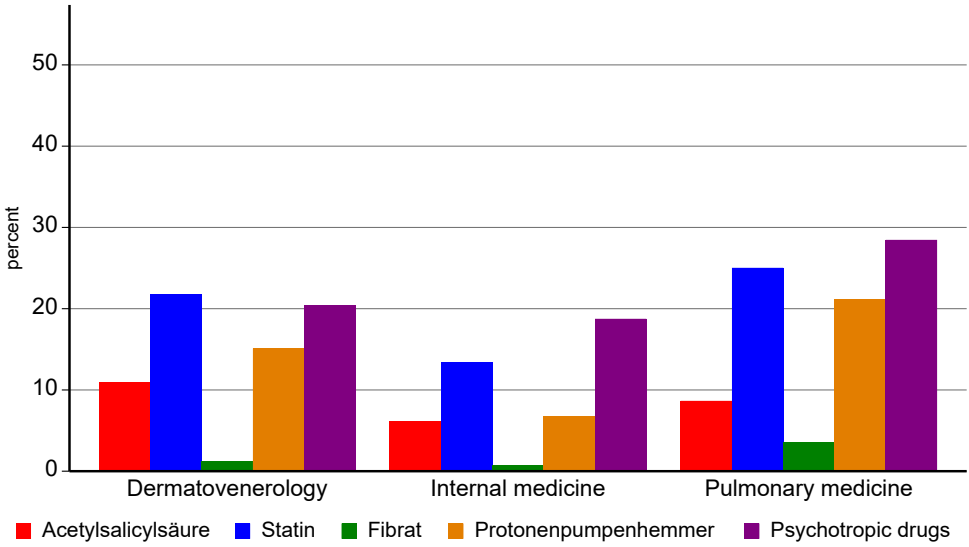
13.3 Co-medication related to age

< 50 years										
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Current therapies	228	%	99	%	322	%	524	%	1160	%
Acetylsalicylic acid	8	3.5	3	3.0	15	4.7	5	1.0	28	2.4
ACE inhibitors/angiotensin antagonists	17	7.5	3	3.0	47	14.6	46	8.8	89	7.7
Beta blocker	15	6.6	1	1.0	17	5.3	19	3.6	60	5.2
Statin	8	3.5	2	2.0	35	10.9	31	5.9	92	7.9
Fibrate	3	1.3	1	1.0	2	0.6	1	0.2	11	0.9
Insulin	2	0.9			7	2.2	1	0.2	6	0.5
Oral antidiabetic drugs	6	2.6	2	2.0	20	6.2	11	2.1	19	1.6
Proton pump inhibitors	53	23.2	16	16.2	28	8.7	48	9.2	79	6.8
Bisphosphonates	1	0.4	1	1.0	1	0.3	3	0.6	9	0.8
Thyroid hormones	4	1.8	3	3.0	8	2.5	35	6.7	20	1.7
Opiate substitution	134	58.8	68	68.7	21	6.5	7	1.3	14	1.2
Psychotropic drugs	161	70.6	79	79.8	61	18.9	80	15.3	218	18.8
Anxiolytics, hypnotics, sedatives	63	27.6	37	37.4	11	3.4	11	2.1	41	3.5
Antidepressants	46	20.2	17	17.2	22	6.8	50	9.5	126	10.9
Antipsychotics	39	17.1	18	18.2	14	4.3	24	4.6	58	5.0

≥ 50 years										
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Current therapies	178	%	95	%	593	%	424	%	959	%
Acetylsalicylic acid	44	24.7	15	15.8	104	17.5	51	12.0	167	17.4
ACE inhibitors/angiotensin antagonists	52	29.2	16	16.8	221	37.3	117	27.6	323	33.7
Beta blocker	28	15.7	12	12.6	102	17.2	54	12.7	179	18.7
Statin	61	34.3	23	24.2	230	38.8	125	29.5	334	34.8
Fibrate	3	1.7			22	3.7	6	1.4	20	2.1
Insulin	6	3.4			21	3.5	11	2.6	25	2.6
Oral antidiabetic drugs	5	2.8	3	3.2	73	12.3	32	7.5	64	6.7
Proton pump inhibitors	50	28.1	29	30.5	100	16.9	67	15.8	177	18.5
Bisphosphonates	1	0.6	5	5.3	19	3.2	26	6.1	26	2.7
Thyroid hormones	22	12.4	23	24.2	29	4.9	62	14.6	67	7.0
Opiate substitution	105	59.0	51	53.7	24	4.0	17	4.0	35	3.6
Psychotropic drugs	124	69.7	65	68.4	127	21.4	127	30.0	289	30.1
Anxiolytics, hypnotics, sedatives	52	29.2	31	32.6	32	5.4	29	6.8	57	5.9
Antidepressants	41	23.0	30	31.6	57	9.6	72	17.0	168	17.5
Antipsychotics	22	12.4	11	11.6	28	4.7	26	6.1	56	5.8

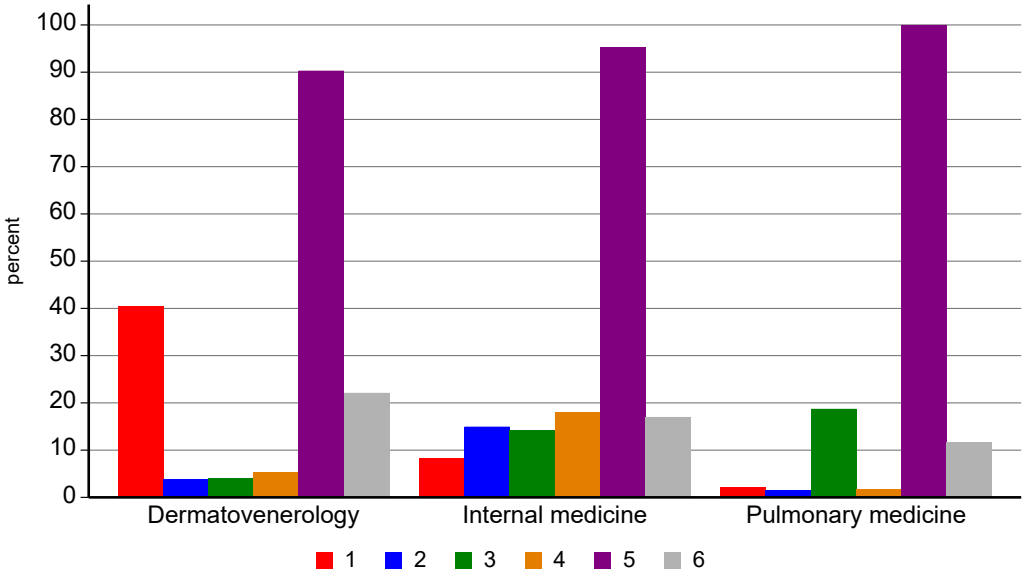
13.4 Co-medication

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



13.5 Examples of quality assurance

"Quality assurance"			
LDL cholesterol not documented within the last 12 months (1)	1223	4857	25.2
LDL cholesterol documented	3634	4857	74.8
LDL > 160 mg/dl	339	3634	9.3
Smoking never documented (2)	366	4857	7.5
Smoking documented	4491	4857	92.5
Smoking	3051	4491	67.9
LDL > 160 mg/dl and smoking (> 50 years)	76	948	8.0
LDL > 160 mg/dl and smoking and no statin (> 50 years)	48	76	63.2
Blood pressure not documented within the last 12 months (3)	524	4857	10.8
Blood pressure documented	4333	4857	89.2
Arterial hypertension	971	4333	22.4
Arterial hypertension and smoking	350	971	36.0
Blood pressure documented (> 50 years)	2131	2366	90.1
Arterial hypertension (> 50 years)	724	2131	34.0
Arterial hypertension and smoking (> 50 years)	245	724	33.8
Arterial hypertension and smoking and no statin (> 50 years)	118	245	48.2
Coronary heart disease (CHD)	286	4857	5.9
CHD and no statin	85	286	29.7
CHD and LDL cholesterol documented	254	286	88.8
CHD and LDL > 130 mg/dl	36	254	14.2
Diabetes	321	4857	6.6
Diabetes and HbA1c > 8	37	321	11.5
Diabetes and no HbA1c within the last 12 months (4)	21	321	6.5
Hepatitis C and visit within the last 12 months	86	4857	1.8
Hepatitis C and elastography never documented (5)	81	86	94.2
No syphilis screening in the last 6 months within MSM (6)	411	2119	19.4



14 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 (28.2%), followed. by the OWS Vienna (17.4%), Innsbruck (15.0%), Linz (13.1%), Graz (9.7%), Salzburg (6.2%), Klagenfurt (4.7%), KFJ Vienna (3.8%) and Feldkirch (2.0%). However, a considerable proportion (33.0%) of patients did not have a follow-up within the last 12 months. Reasons for this „loss of follow-up“ could be a change to health-care providers outside the HIV-centres of AHIVCOS, lack of knowledge of death and many individuals might have left the country.

Who and how many are infected with HIV in Austria?

The cohort study records the number of the included patients, the number of patients on ART (approximately 80% of all patients on ART in Austria are included in the cohort), the proportion of “late“ presenters and finally the number of the patients who died with or without AIDS.
The median age at diagnosis has been between 30 and 40 years since 1990. 24.8% of the patients with a follow-up in the last 12 months are female. The rate is highest in Burgenland (32.9%), Upper Austria (31.9%), Vorarlberg (26.9%) and Tyrol (26.6%).
In the subgroup of heterosexually acquired infections, the rate of the women is 50.9%. It is highest in Upper Austria (56.2%), Tyrol (53.6%), Burgenland (52.8%), Carinthia (52.7%) and Styria (52.1%). Among patients newly diagnosed in 2021, 25.9% have been infected through heterosexual contacts. Since 2000, 35.2% of all newly diagnosed HIV infections were transmitted through heterosexual contacts.

Most of the cohort participants are Austrian nationals (70.5%). 8.5% come from high prevalence countries and 18.1% from low prevalence countries outside Austria. Information on the nationality of the remaining patients is missing.

As of January 1st 2017, the modelling tool of ECDC reveals a number of 9440 PLHIV, assuming that AHIVCOS is representative for the whole of Austria. This is likely an overestimation, since the ascertainment of patients who left the country is incomplete.

According to Hauptverband der Sozialversicherungsträger, 6847 persons received cART in 2018. An analysis within AHIVCOS, based on the same method, revealed 4945 persons with cART in 2017 representing 75% of all patients in Austria receiving cART. Overall, we estimate, according to the ECDC tool, that about 80-85% of PLHIV are receiving cART (no major change for 2017 expected). Thus the estimate for PLHIV, based on the number given by the Hauptverband and the calculation of 80-85% receiving cART, add up to 8055-8560 PLHIV for end of 2018.

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 2021 were analysed. During this period, 6516 HIV infections were newly diagnosed. The infections occurred in 35.0% through heterosexual transmission, in 44.5% through MSM and in 14.3% 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.

17.4% 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, 259 (7.1%) of 3633 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 237/µl. The current CD4 cell count is 670/µl (median at the last measurement). As of September 1st, 2021, about 3.9% of the patients with a visit in the last 12 months had a current CD4 cell count below 200/µl and 20 (0.4%) of them had a CD4 cell count <50/µl. The mean CD4 cell count is currently 704/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).

Access to antiretroviral therapy

The Austrian HIV Cohort Study cannot evaluate whether access to the HIV centres differs by sex, mode of transmission, nationality, or other factors.

The nine HIV centres have to care for an increasing number of patients on antiretroviral treatment. This was a natural development, there was no public health policy which pushed the treatment into the HIV-centres. One might say, “the market wants it that way“.

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 10 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 10 years is about 20% in patients who started ART with NNRTIs. The probability of PI-associated resistance after 10 years is 35% in patients who had a PI-based antiretroviral combination therapy as their initial therapy. The results are about the same if transmitted resistances are excluded.

The strongest risk factor for the development of 3-class-resistance during antiretroviral therapy is initiation of ART before 1997, followed by low CD4 nadir and younger age

(<30 years). Persons with a current HIV RNA below 200 copies/ml seem to have a lower risk of developing 3-class-resistance during ART.

In our cohort, 45 patients of 8224 (0.5%) have a mutation of the codon 65 of the RT (K65R). The occurrence of the mutation K65R was more frequent in regimens including Tenofovir compared with Abacavir and could be found more often in patients with advanced immune deficiency (low CD4 nadir/ AIDS; chapter 12.3.1.2).

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 very representative of the epidemiology of HIV/AIDS in Austria and therefore serves as source of data for the ECDC in Stockholm. It has become more comprehensive in recent years and can now 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.

15 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

16 Austrian HIV Cohort Study Group

As of November 2021

Steering committee members: Alexander Egle, Manfred Kanatschnig, Angela Öllinger, Armin Rieger, Brigitte Schmied, Elmar Wallner, Robert Zangerle
Coordinating Centre: Medical University of Innsbruck (Robert Zangerle)
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