2022년 우리나라 신대체 요법의 현황
– 인산 민병석 교수 기념 말기 신부전 환자 등록 사업 2022 –

KOREAN RENAL DIALYSIS SYSTEM (KORDS) 2022

대한신장학회 등록위원회
KORDS Committee, Korean Society of Nephrology

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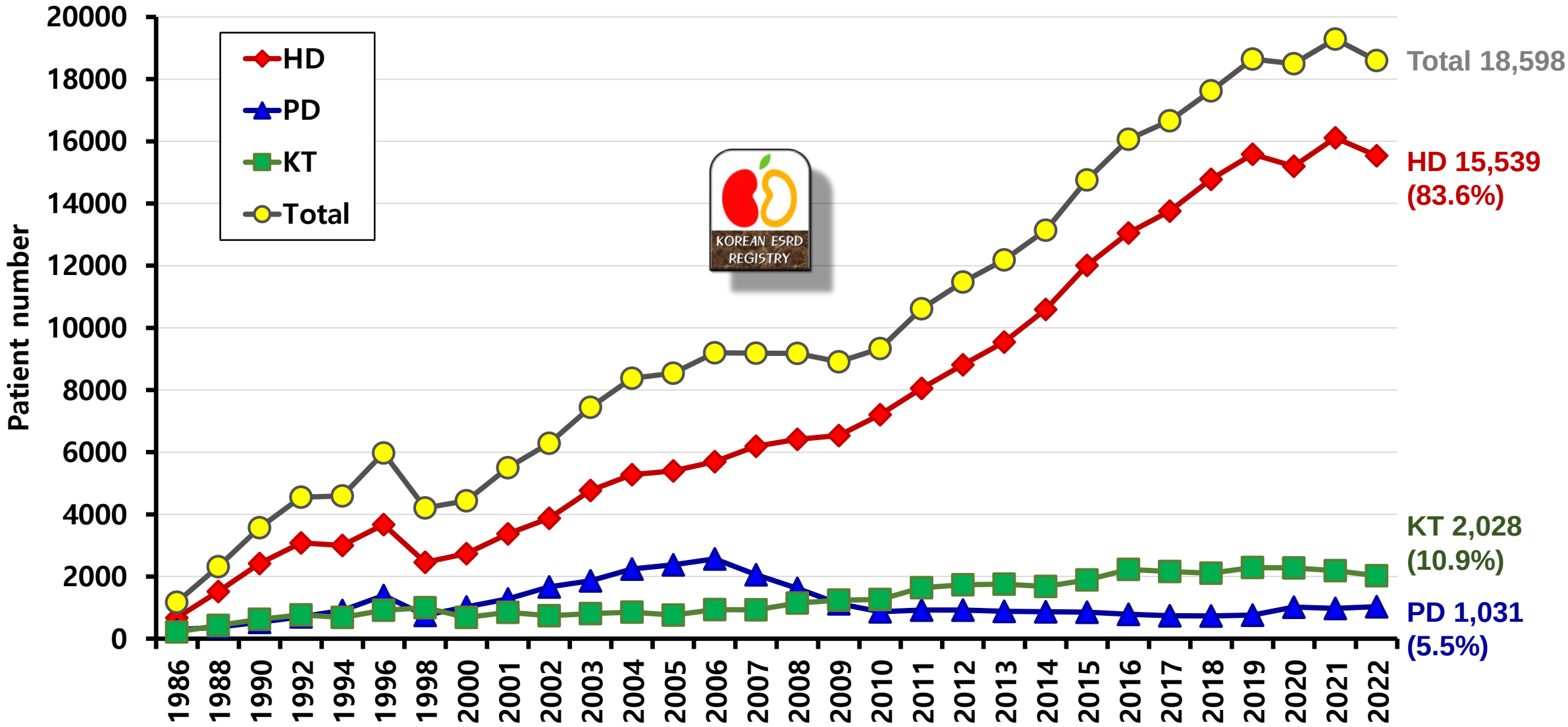
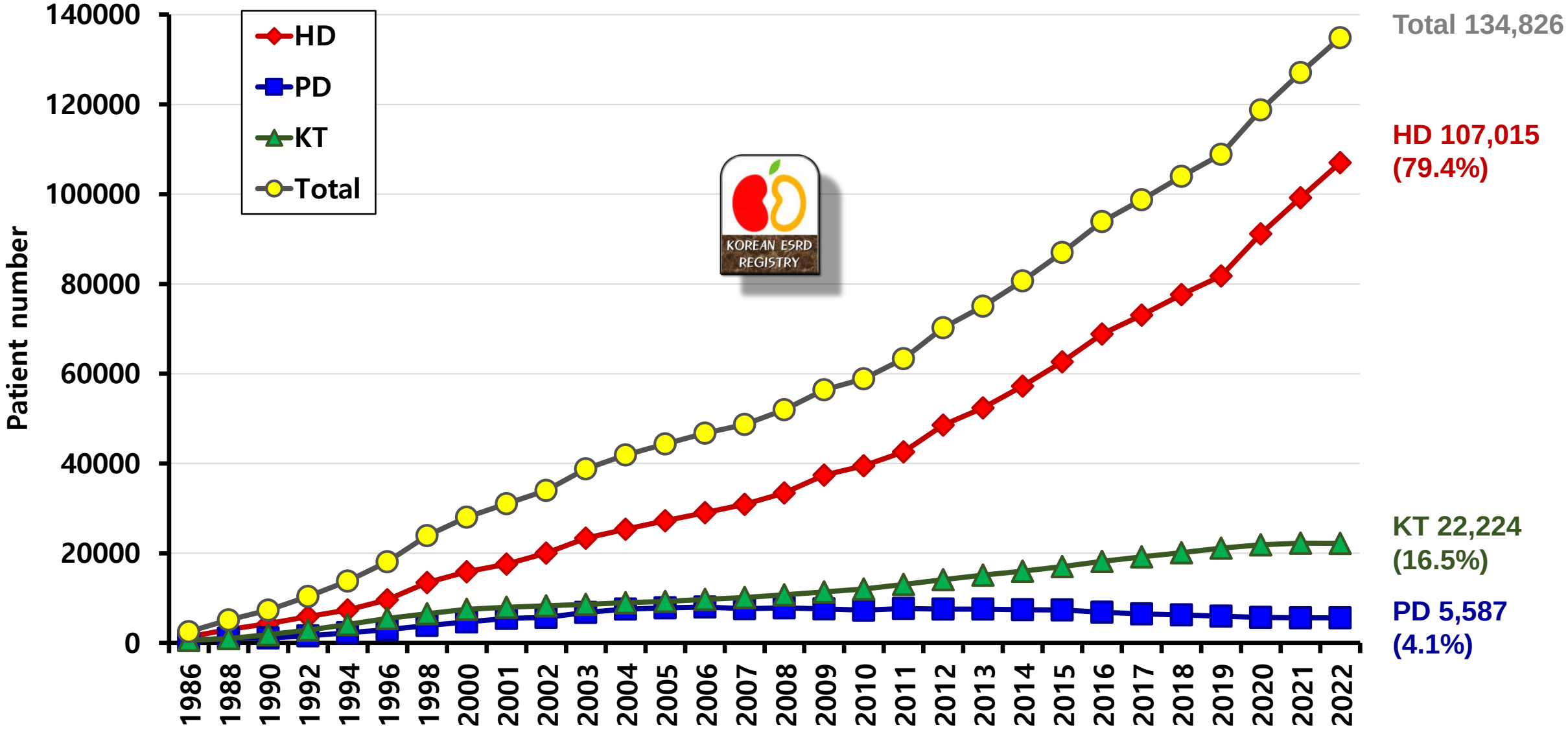
I. 우리나라 말기 신부전 환자의 발병률 및 유병률 분석 (Incidence and Prevalence of ESKD patients in Korea, 2022)

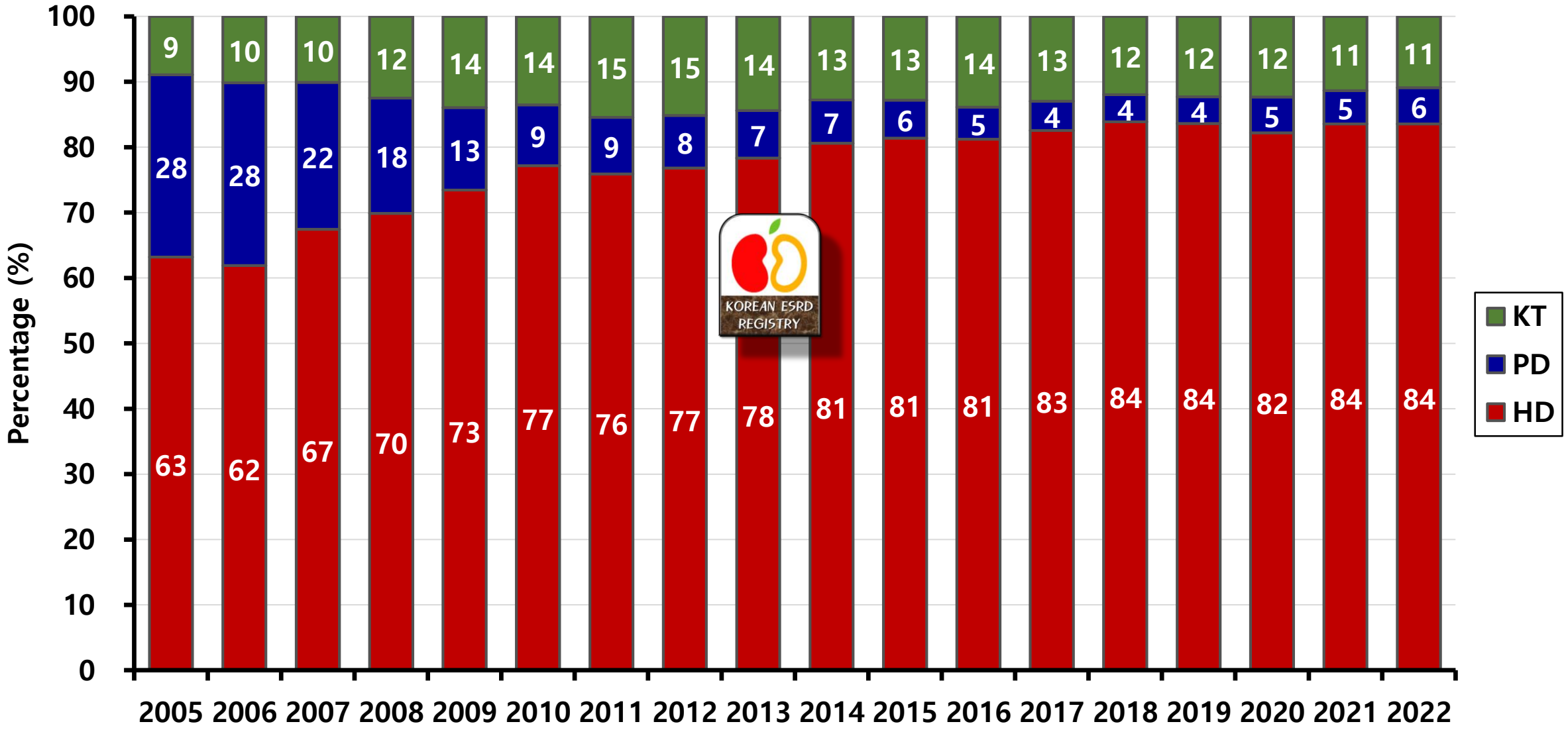
Incidence of ESKD



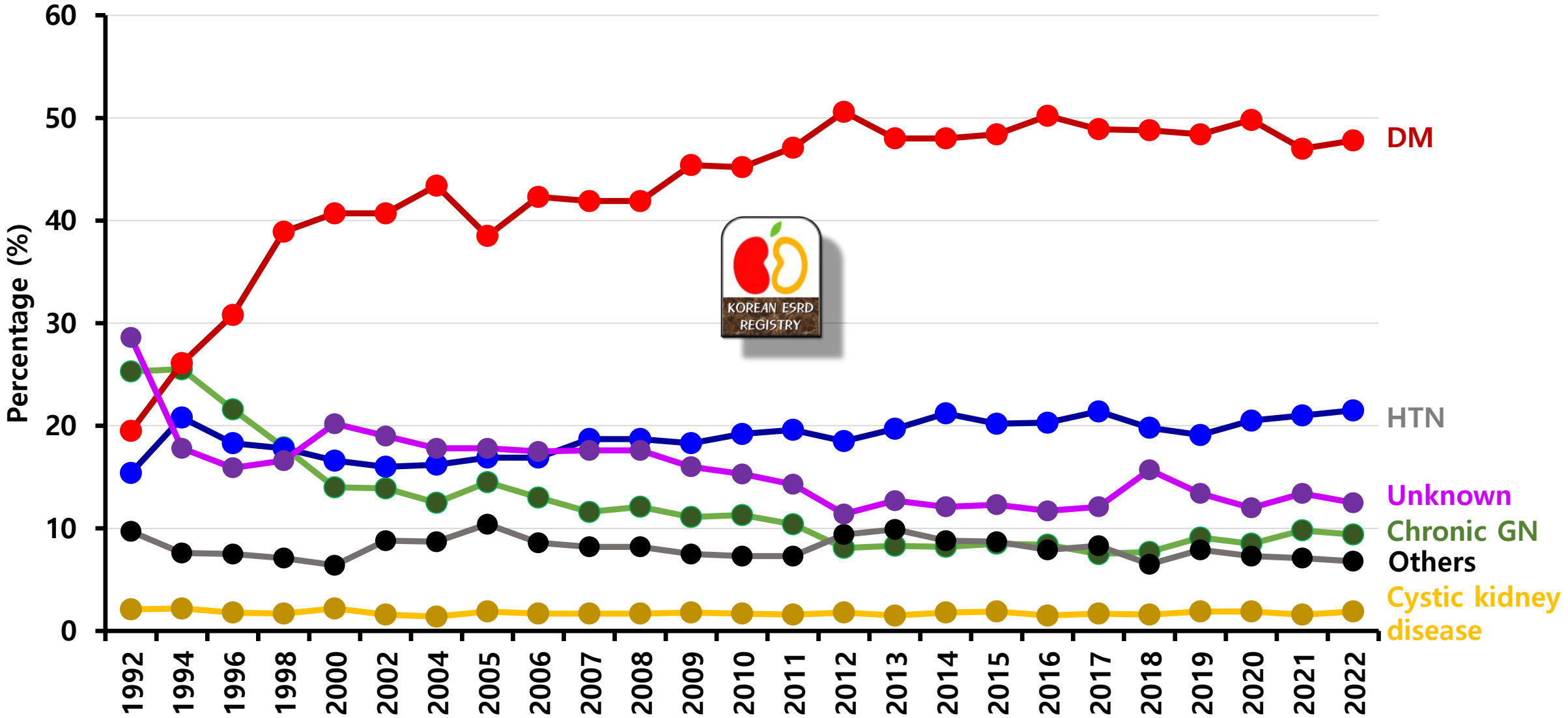
Prevalence of ESKD



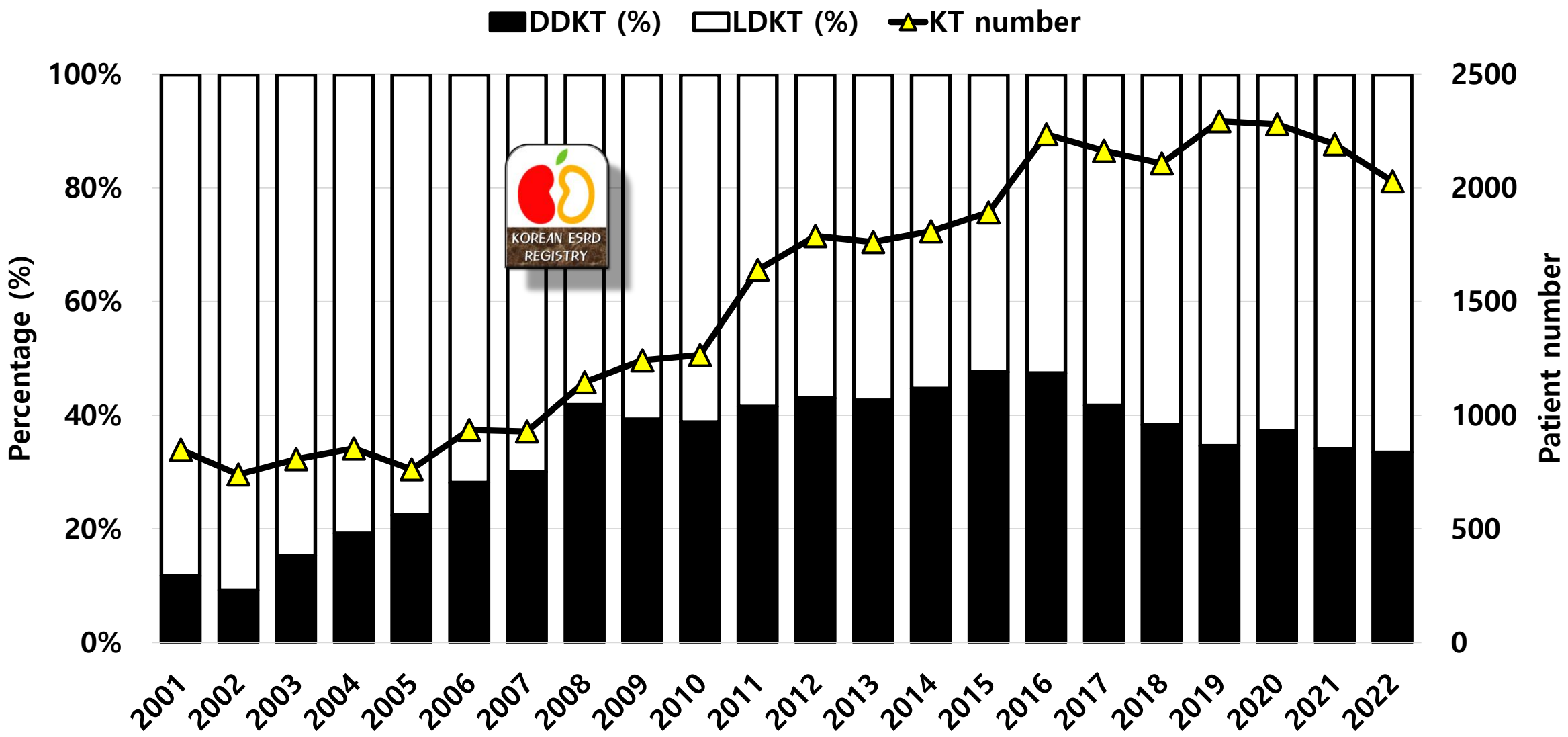
Proportion of Annual ESKD Incidence



Causes of ESKD

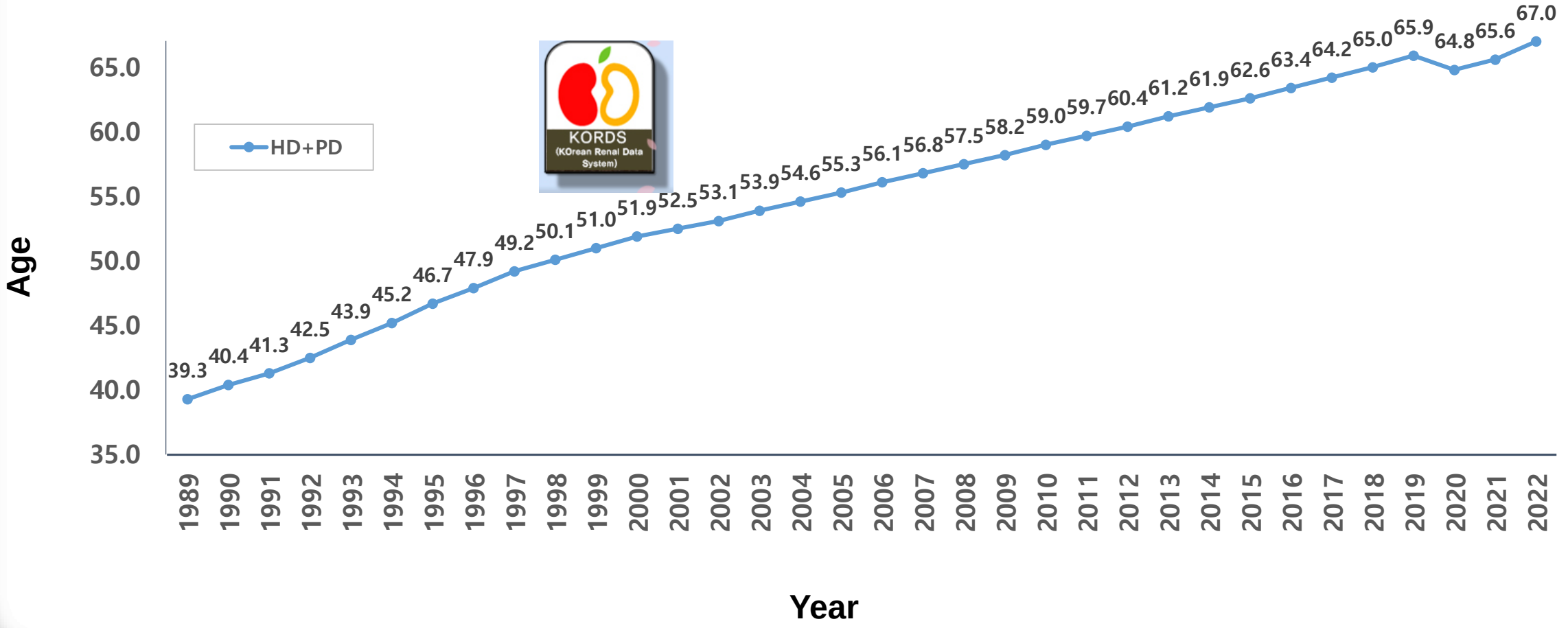


Current Status of Kidney Transplantation (KT)

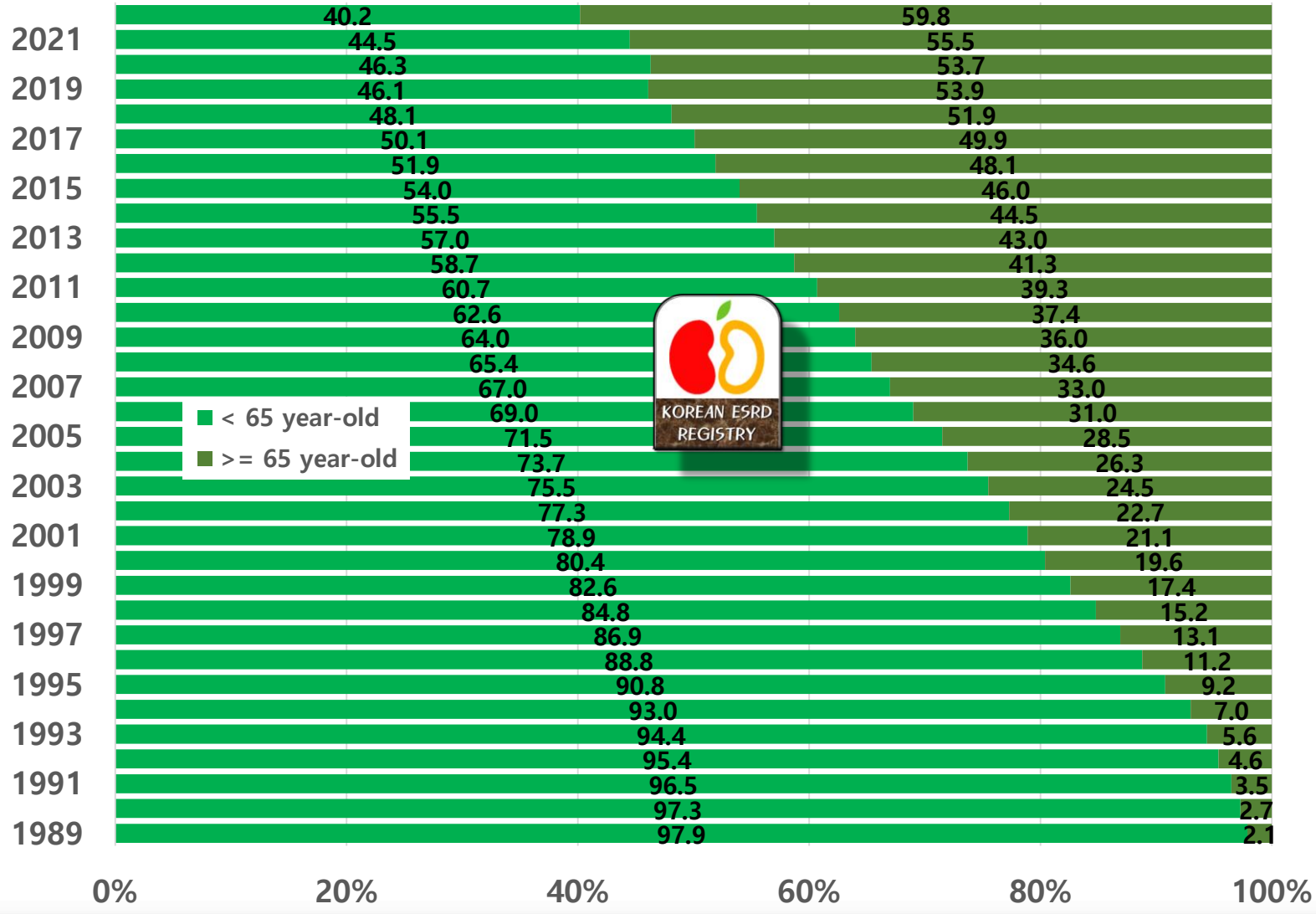


II. 우리나라 말기신부전 환자와 투석 치료의 특징 (Patients and Dialysis Characteristics of ESKD in Korea, 2022)

Trend of age in patients with ESKD

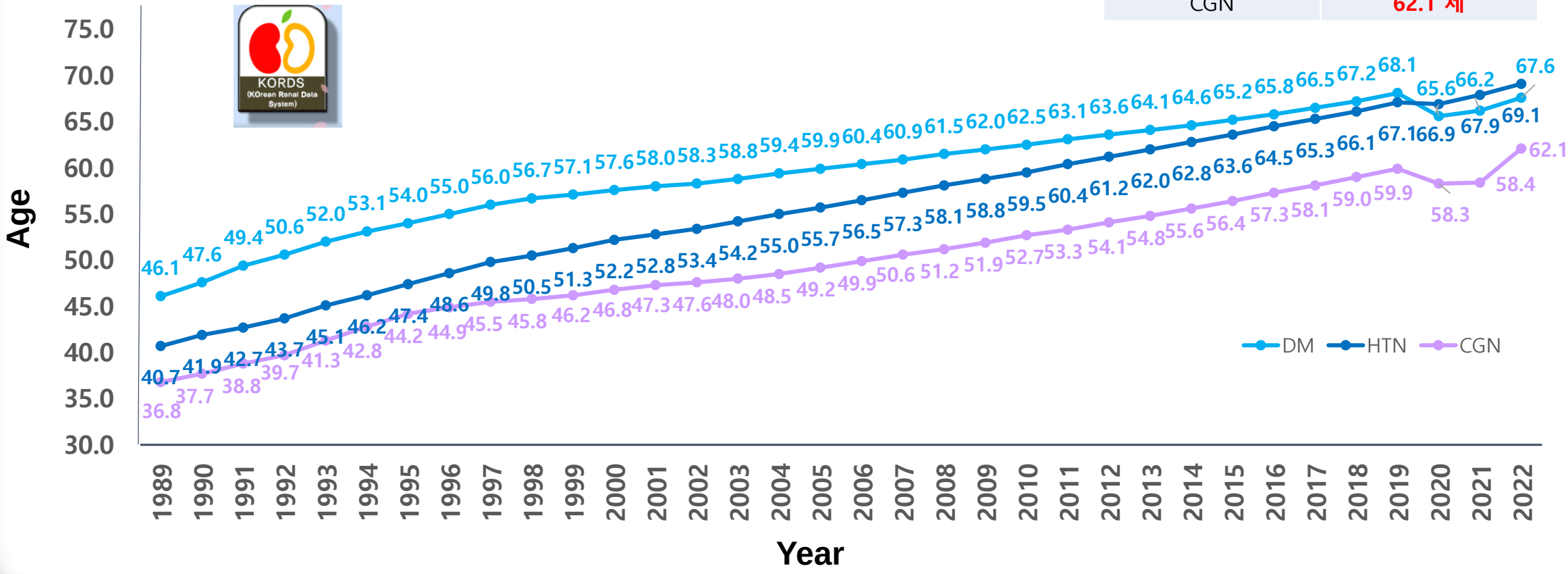


Trend in proportion of elderly patients with ESKD

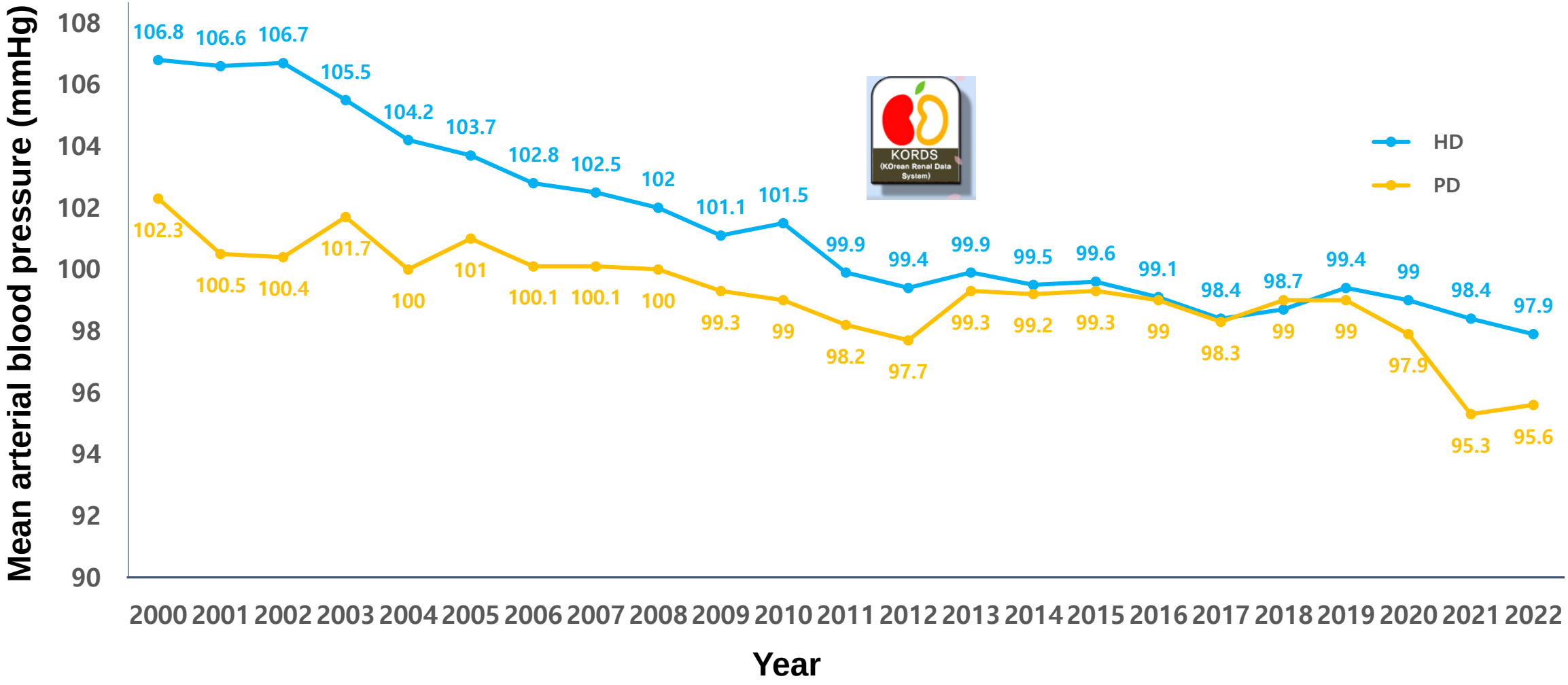


Age distribution of dialysis patients according to underlying diseases

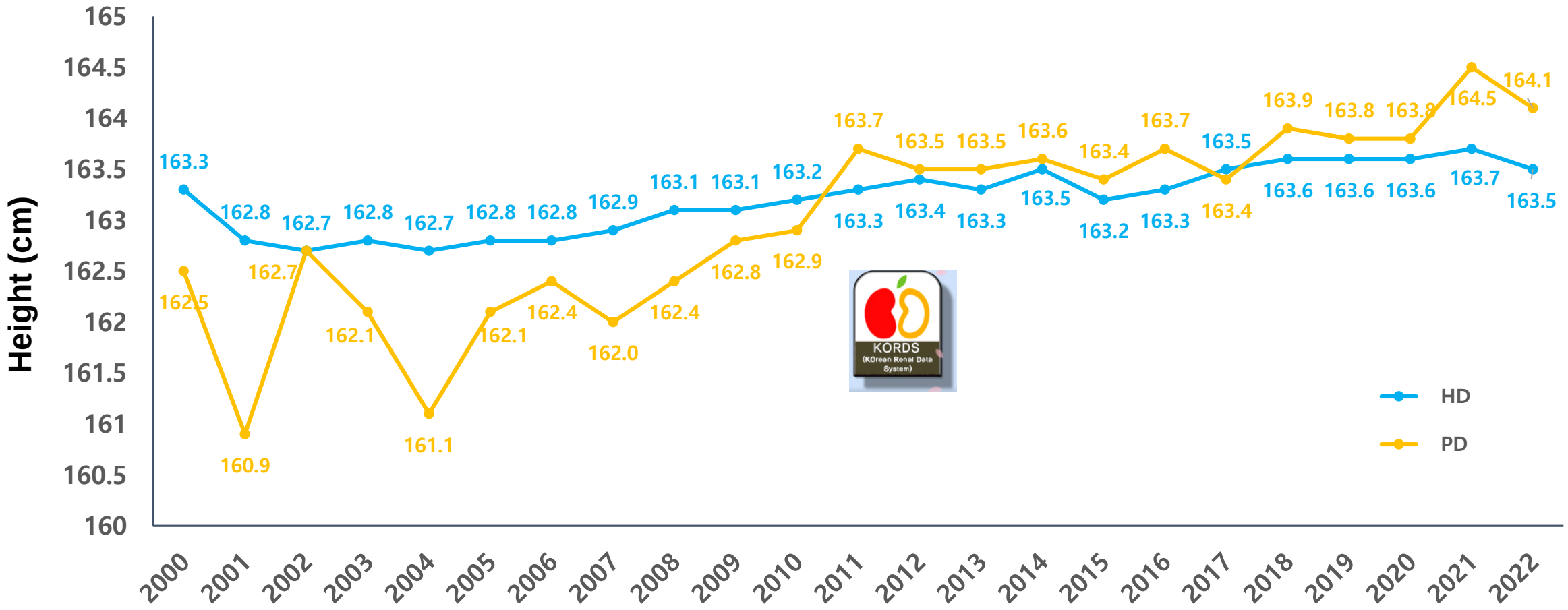
기저 질환	Age (2022년)
DM	67.6 세
HTN	69.1 세
CGN	62.1 세



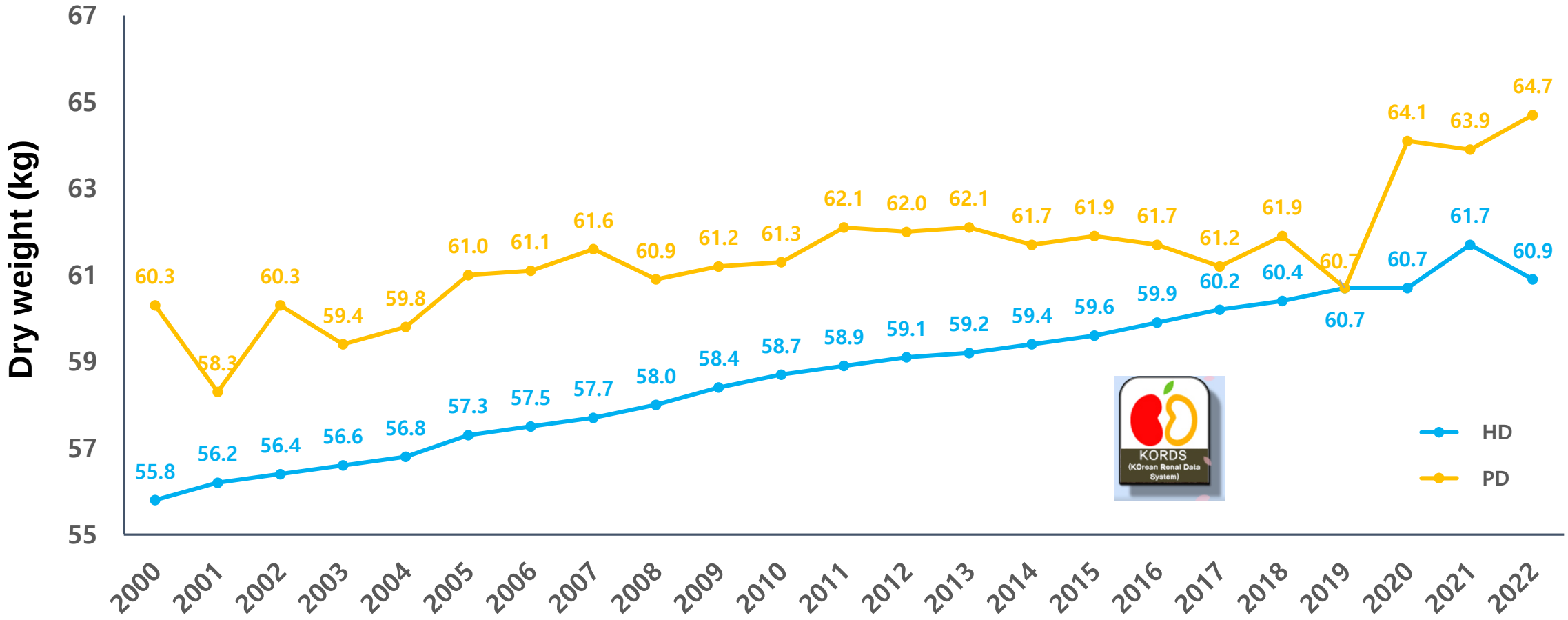
Distribution of mean blood pressure



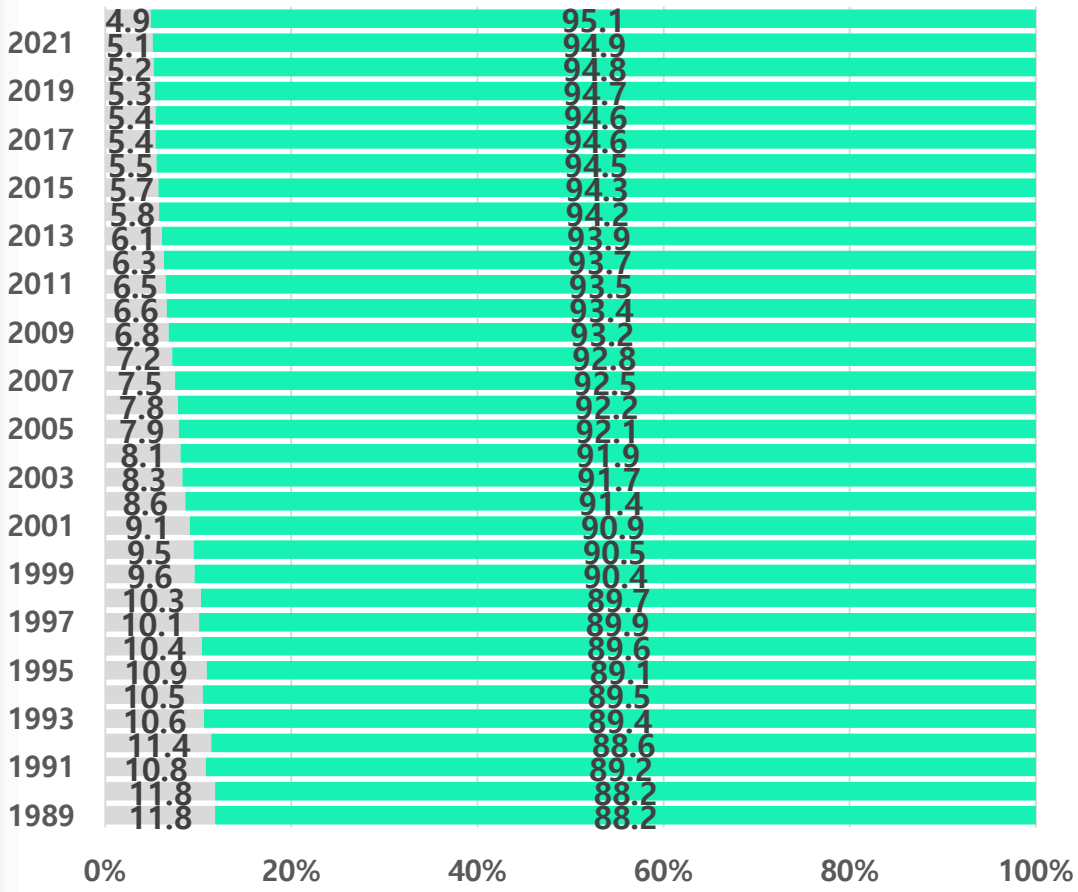
Distribution of Height

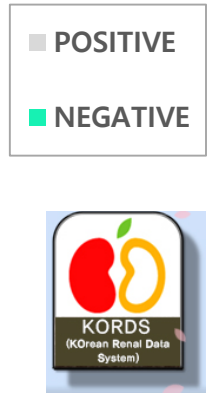


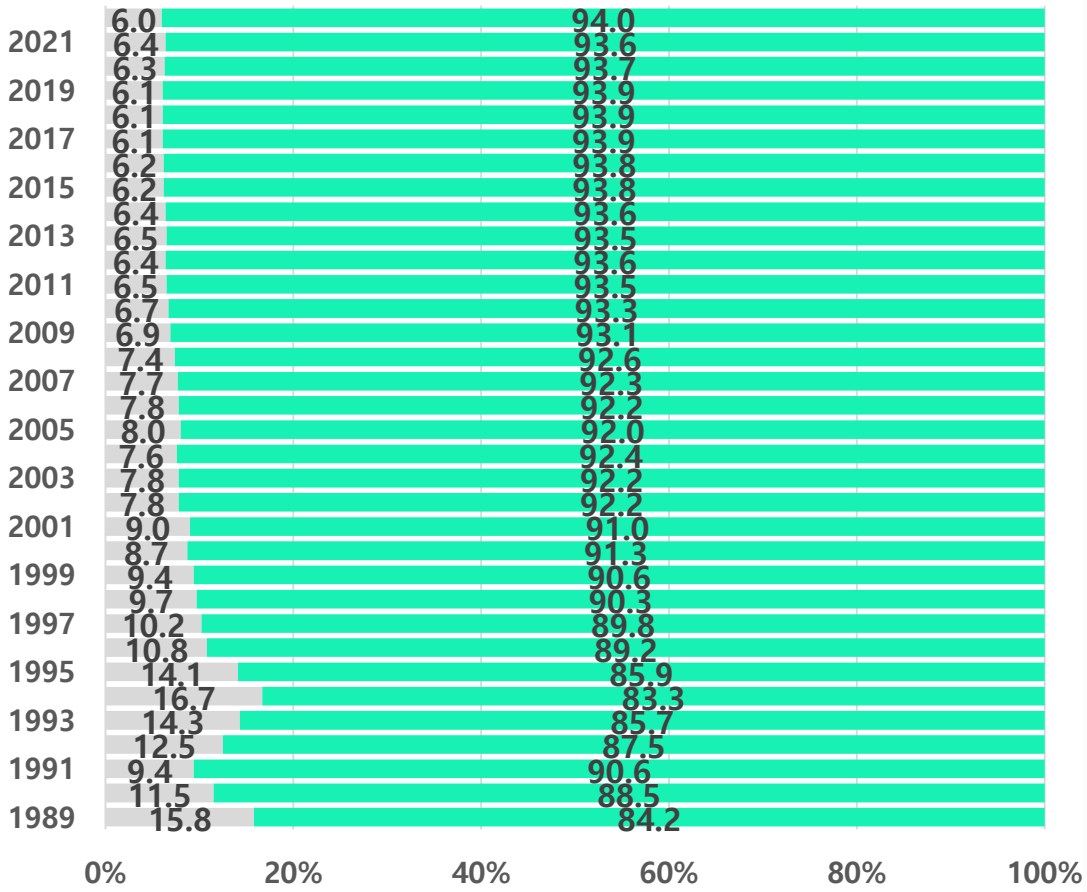
Distribution of Dry weight



Hepatitis B


HD
HBs Ag of HD patients
2021 4.9 95.1
2019 5.1 94.9
2017 5.2 94.8
2015 5.3 94.7
2013 5.4 94.6
2011 5.4 94.6
2009 5.5 94.5
2007 5.7 94.3
2005 5.8 94.2
2003 6.1 93.9
2001 6.3 93.7
1999 6.5 93.5
1997 6.6 93.4
1995 6.8 93.2
1993 7.2 92.8
1991 7.5 92.5
1989 7.8 92.2
7.9 92.1
8.1 91.9
8.3 91.7
8.6 91.4
9.1 90.9
9.5 90.5
9.6 90.4
10.3 89.7
10.1 89.9
10.4 89.6
10.9 89.1
10.5 89.5
10.6 89.4
11.4 88.6
10.8 89.2
11.8 88.2
11.8 88.2
0% 20% 40% 60% 80% 100%

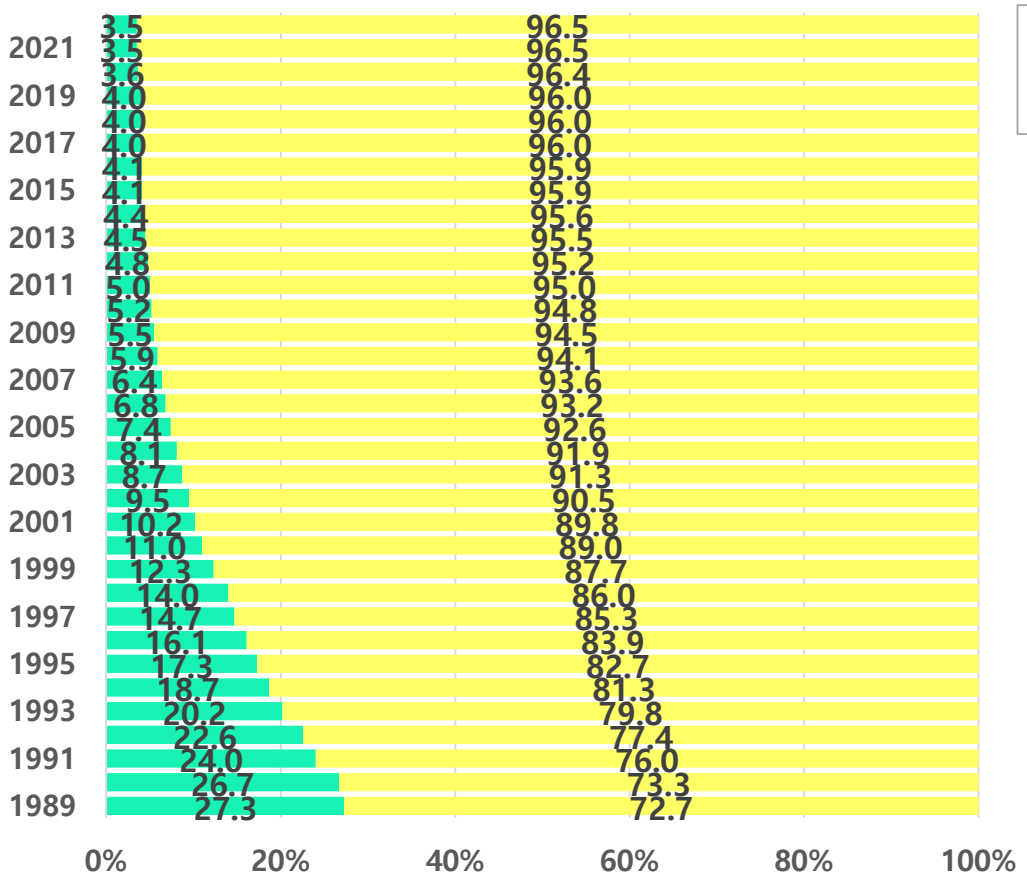

POSITIVE
NEGATIVE
KORDS
(KOrean Renal Data System)


PD
HBs Ag of PD patients
2021 6.0 94.0
2019 6.4 93.6
2017 6.3 93.7
2015 6.1 93.9
2013 6.1 93.9
2011 6.2 93.8
2009 6.2 93.8
2007 6.4 93.6
2005 6.5 93.5
2003 6.4 93.6
2001 6.5 93.5
1999 6.7 93.3
1997 6.9 93.1
1995 7.4 92.6
1993 7.7 92.3
1991 7.8 92.2
1989 8.0 92.0
7.6 92.4
7.8 92.2
7.8 92.2
9.0 91.0
8.7 91.3
9.4 90.6
9.7 90.3
10.2 89.8
10.8 89.2
14.1 85.9
16.7 83.3
14.3 85.7
12.5 87.5
9.4 90.6
11.5 88.5
15.8 84.2
0% 20% 40% 60% 80% 100%

Hepatitis C

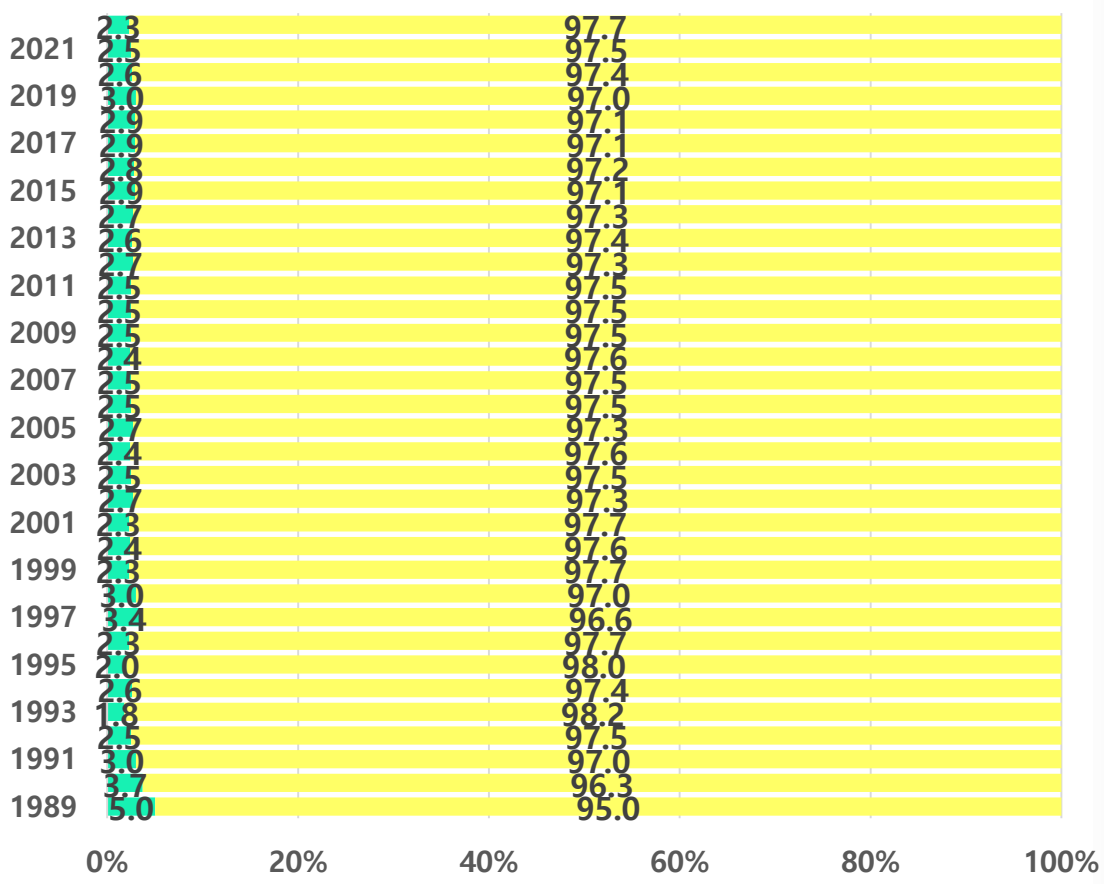
HD

HCV Ab of HD patients



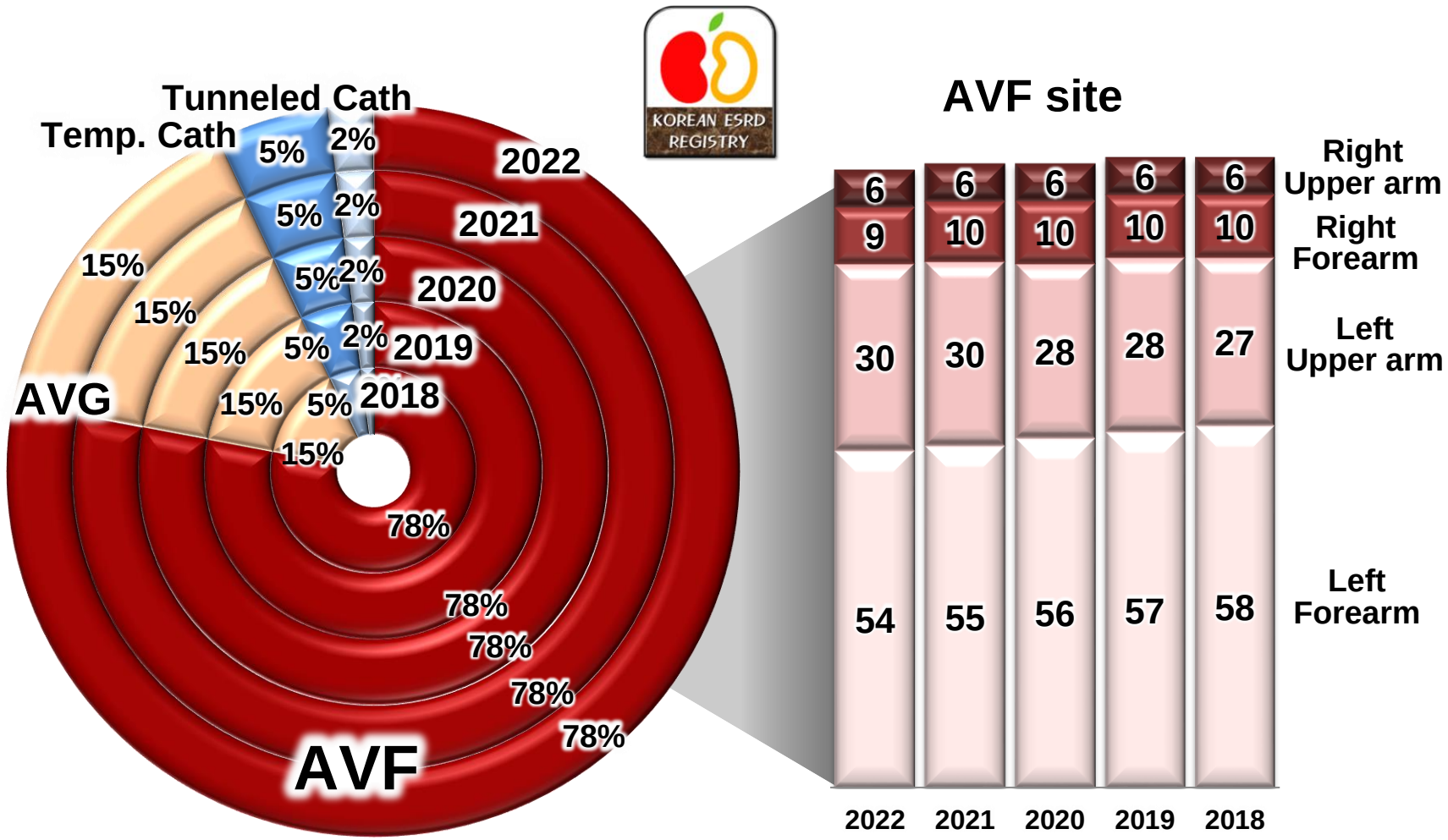
PD

HCV Ab of PD patients

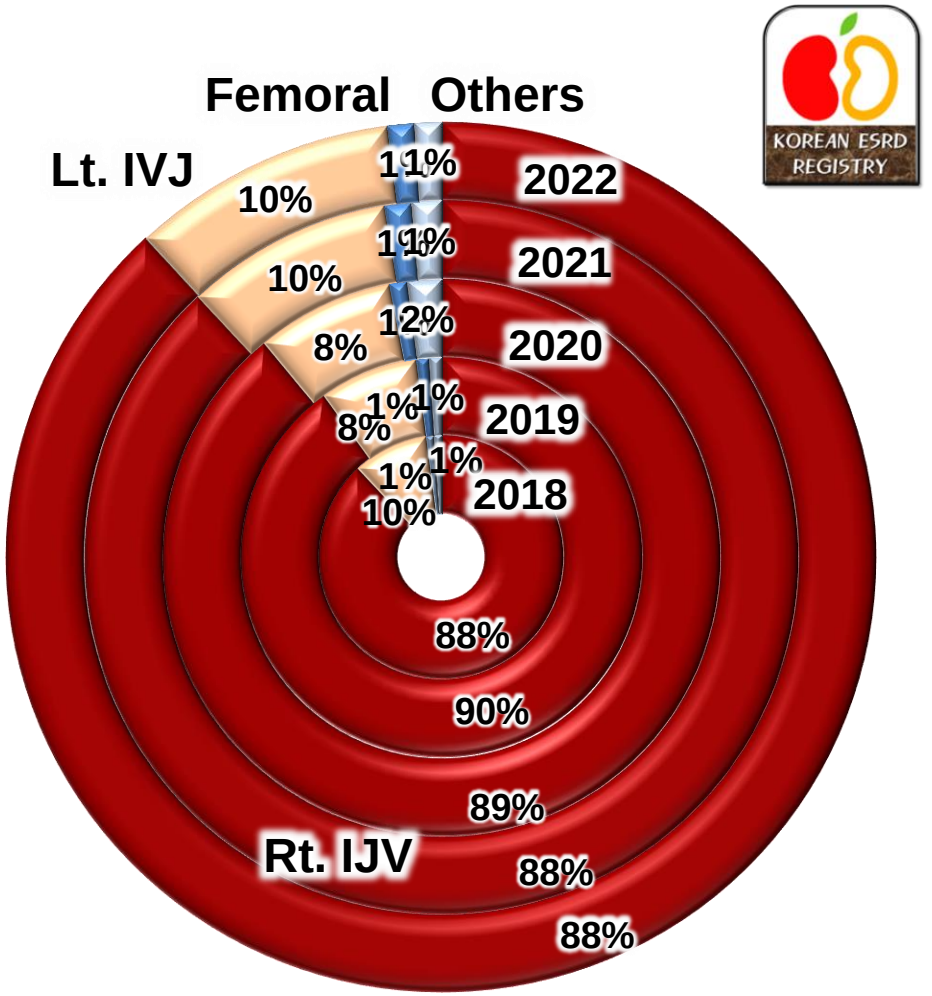


우리나라 혈액 투석 환자의 특징

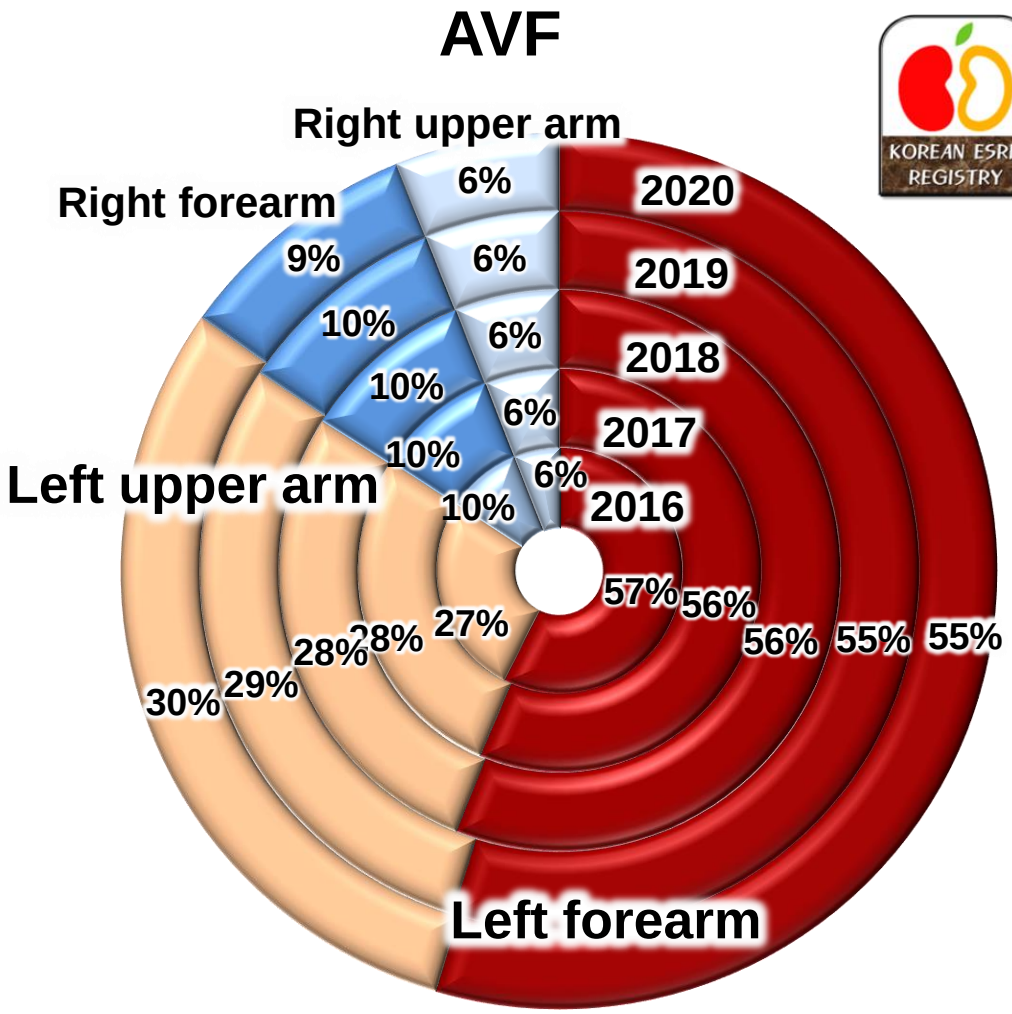
Vascular Access (1)-Distribution of access type

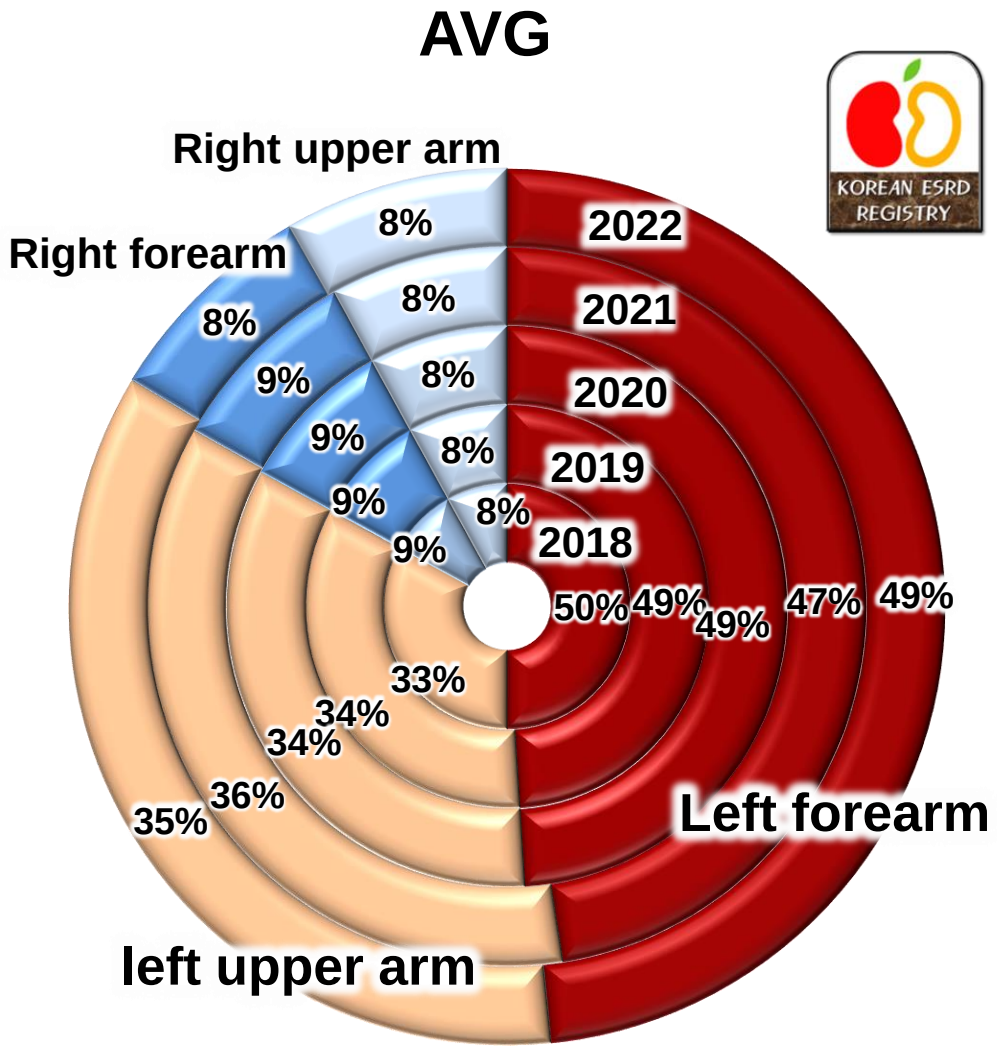


Vascular Access (2)-Location of catheter for HD

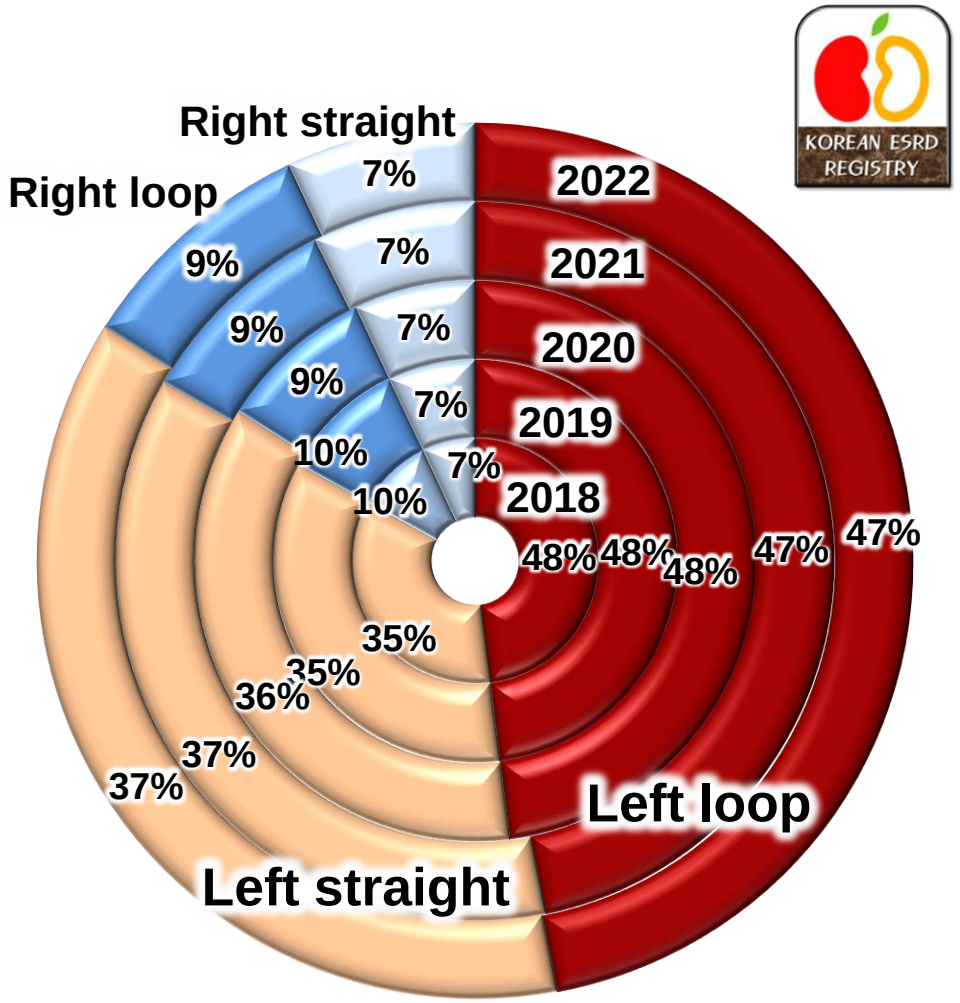


Vascular Access (3)-Distribution of OP site

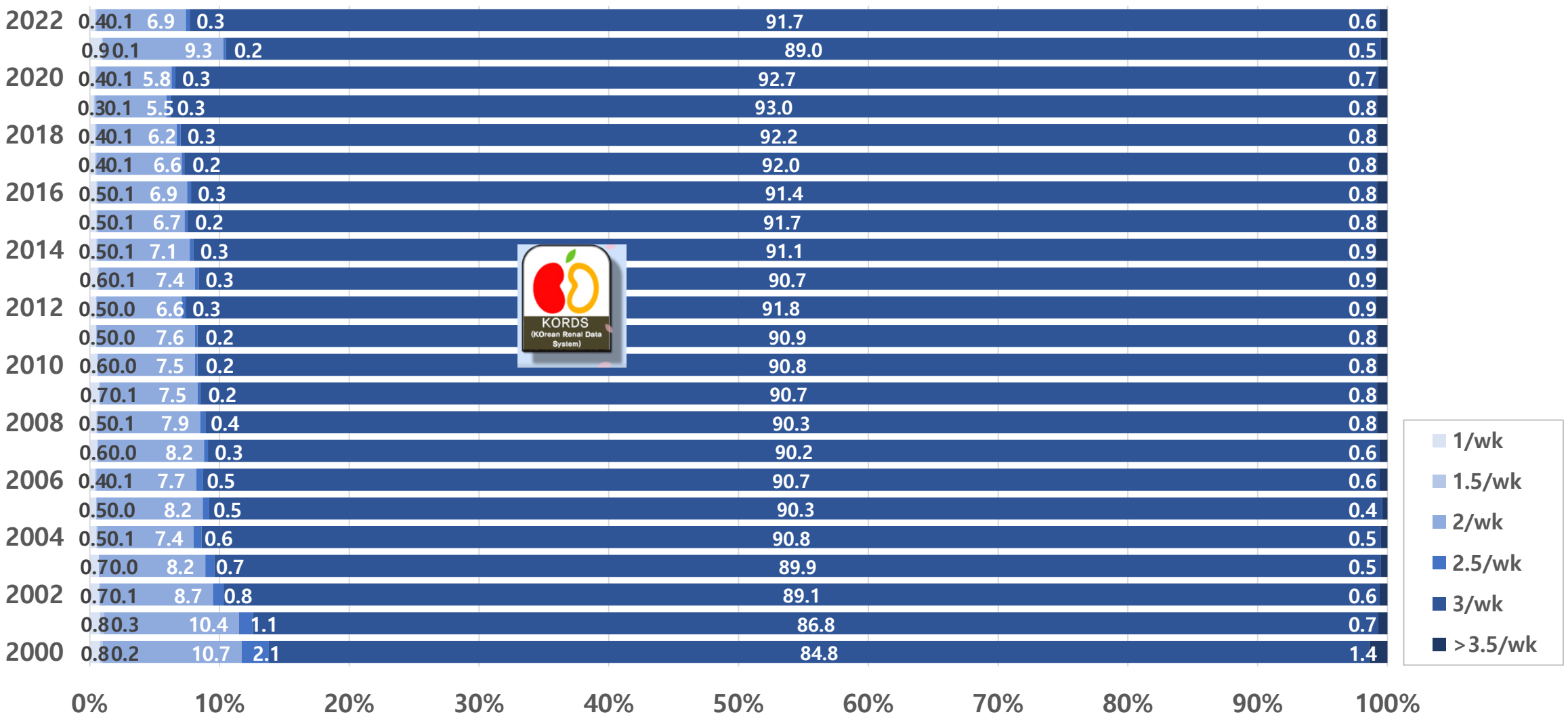




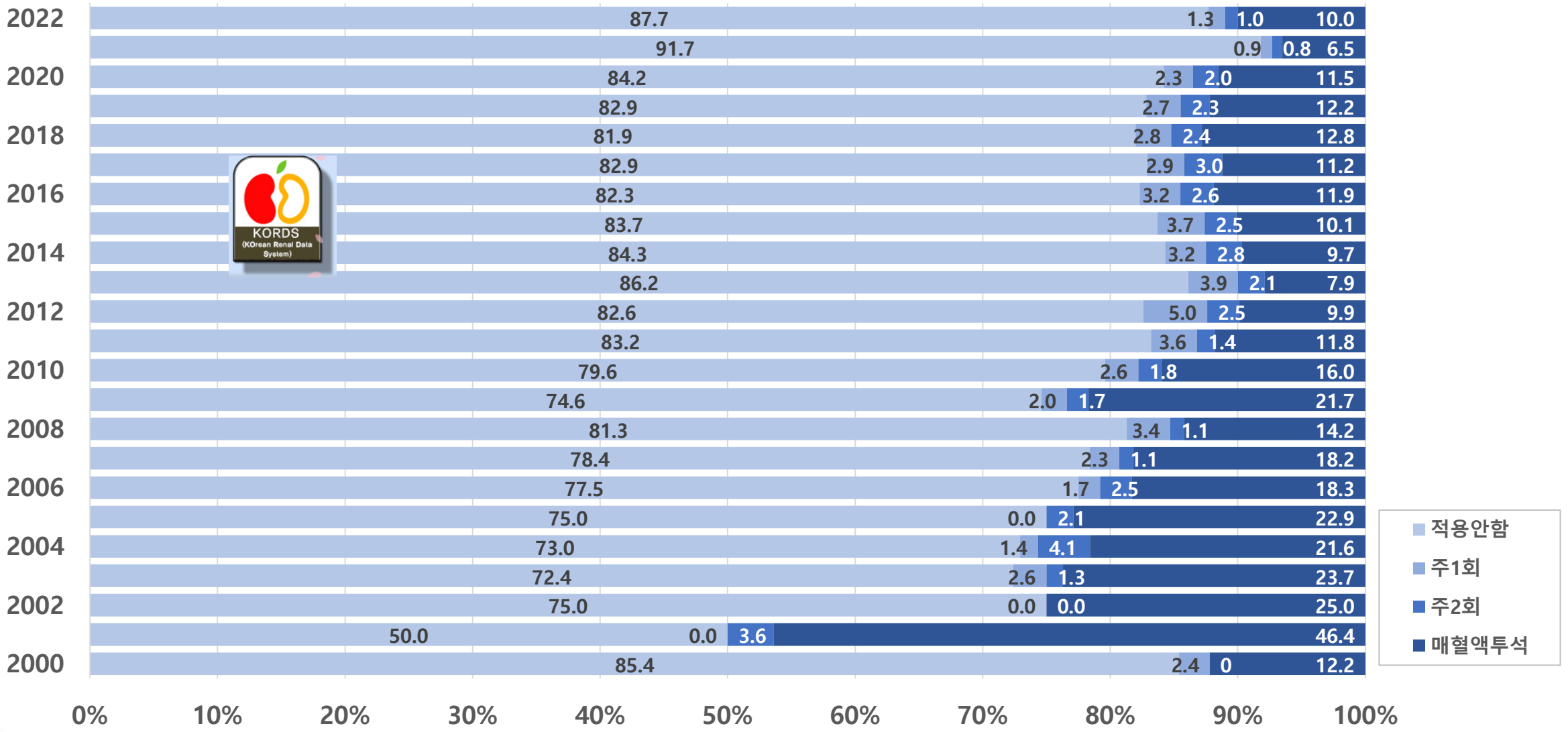
Vascular Access (4)-Type of AVG



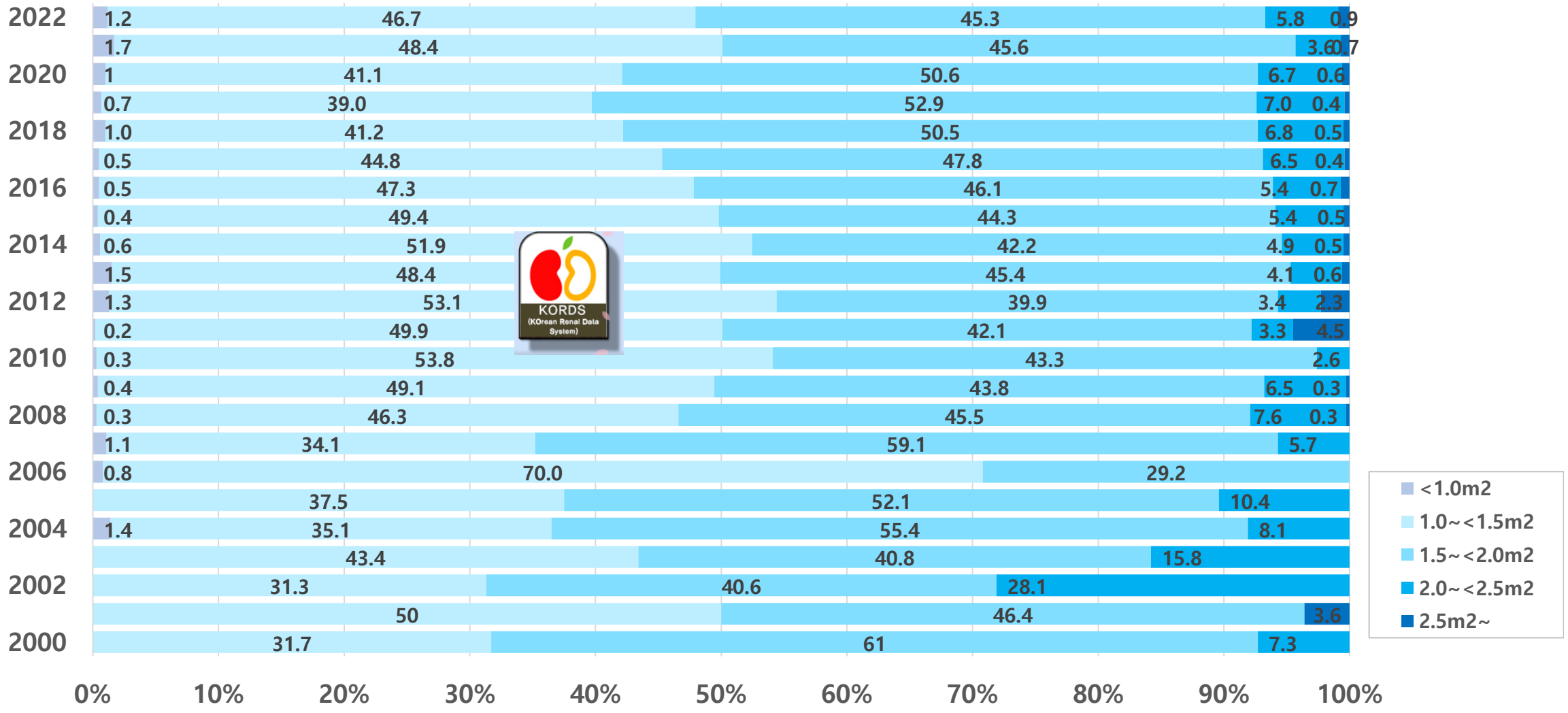
Frequency of HD (session/week)



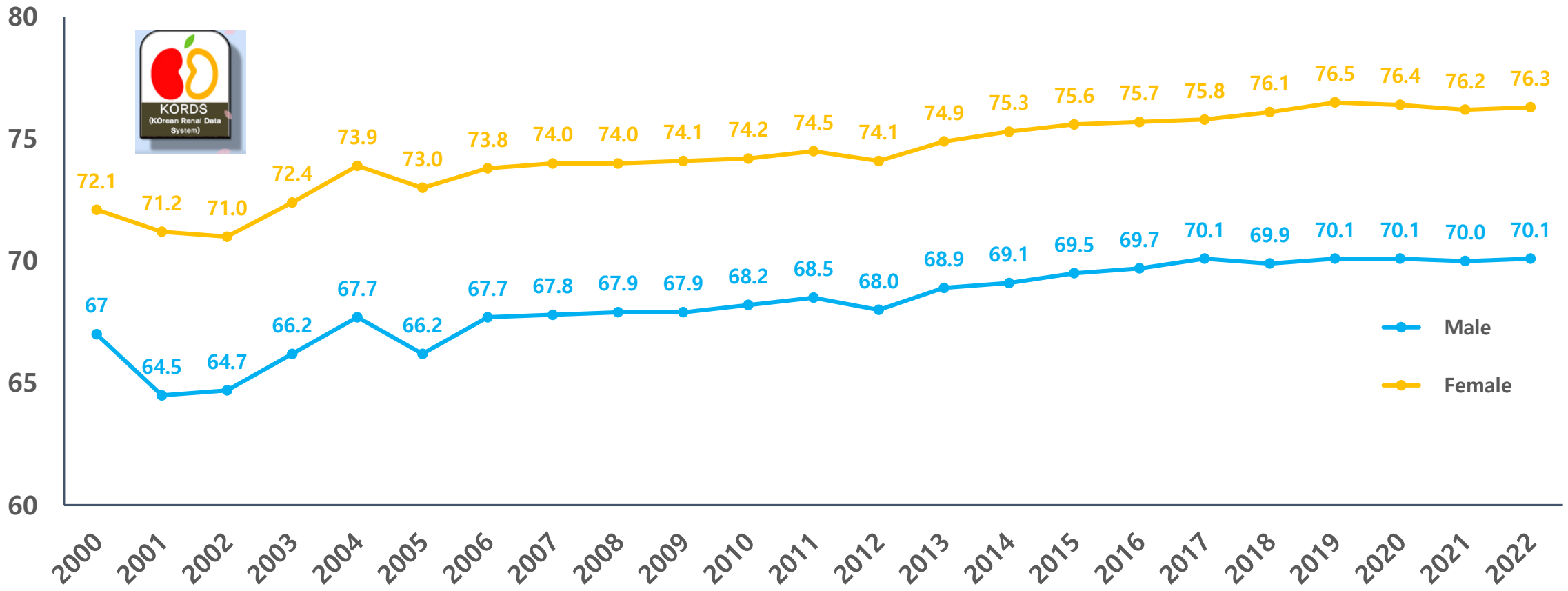
Proportion of HDF



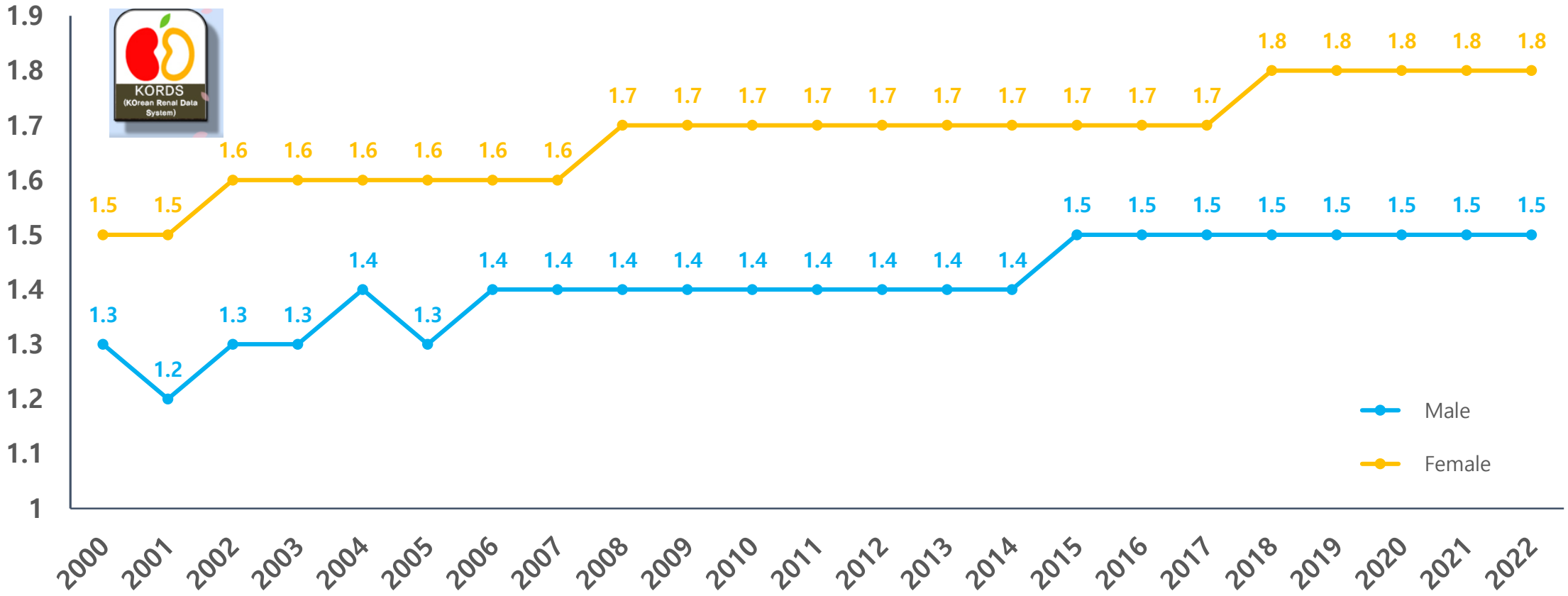
Percent of patients according to the using dialyzer membrane surface area



Adequacy of HD (Urea Reduction Rate)

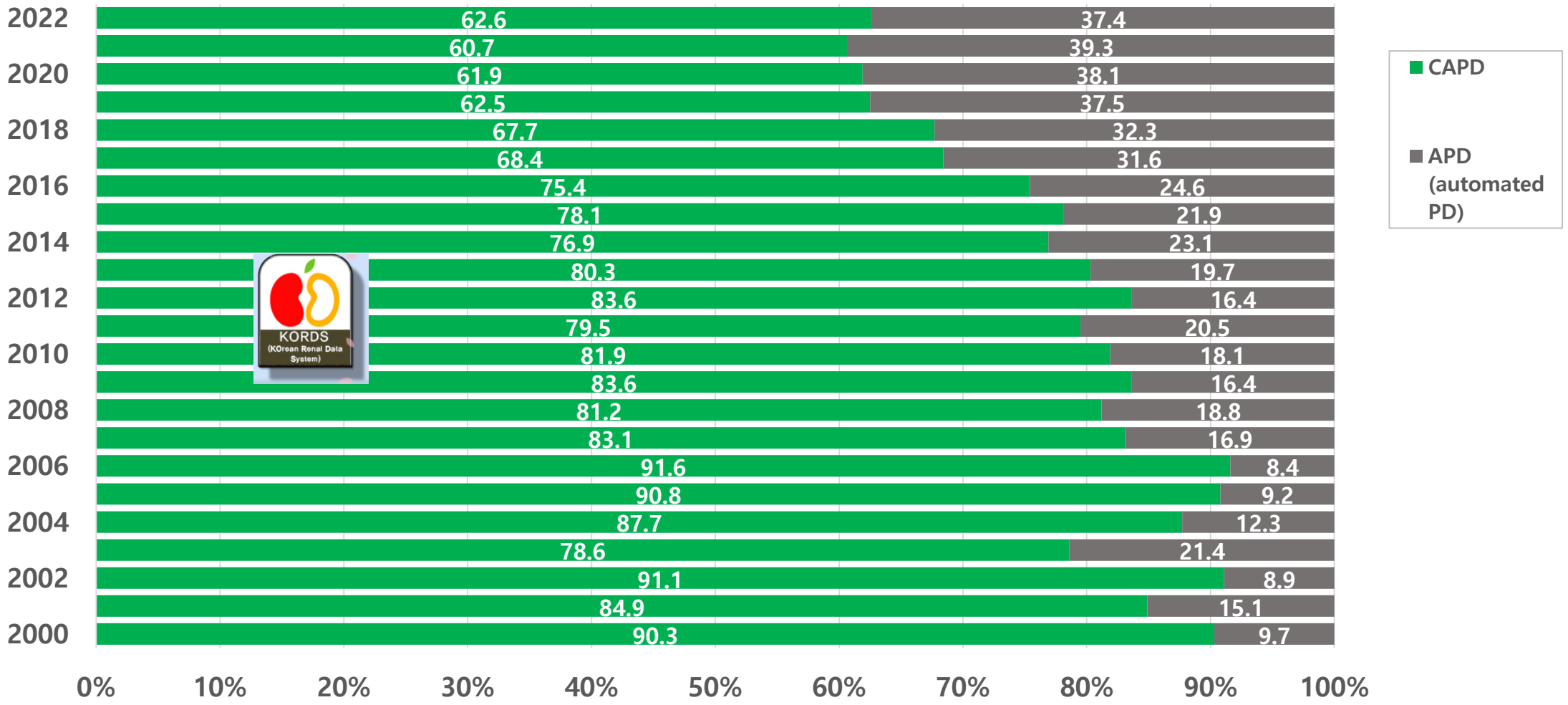


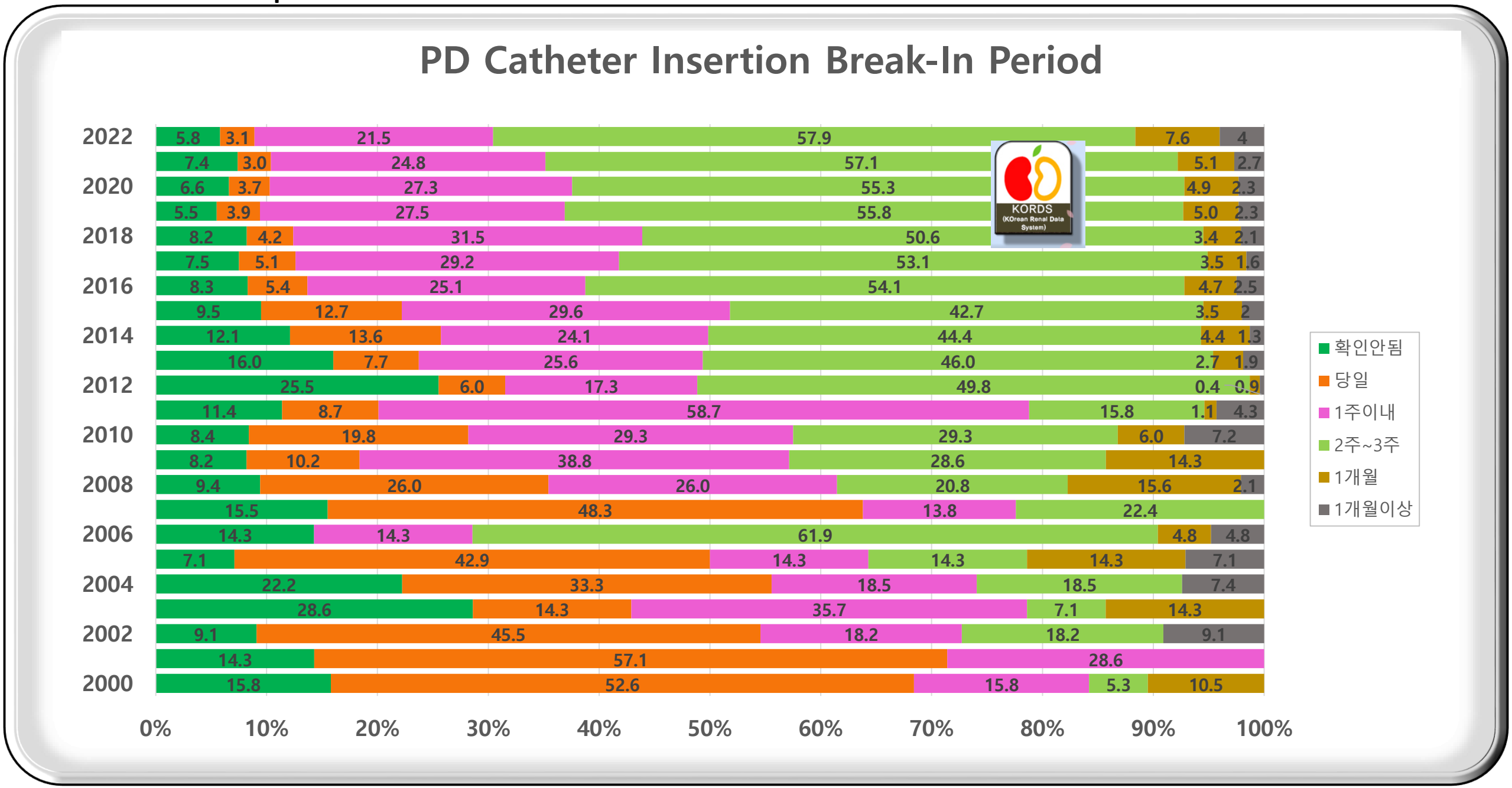
Adequacy of HD (spKt/V)



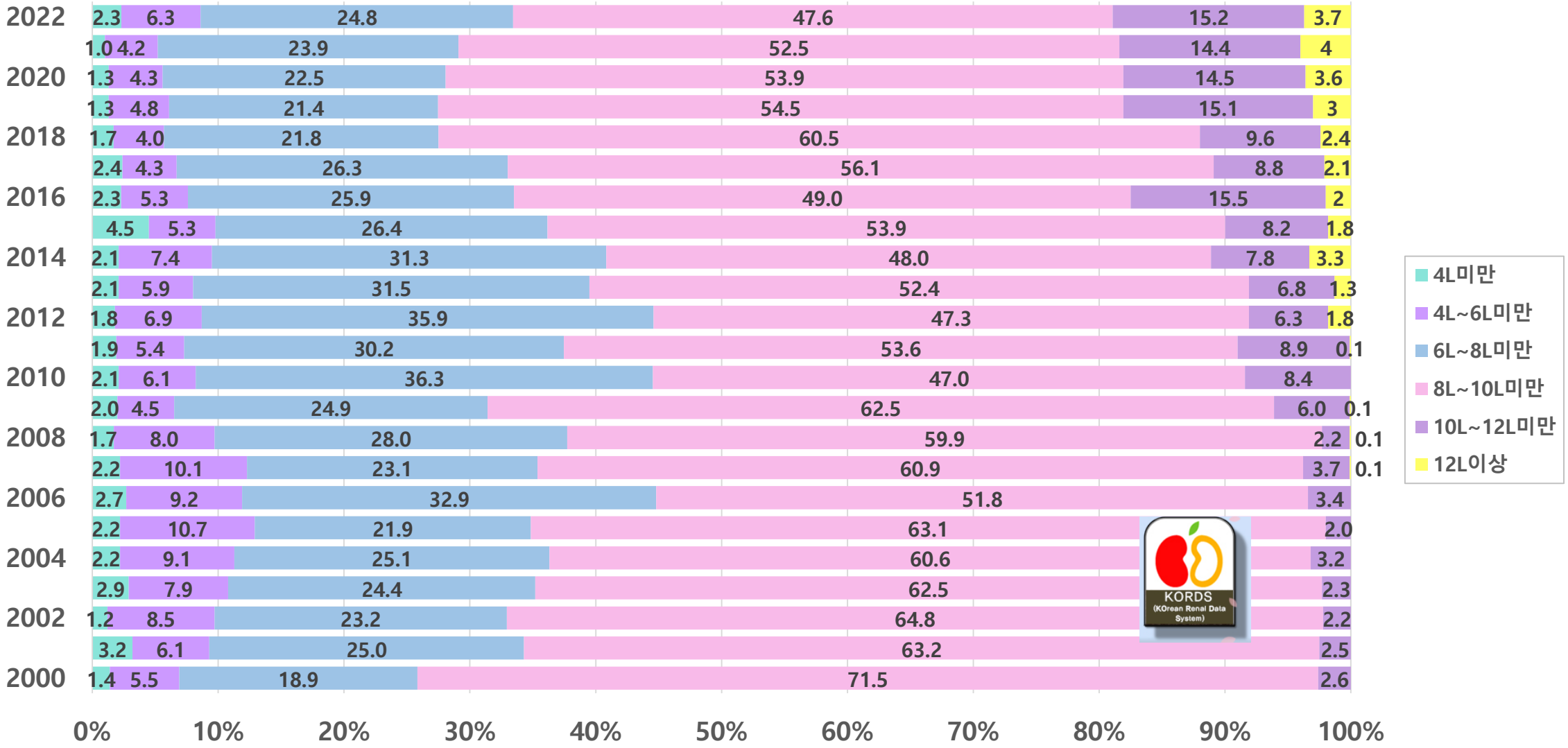
우리나라 복막 투석 환자의 특징

Trends in type of peritoneal dialysis (PD)

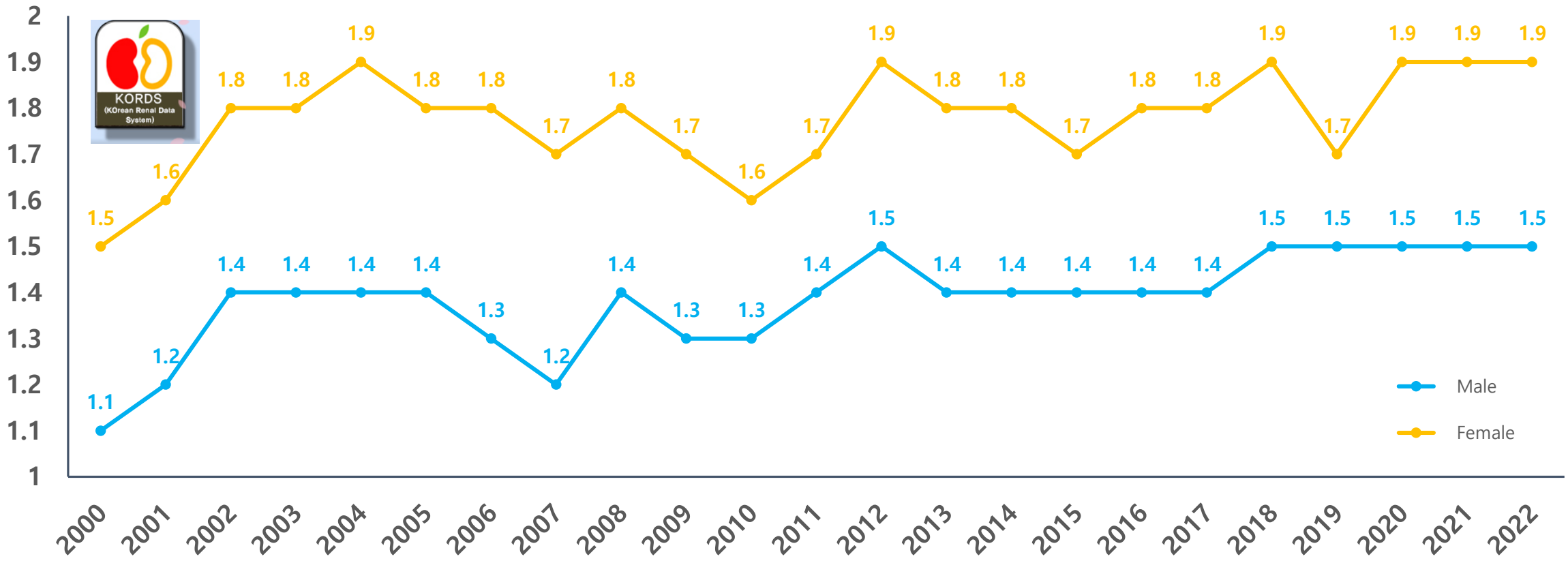



PD Catheter Insertion Break-In Period
2022
5.8 3.1 21.5 57.9 7.6 4
7.4 3.0 24.8 57.1 5.1 2.7
2020
6.6 3.7 27.3 55.3 4.9 2.3
5.5 3.9 27.5 55.8 5.0 2.3
2018
8.2 4.2 31.5 50.6 3.4 2.1
7.5 5.1 29.2 53.1 3.5 1.6
2016
8.3 5.4 25.1 54.1 4.7 2.5
9.5 12.7 29.6 42.7 3.5 2
2014
12.1 13.6 24.1 44.4 4.4 1.3
16.0 7.7 25.6 46.0 2.7 1.9
2012
25.5 6.0 17.3 49.8 0.4 0.9
11.4 8.7 58.7 15.8 1.1 4.3
2010
8.4 19.8 29.3 29.3 6.0 7.2
8.2 10.2 38.8 28.6 14.3
2008
9.4 26.0 26.0 20.8 15.6 2.1
15.5 48.3 13.8 22.4
2006
14.3 14.3 61.9 4.8 4.8
7.1 42.9 14.3 14.3 14.3 7.1
2004
22.2 33.3 18.5 18.5 7.4
28.6 14.3 35.7 7.1 14.3
2002
9.1 45.5 18.2 18.2 9.1
14.3 57.1 28.6
2000
15.8 52.6 15.8 5.3 10.5
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
KORDS
(KOrean Renal Data System)
확인안됨
당일
1주이내
2주~3주
1개월
1개월이상

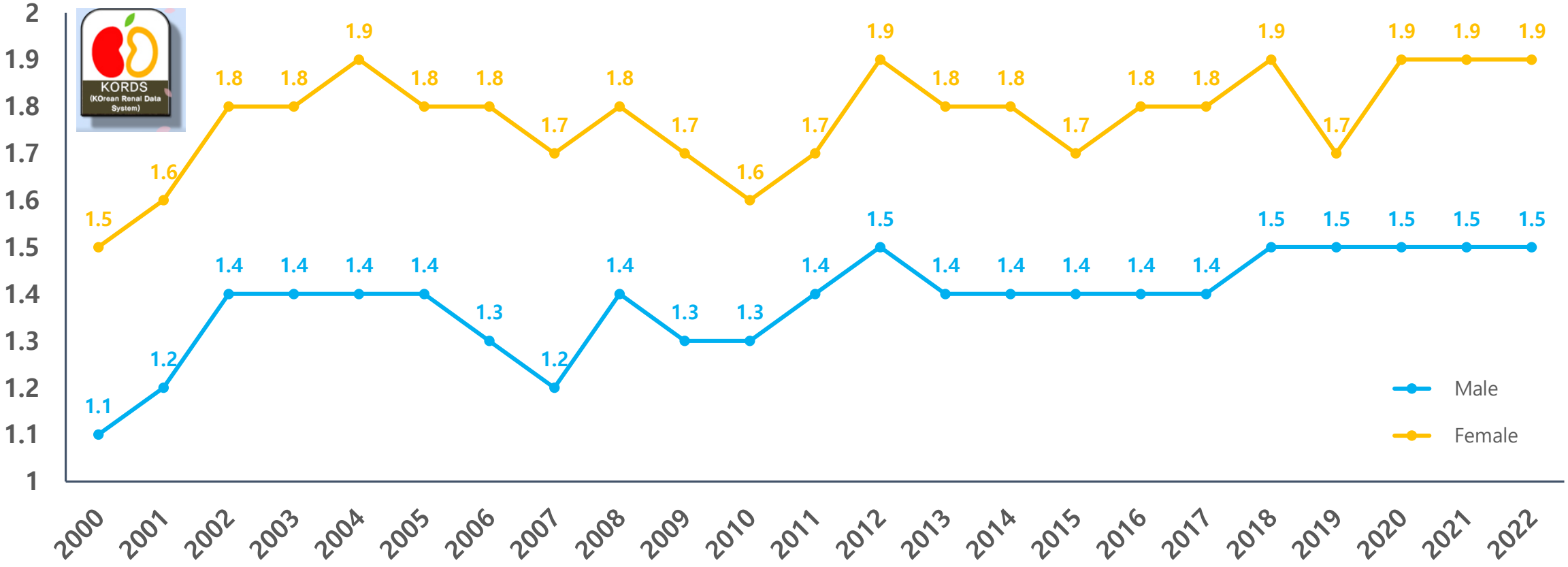
Prescriptions of PD dose per day



Adequacy of PD: weekly Kt/V (Dialysate)

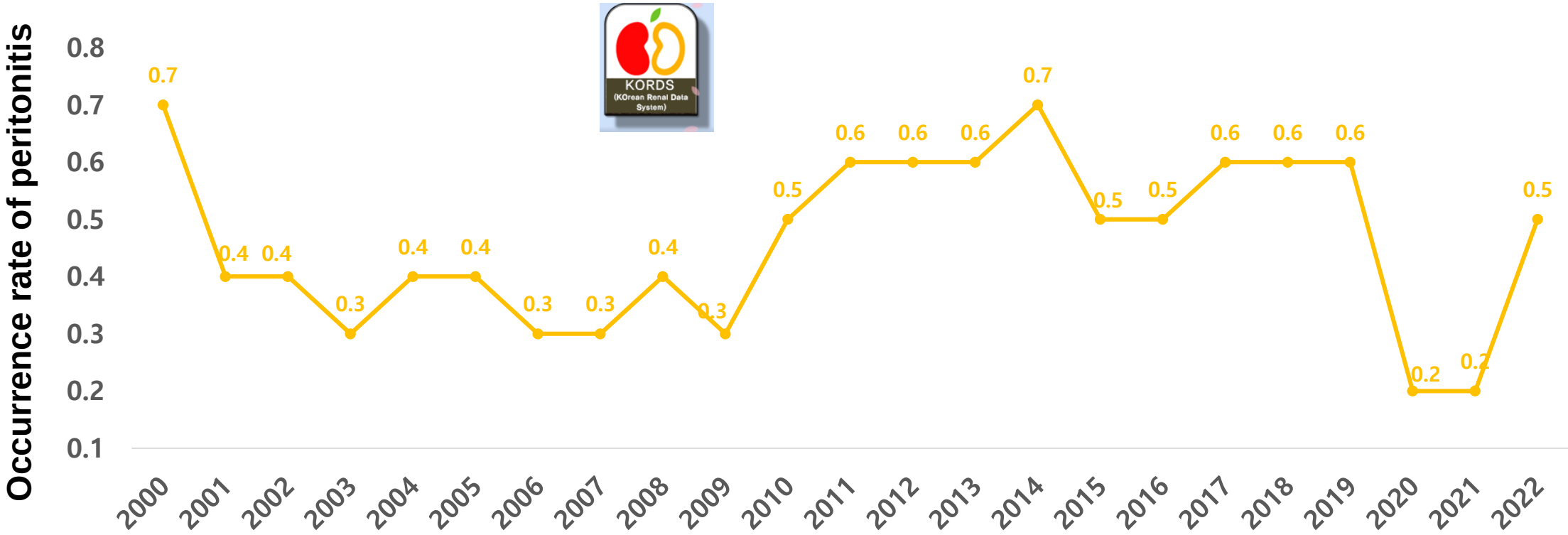


Adequacy of PD: weekly Kt/V (Total)



Trends in Exit infection of PD patients (%)

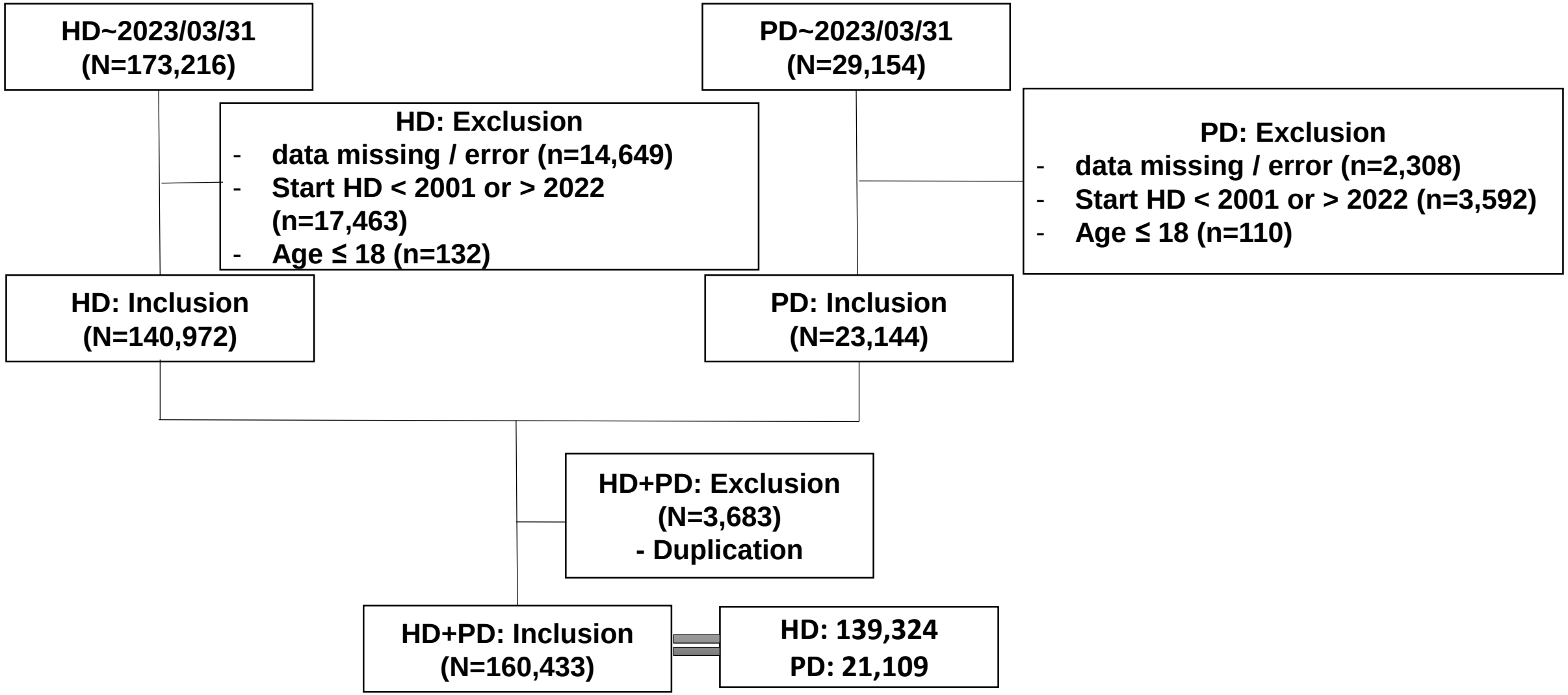
Trends in the occurrence rate of PD-related peritonitis



III. 우리나라 말기신부전 환자의 생존율 변화와 위험인자 (Mortality analysis of ESKD patients in Korea)

Contents

Flow chart of patient selection for the cohort



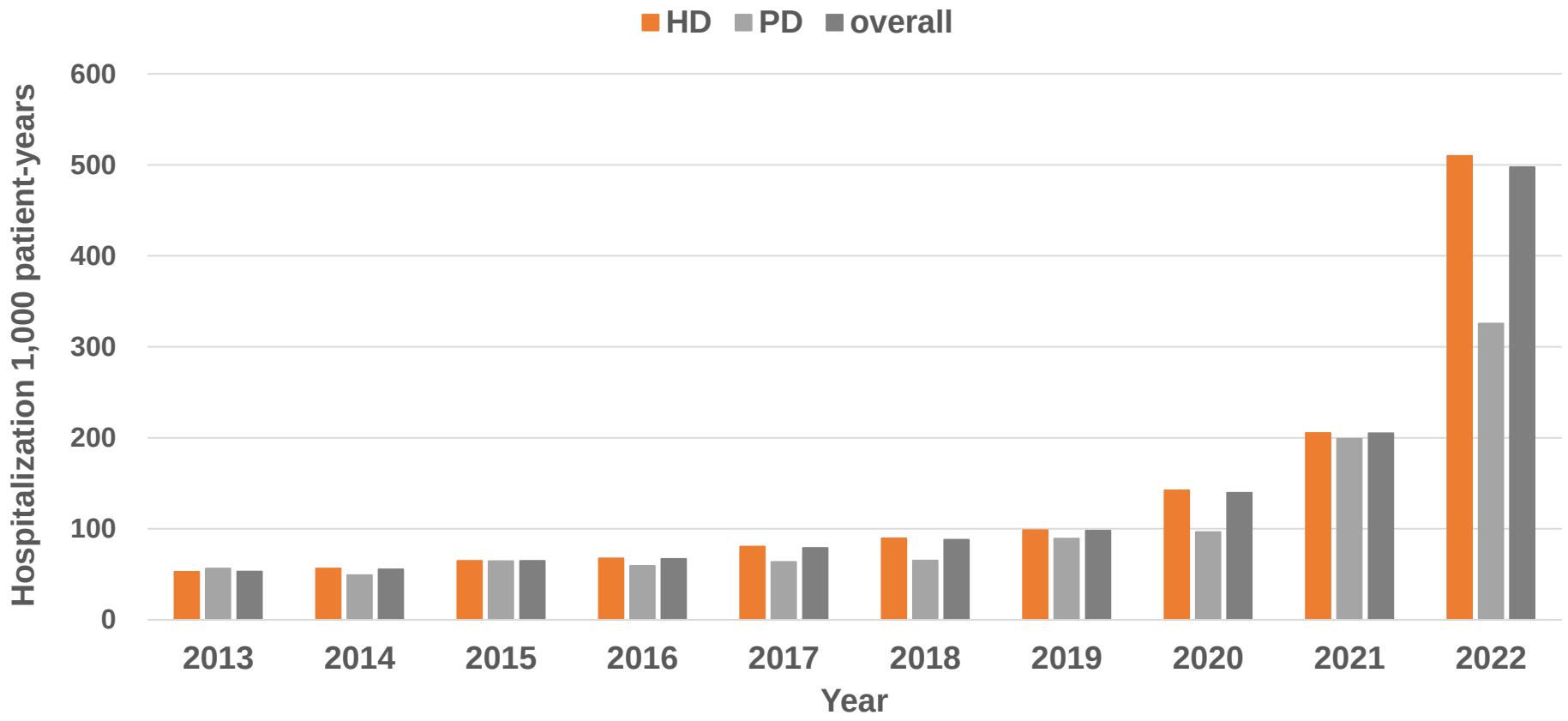
Hospitalization

All-cause hospitalization for dialysis patients

Method

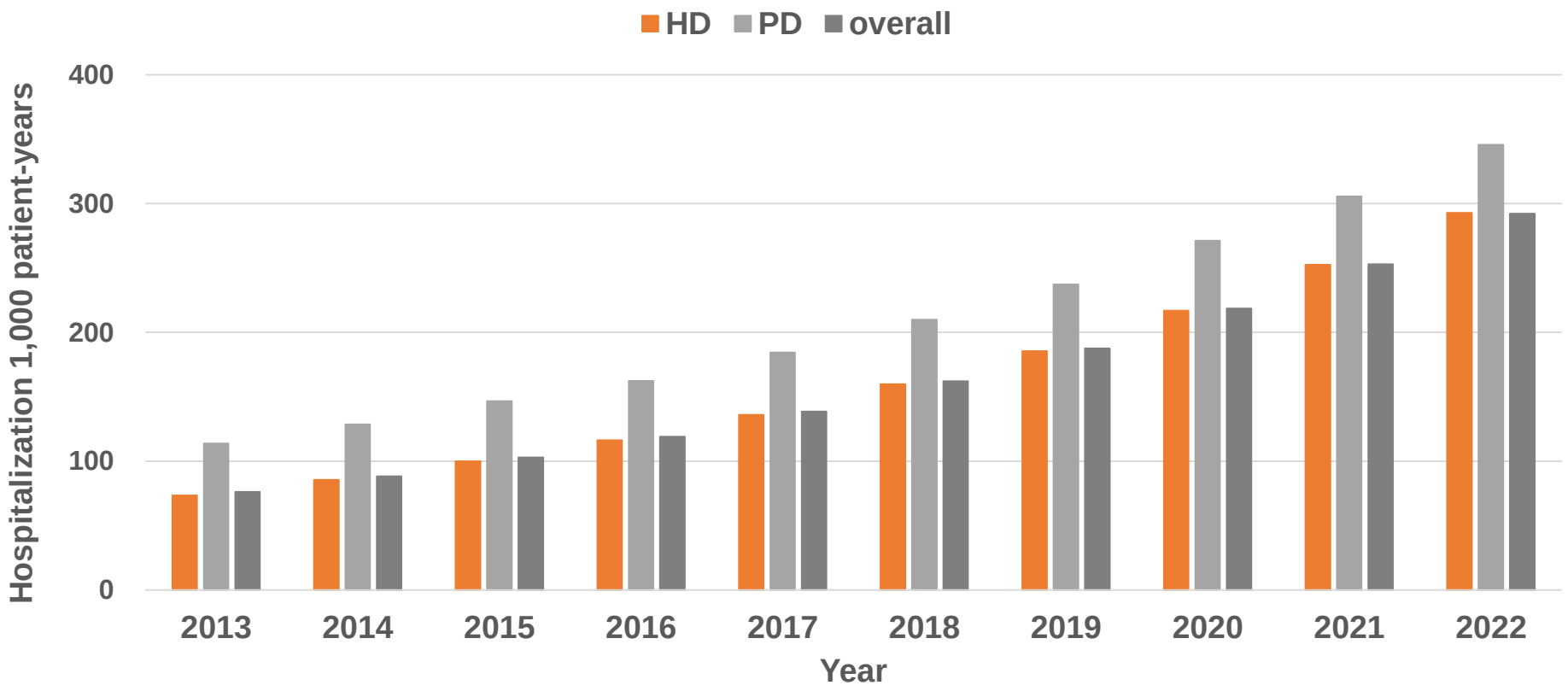
- Enrolled period: 2001.01.01~2022.12.31
- Event end date: 2022.12.31
- Hospitalization: Per 1,000 person-years
- Adjusted: age & sex using Poisson regression model
- R studio version 4.2.1

All-cause hospitalization rates in dialysis patients, by treatment modality (HD and PD), 2013-2022: Unadjusted



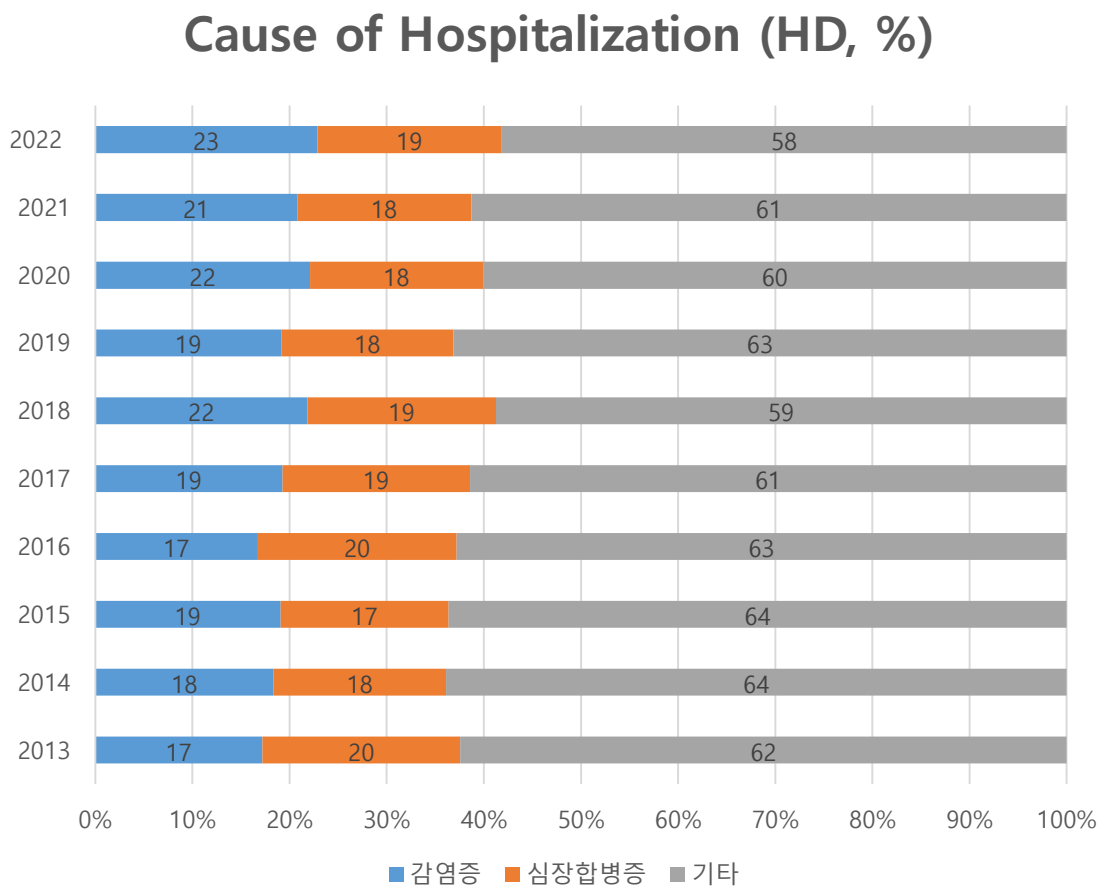
2023 KORDS annual report- figure 3-1

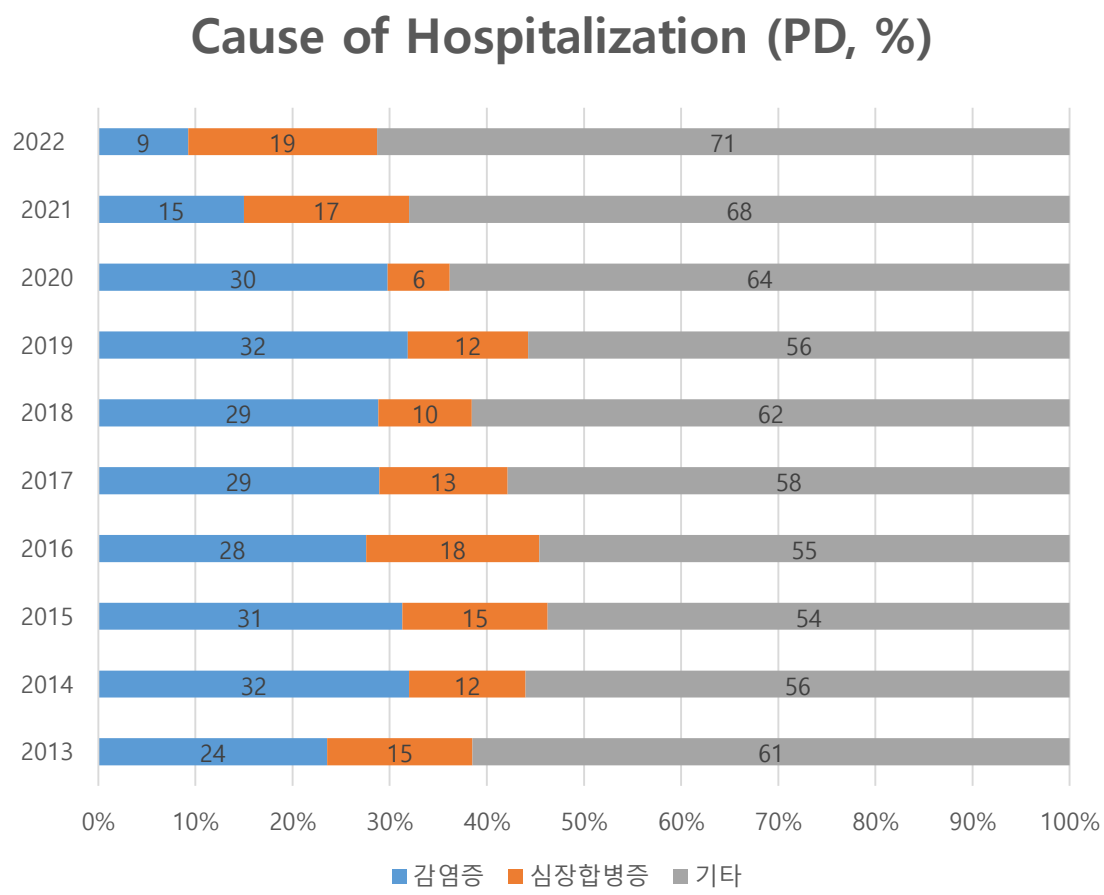
All-cause hospitalization rates in dialysis patients, by treatment modality, 2013-2022: Adjusted by age and sex



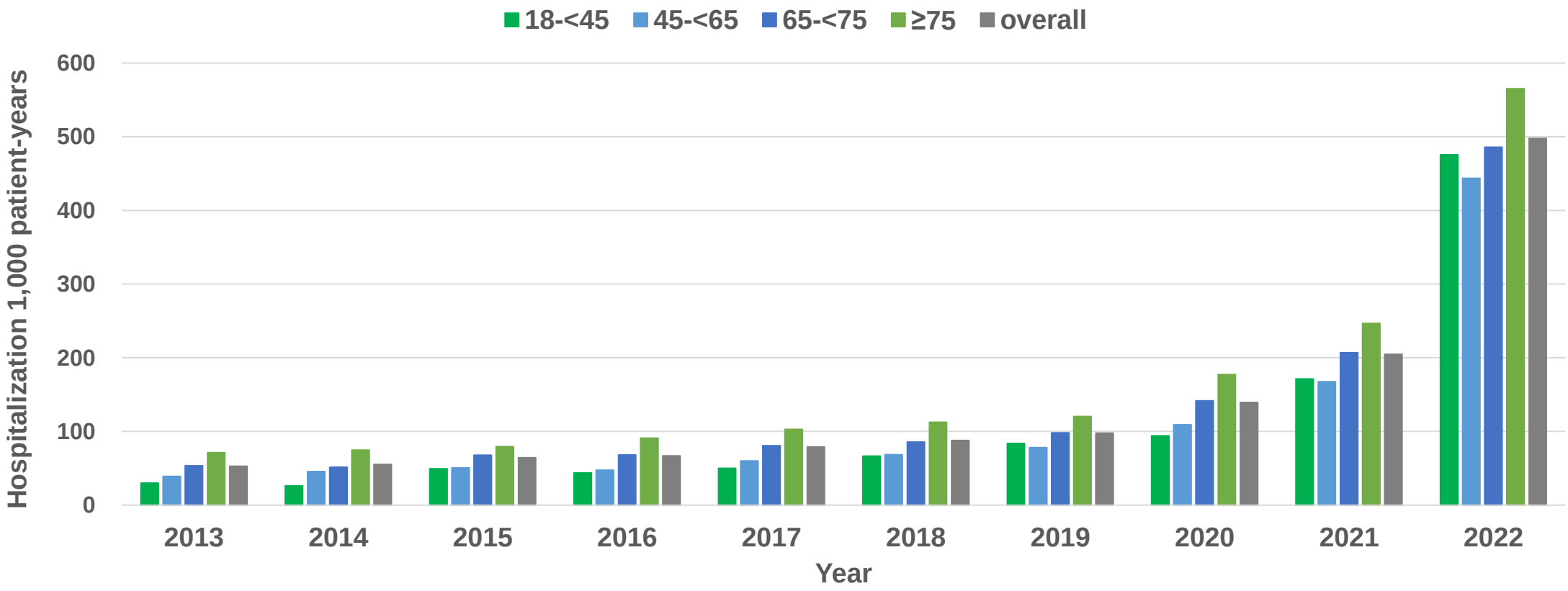
2023 KORDS annual report- figure 3-2

Cause of hospitalization in dialysis patients, 2013-2022

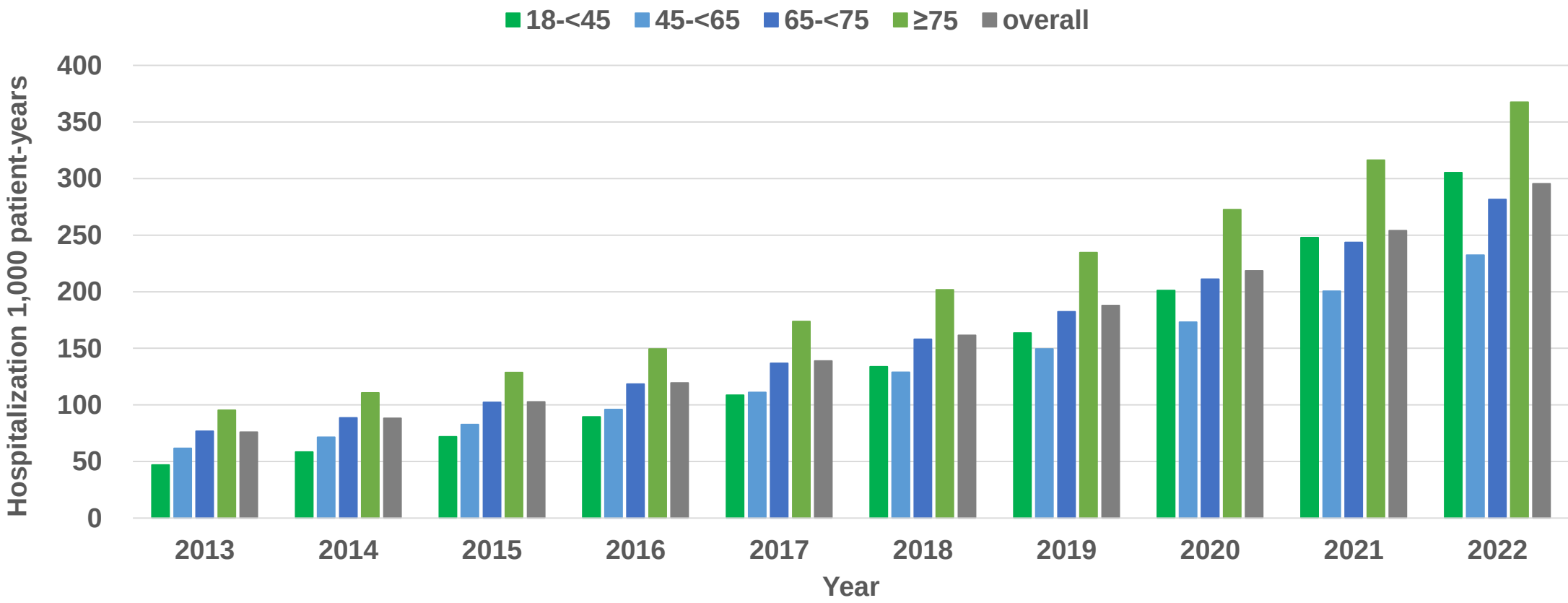




All-cause hospitalization rates in dialysis patients, by age, 2013-2022: Unadjusted

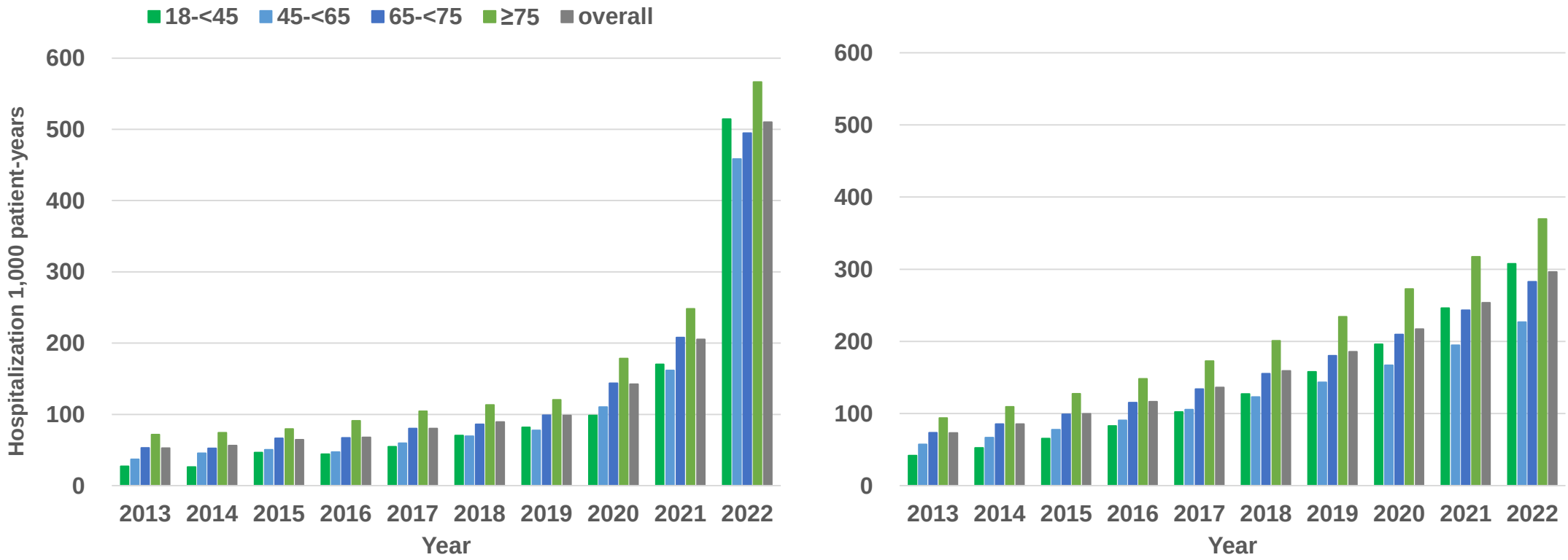


All-cause hospitalization rates in dialysis patients, by age, 2013-2022: Adjusted by sex



2023 KORDS annual report- figure 3-3

All-cause hospitalization rates in HD patients, by age, 2013-2022



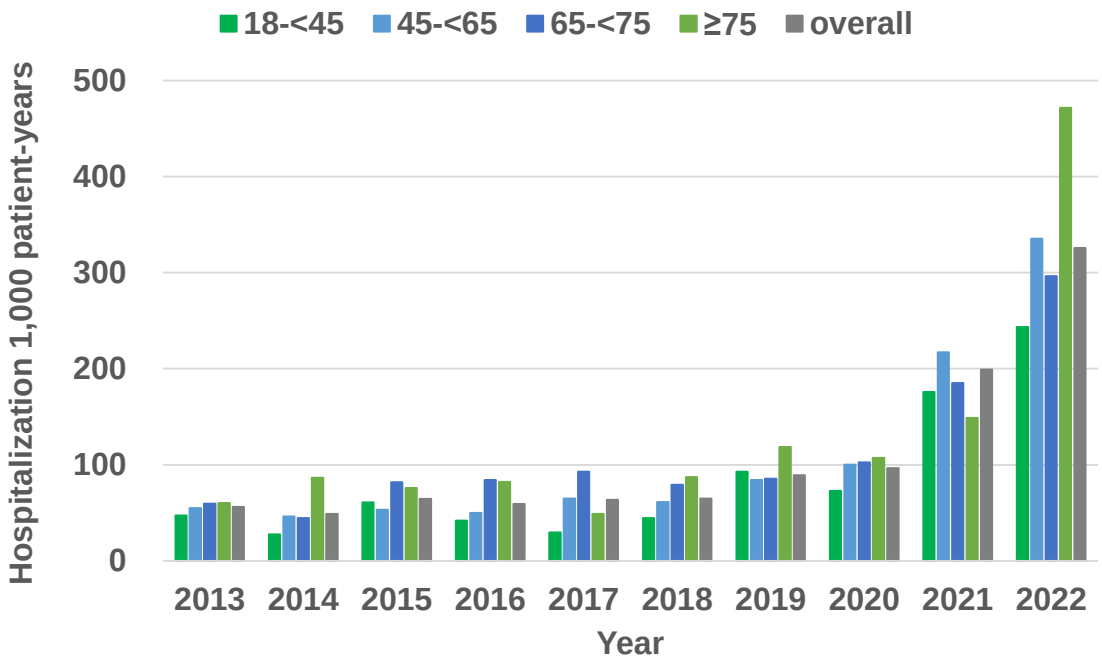
Unadjusted

Adjusted by sex

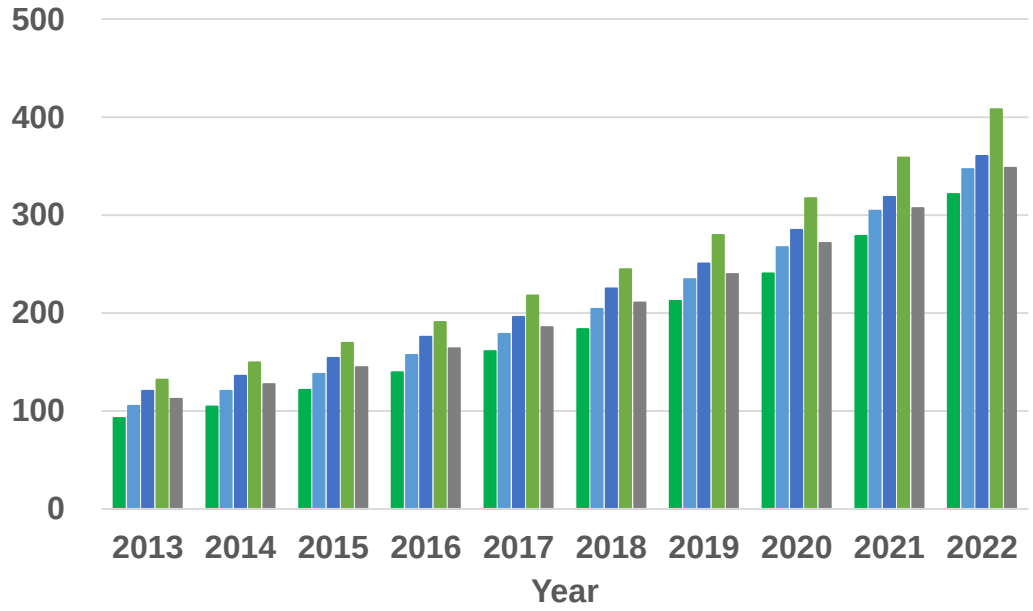
High hospitalization rates among patients aged 18-<45

2023 KORDS annual report- figure 3-4

All-cause hospitalization rates in PD patients, by age, 2013-2022



Unadjusted



Adjusted by sex

Hospitalization rates tend to increase with age

Mortality

All-cause mortality for dialysis patients

Method

- Enrolled period: 2001.01.01~2022.12.31
- Event end date: 2022.12.31
- Mortality

  1) Per 1,000 person-years for death rate: Poisson regression model

     ⇒ Adjusted by age and sex

  2) Survival probability: Cox regression model

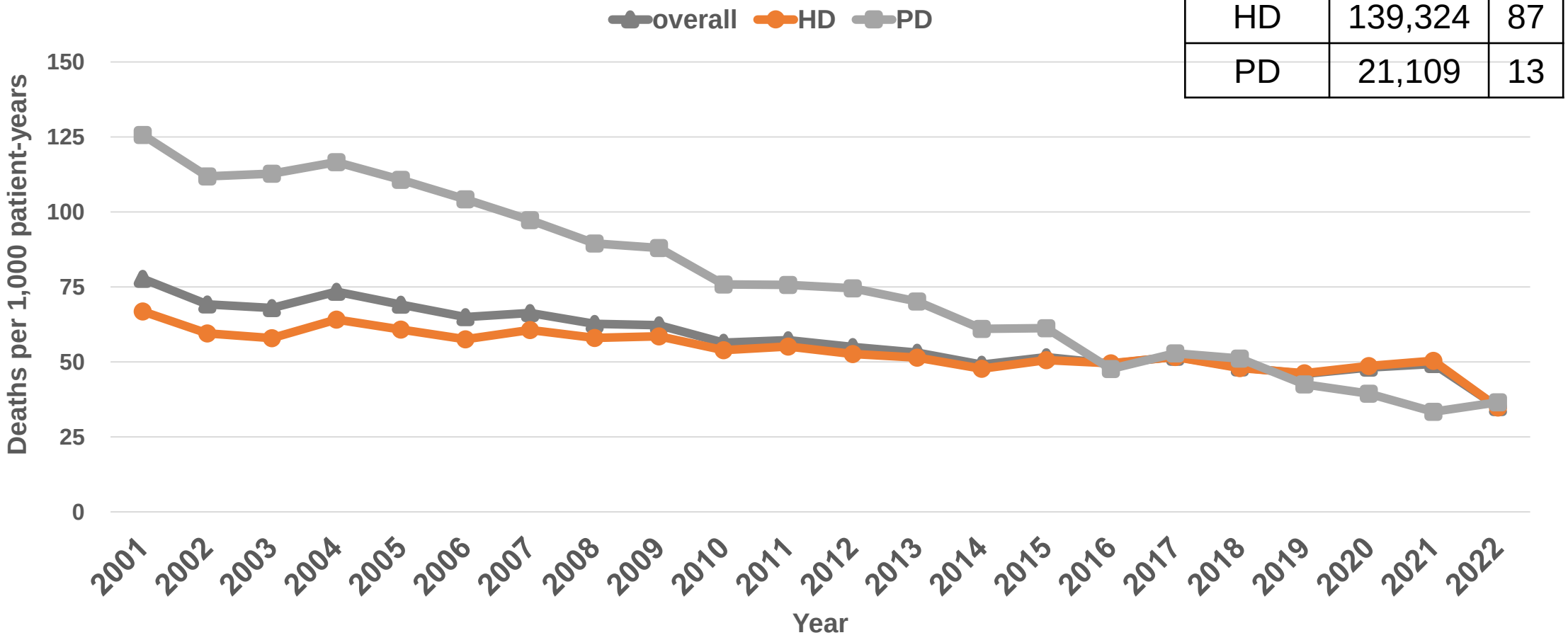
     ⇒ Adjusted by age, sex, the year of dialysis onset

- R studio version 4.2.1

2023 KORDS annual report- figure 3-5

All-cause mortality in dialysis patients, by treatment modality (HD and PD), 2001-2022: Unadjusted

Overall	**160,433**	%
HD	139,324	87
PD	21,109	13



All-cause mortality in dialysis patients, by treatment modality (HD and PD), 2001-2022: Adjusted by age and sex

Overall	**160,433**	%
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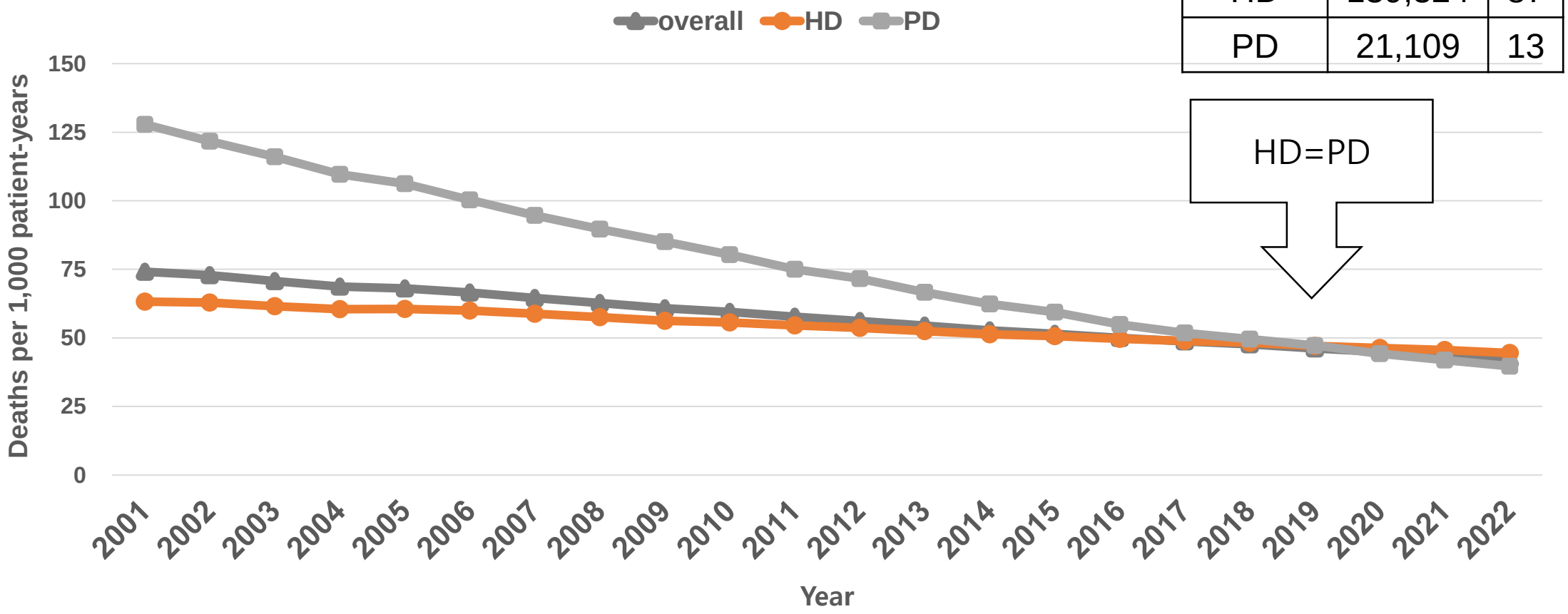
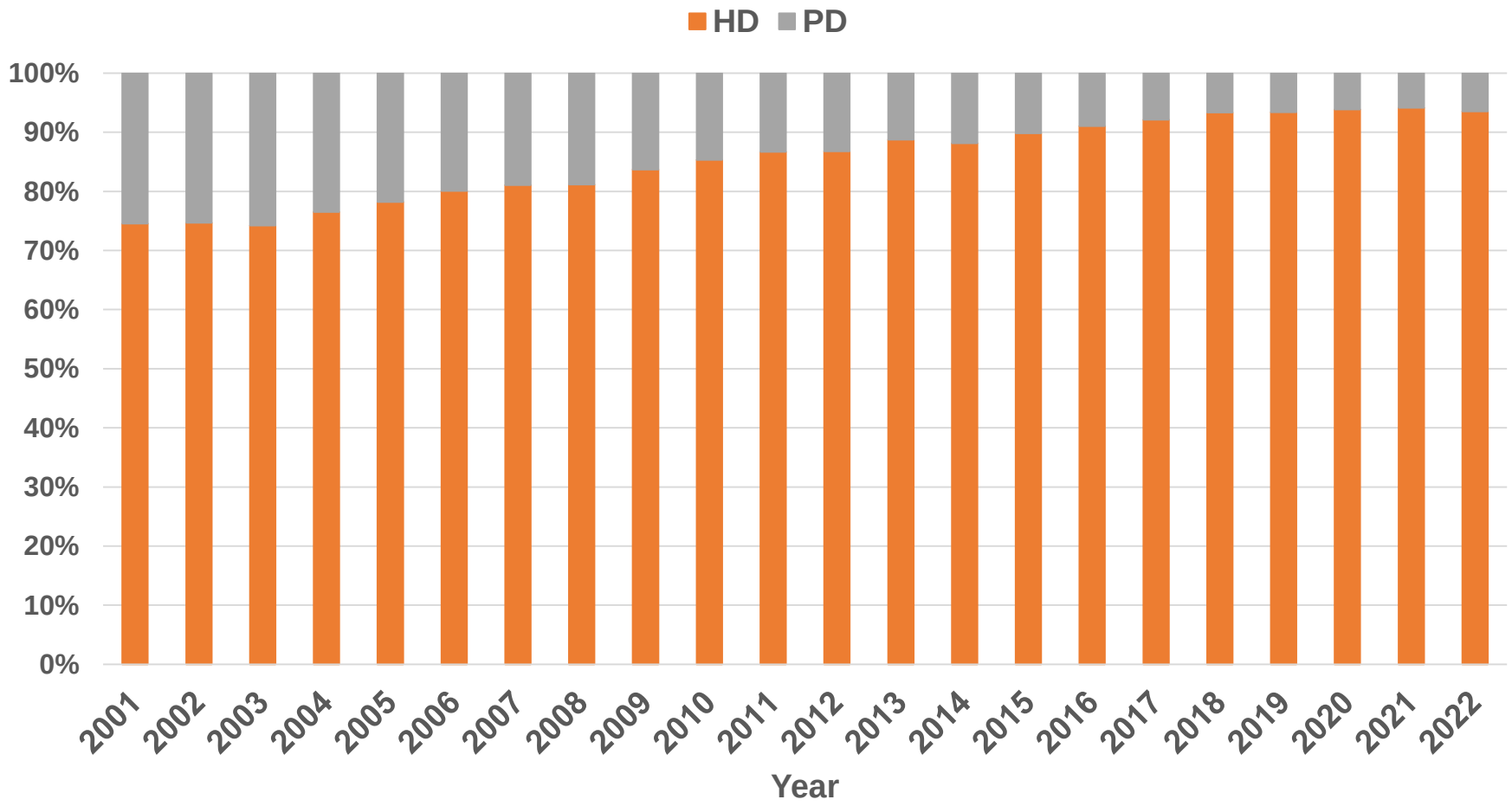
PD	21,109	13



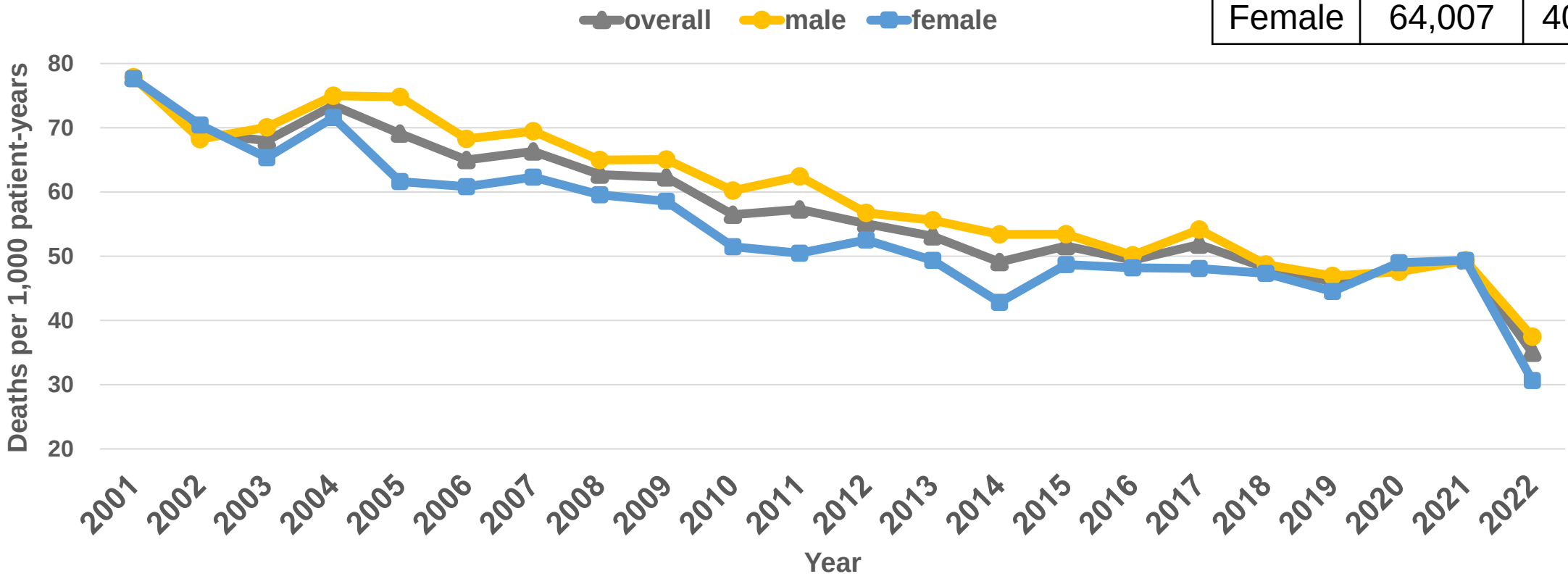
The proportion of incident patients included in survival analysis, 2001-2022



2023 KORDS annual report- figure 3-7

All-cause mortality in dialysis patients, by sex (male and female), 2001-2022: Unadjusted

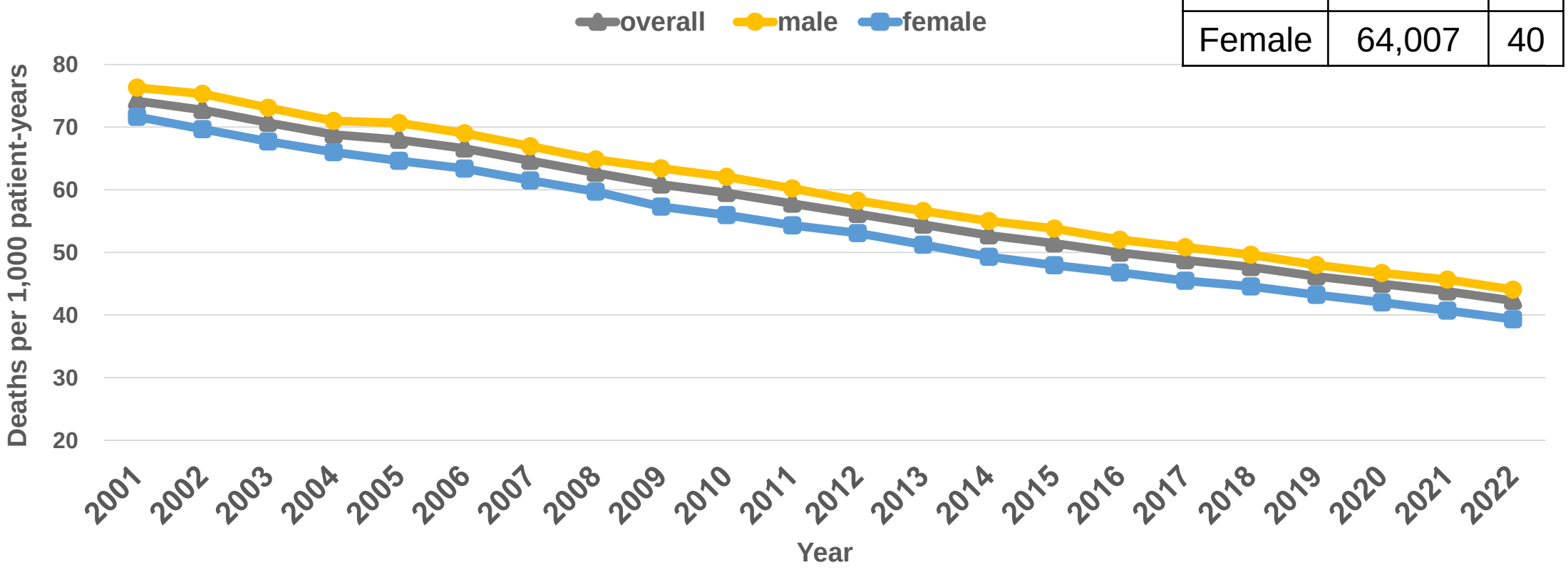
Overall	**160,433**	%
Male	96,426	60
Female	64,007	40



2023 KORDS annual report- figure 3-8

All-cause mortality in dialysis patients, by sex (male and female), 2001-2022: Adjusted by age

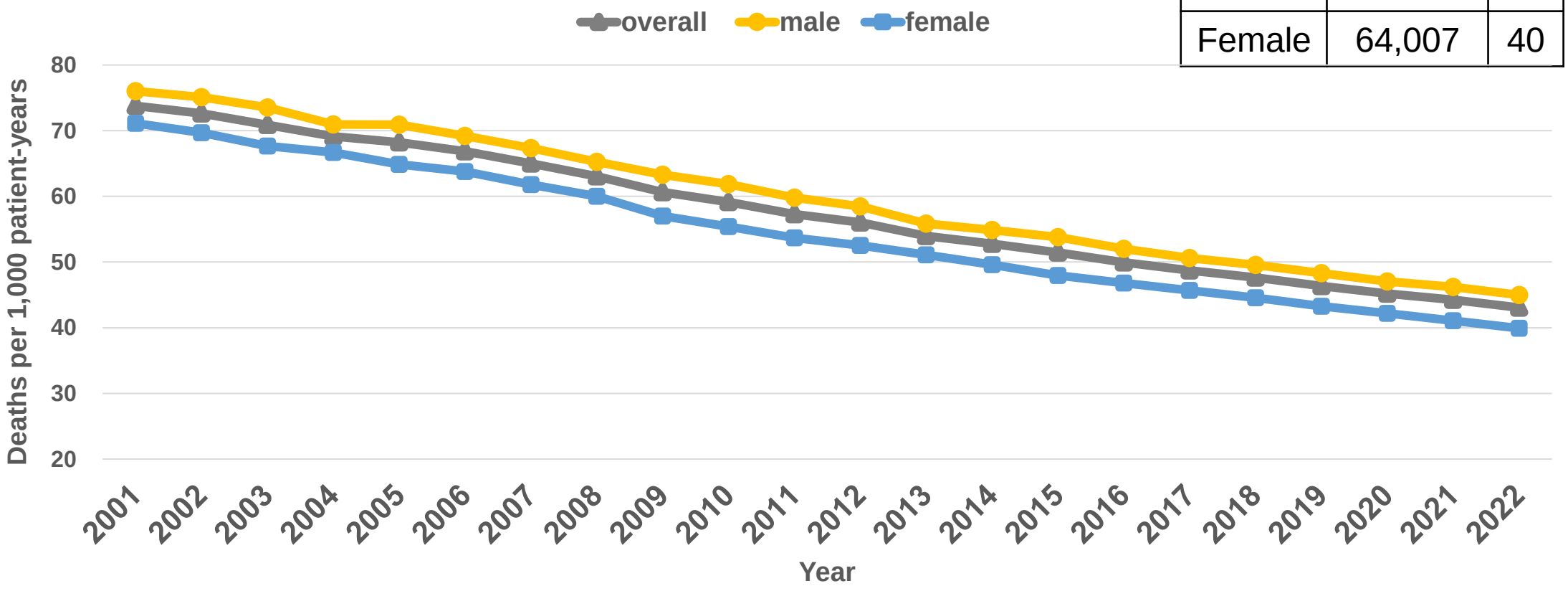
Overall	**160,433**	%
Male	96,426	60
Female	64,007	40



Mortality: Male > Female

All-cause mortality in dialysis patients, by sex (male and female), 2001-2022: Adjusted by age and modality

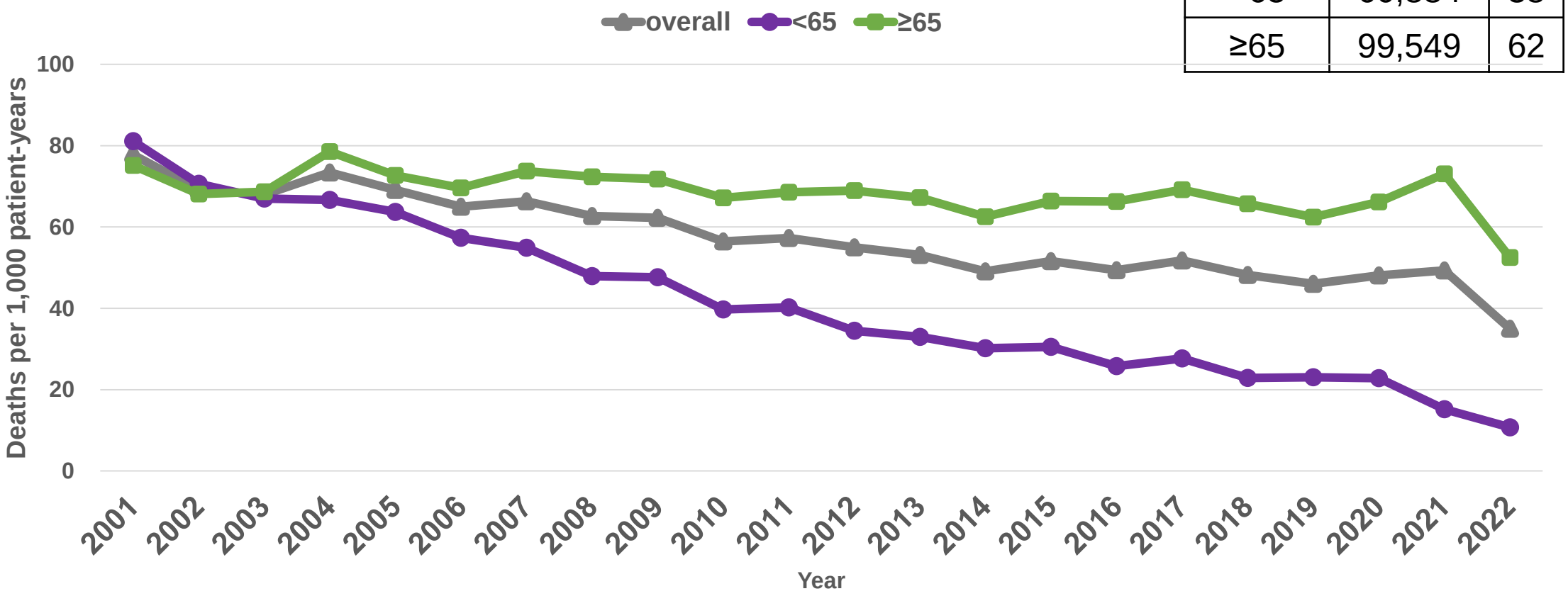
Overall	**160,433**	%
Male	96,426	60
Female	64,007	40



Mortality: Male > Female

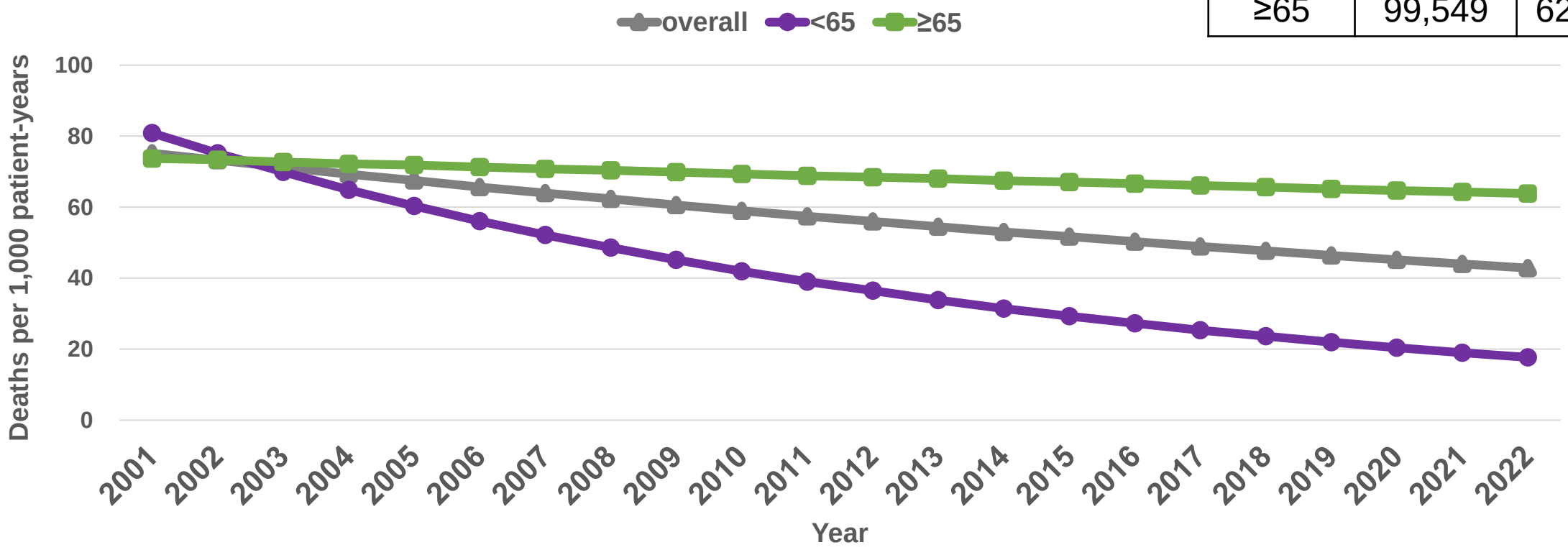
All-cause mortality in dialysis patients, by age (<65, ≥65), 2001-2022: Unadjusted

Overall	**160,433**	%
<65	60,884	38
≥65	99,549	62



All-cause mortality in dialysis patients, by age (<65, ≥65), 2001-2022: Adjusted by sex

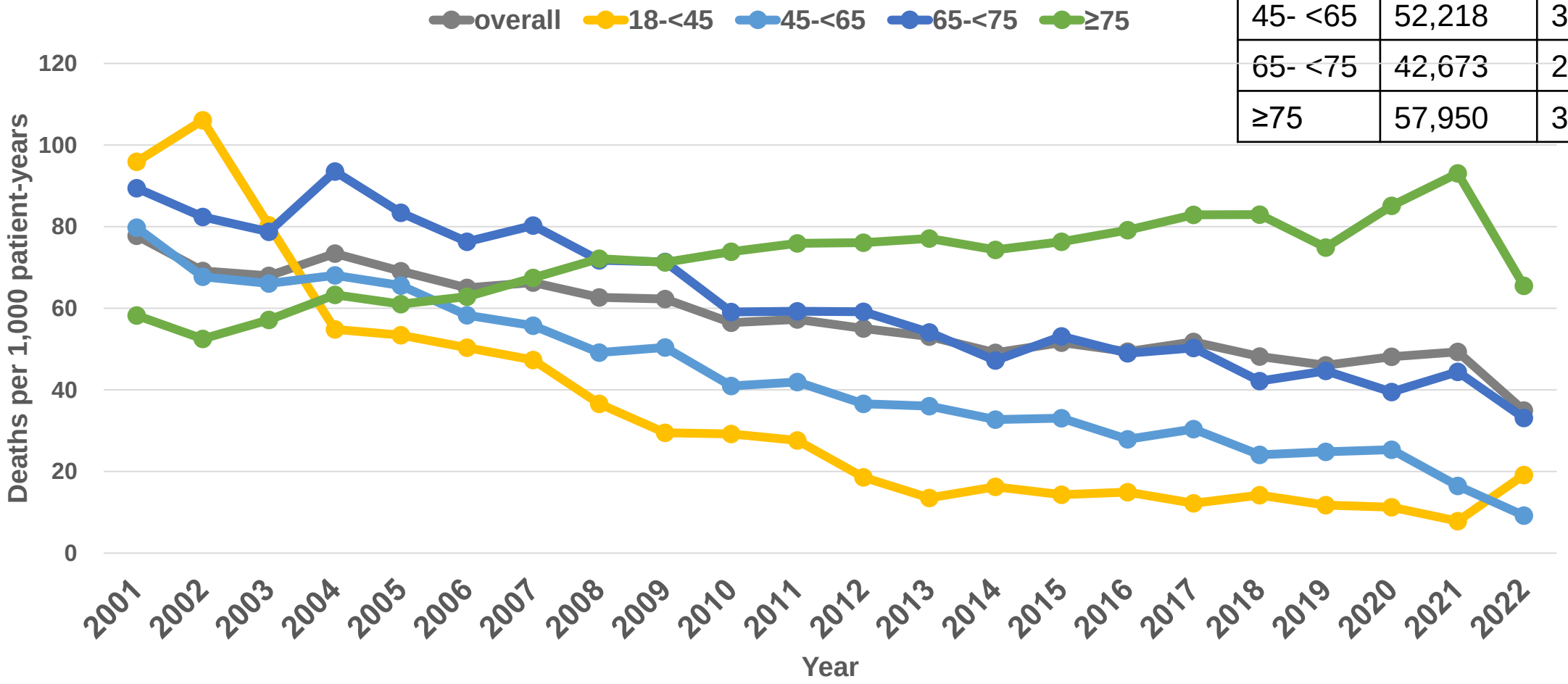
Overall	**160,433**	%
<65	60,884	38
≥65	99,549	62



2023 KORDS annual report- figure 3-9

All-cause mortality in dialysis patients, by 4 age group, 2001-2022: Unadjusted

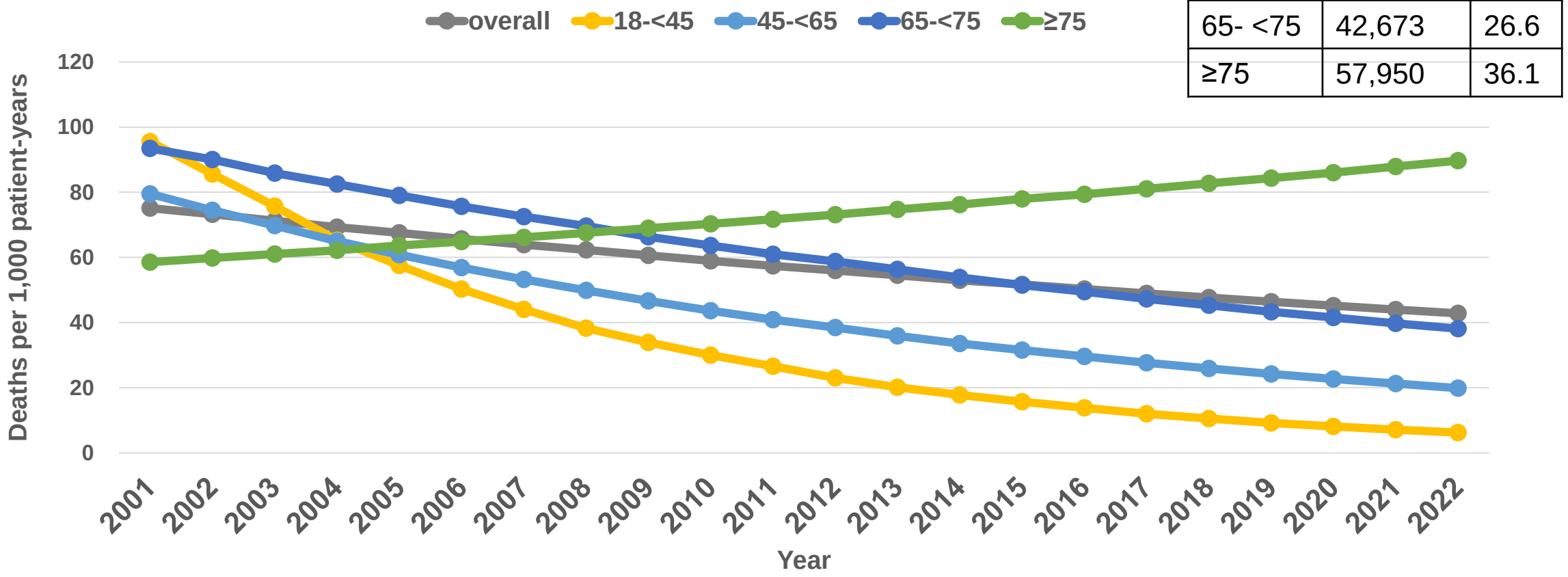
Overall	**160,433**	%	**0.5**
18- <45	7,595	4.7	
45- <65	52,218	32.5	
65- <75	42,673	26.6	
≥75	57,950	36.1	



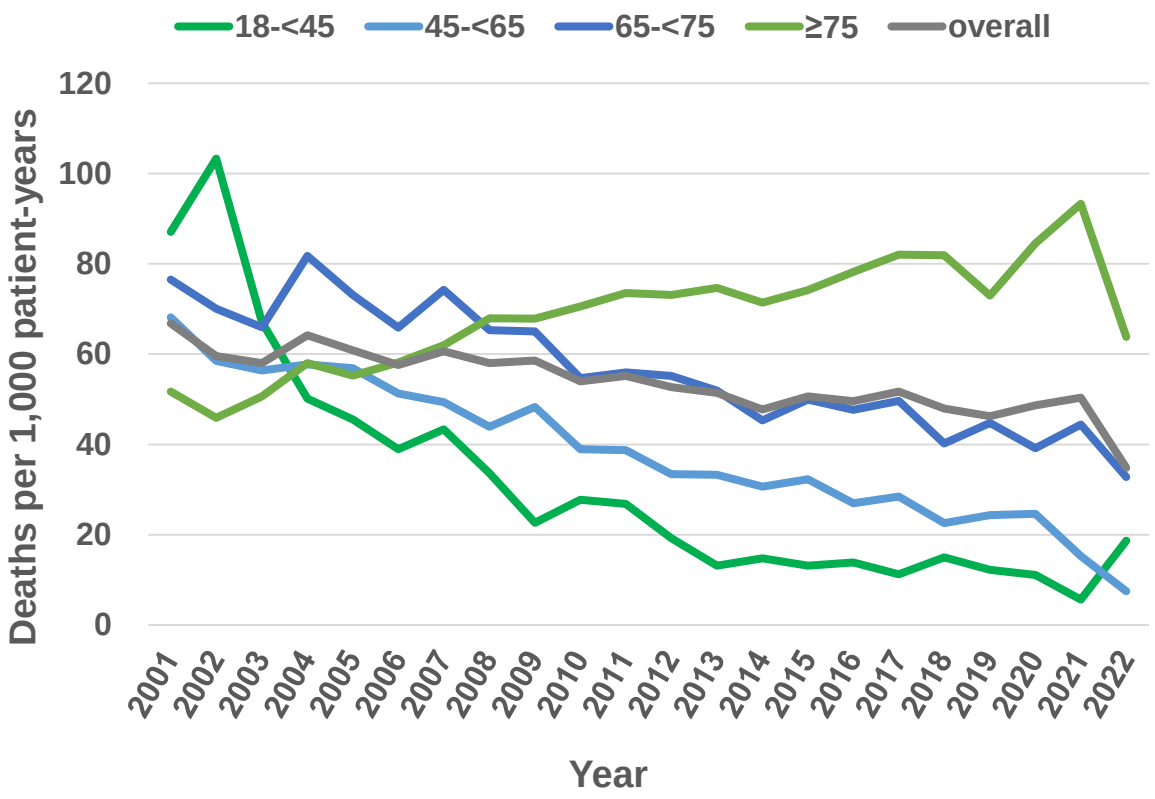
2023 KORDS annual report- figure 3-10

All-cause mortality in dialysis patients, by 4 age group, 2001-2022: Adjusted by sex

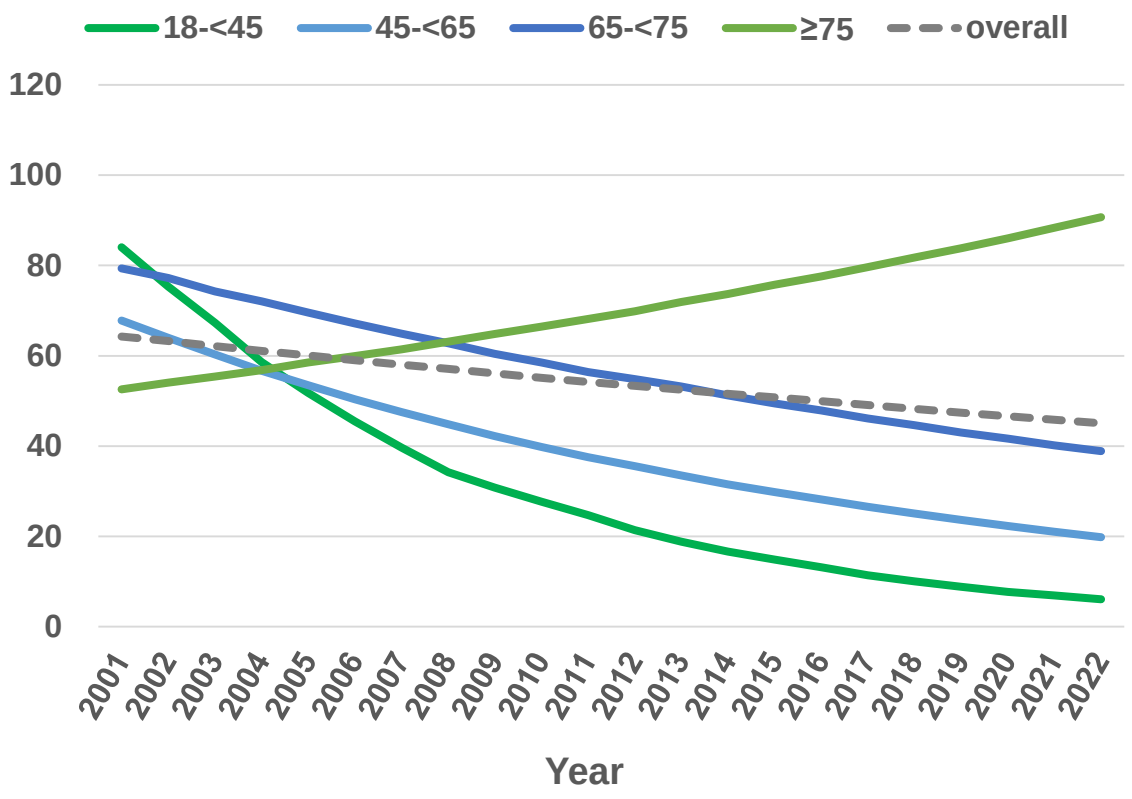
Overall	**160,433**	%
18- <45	7,595	4.7
45- <65	52,218	32.5
65- <75	42,673	26.6
≥75	57,950	36.1



All-cause mortality in HD patients, by 4 age group, 2001-2022

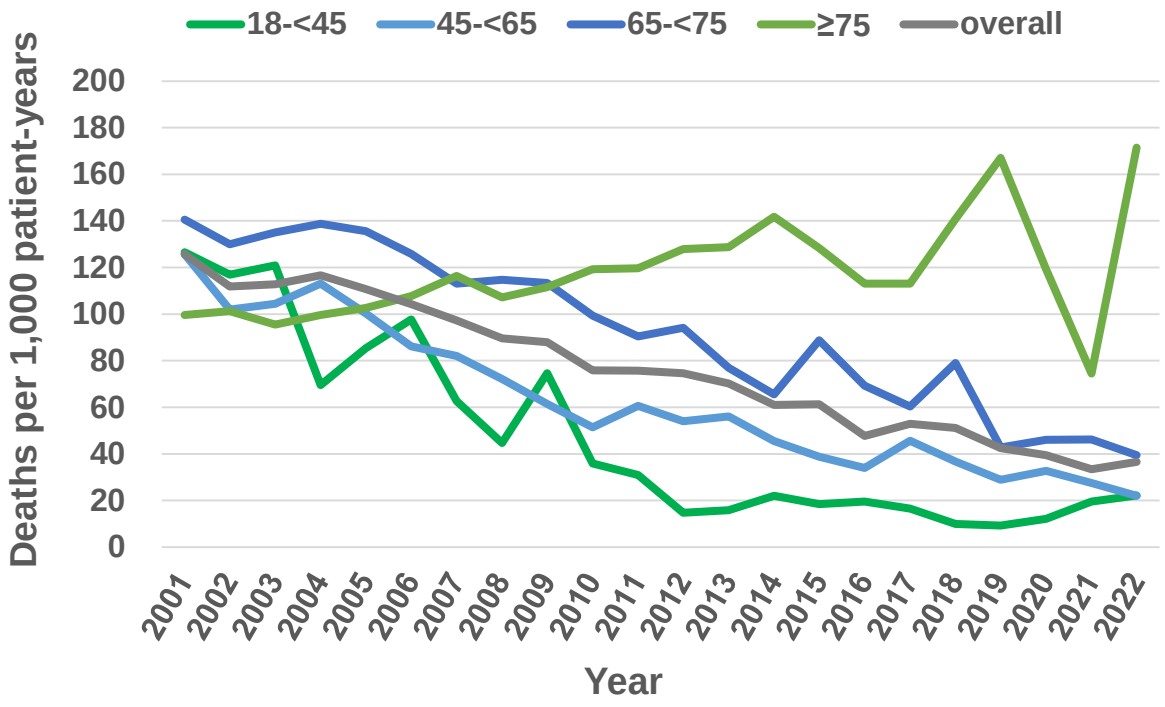


Unadjusted

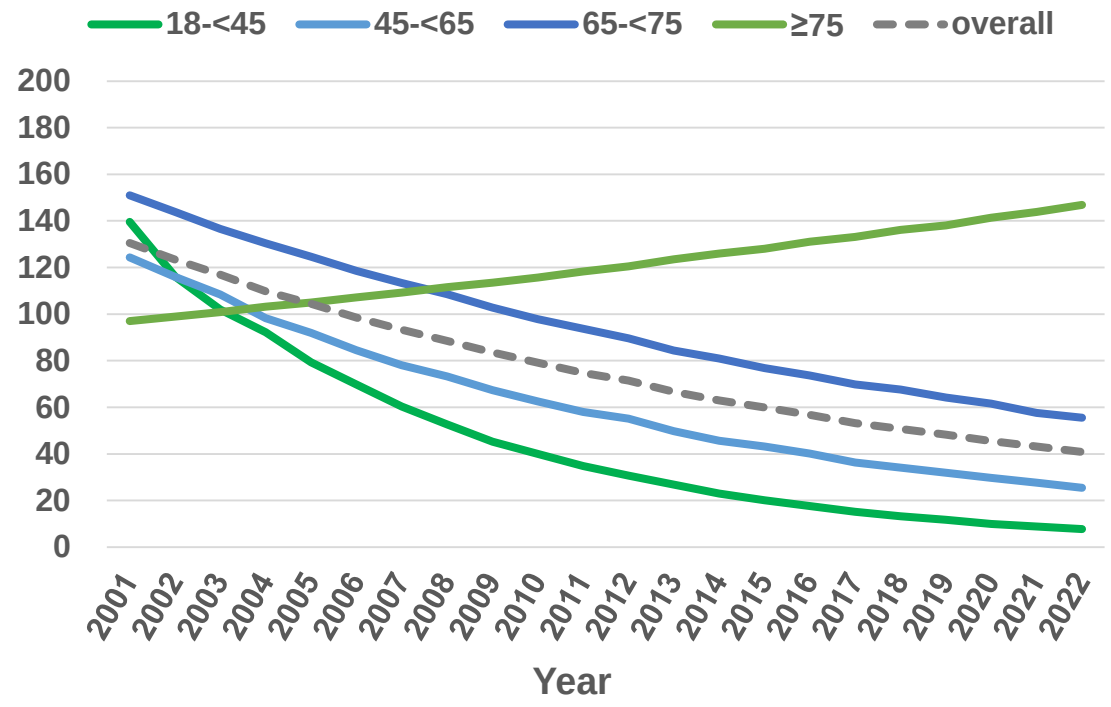


Adjusted by sex

All-cause mortality in PD patients, by 4 age group, 2001-2022

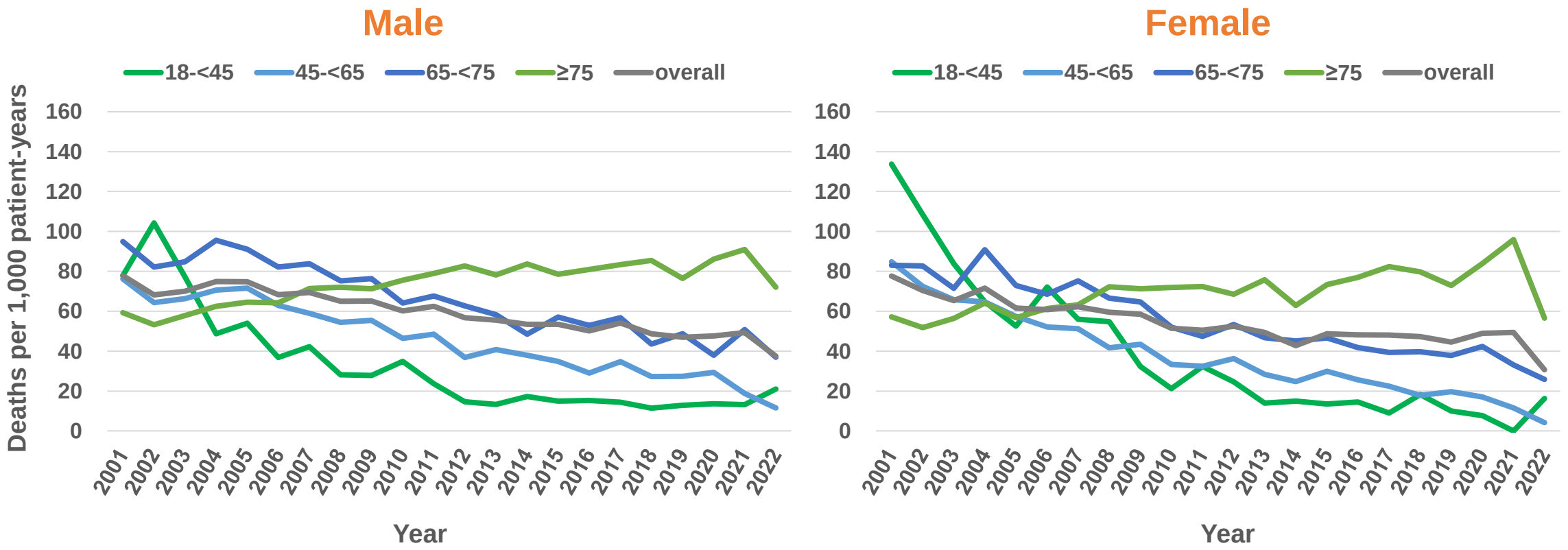


Unadjusted



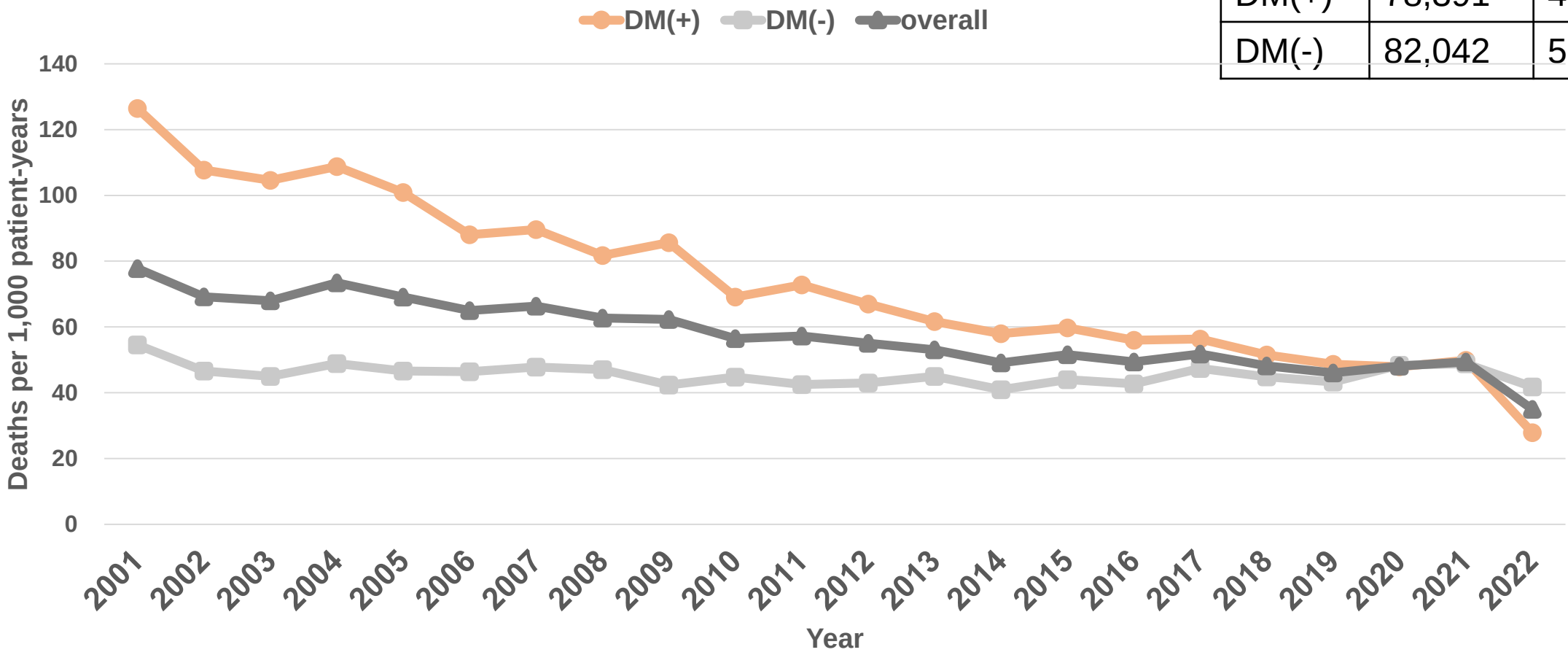
Adjusted by sex

All-cause mortality in dialysis patients, by 4 age group across sex, 2001-2022: Unadjusted



All-cause mortality in dialysis patients, by DM, 2001-2022: Unadjusted

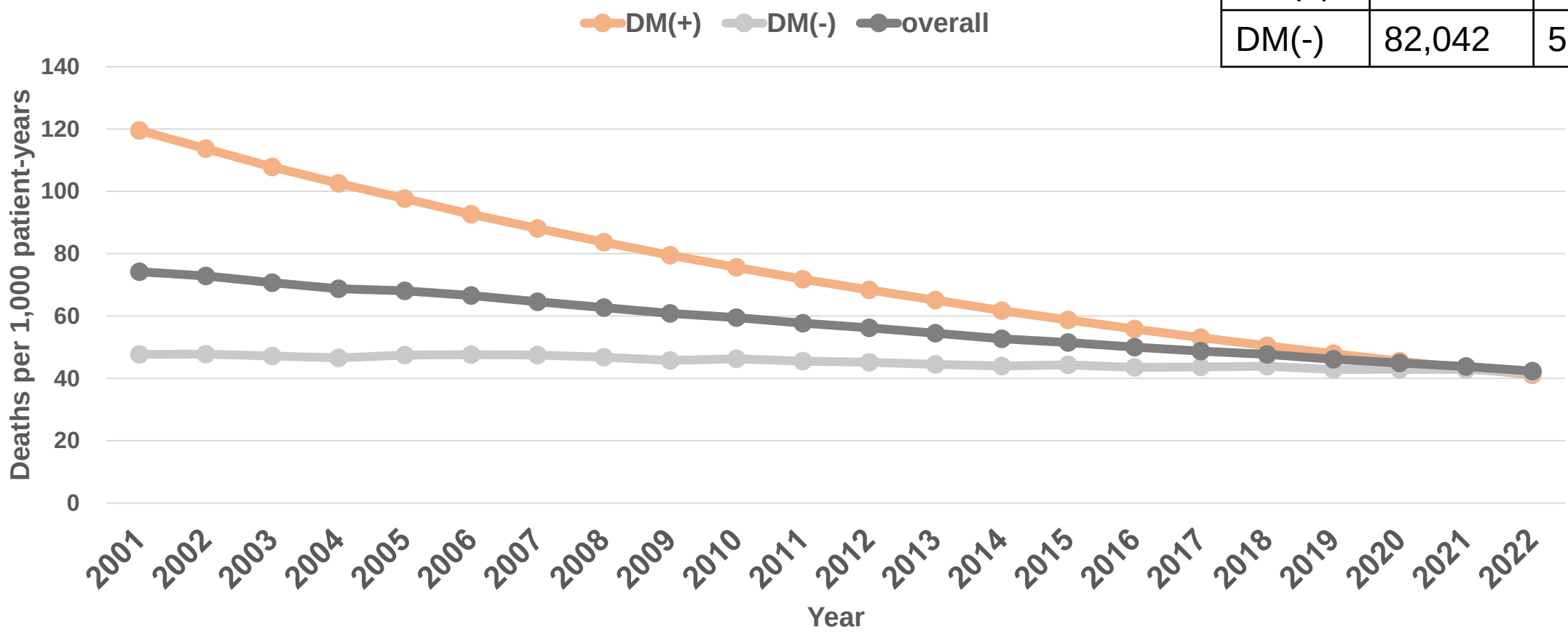
Overall	**160,433**	%
DM(+)	78,391	49
DM(-)	82,042	51



2023 KORDS annual report- figure 3-11

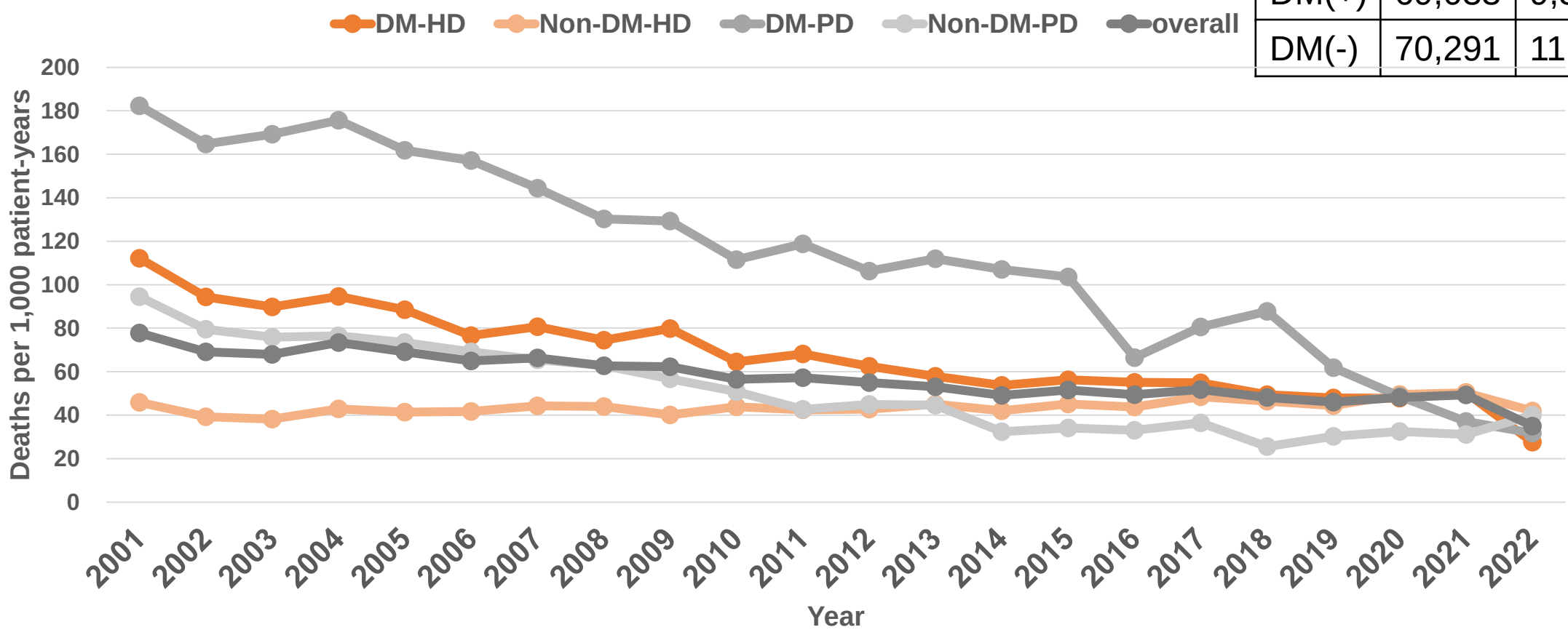
All-cause mortality in dialysis patients, by DM, 2001-2022: Adjusted by age and sex

Overall	**160,433**	%
DM(+)	78,391	49
DM(-)	82,042	51



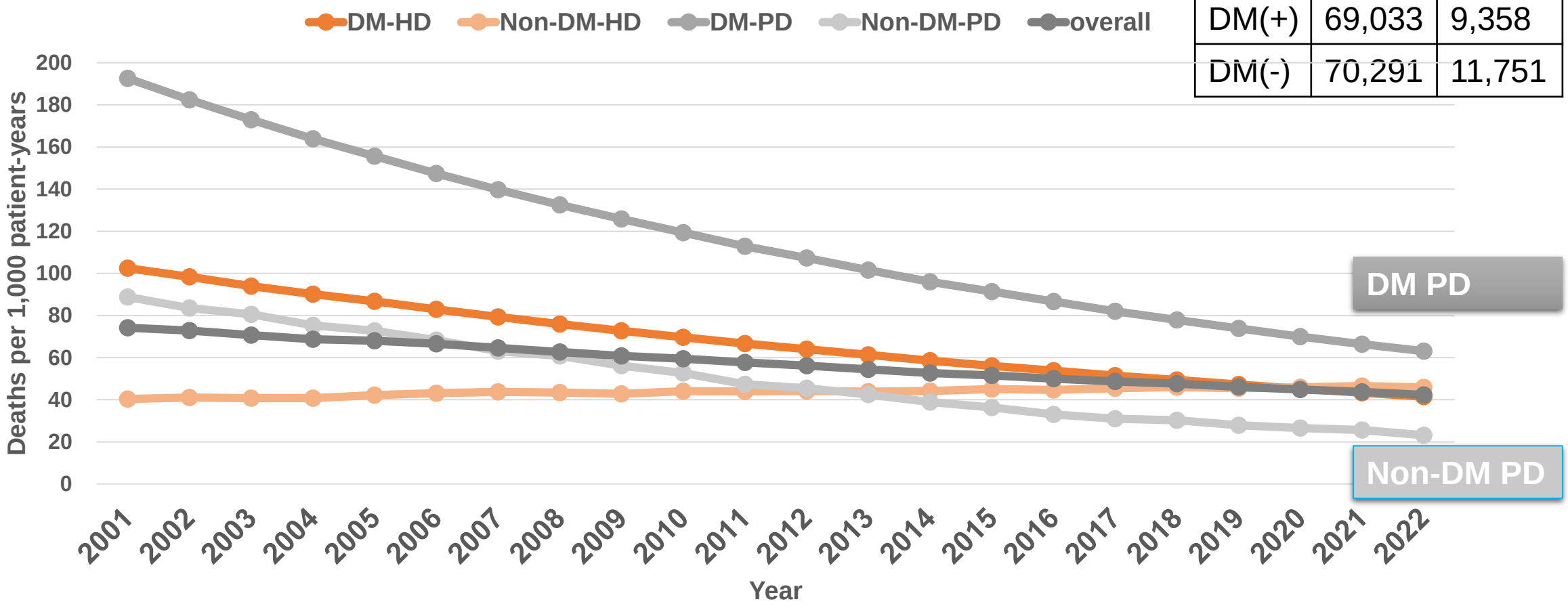
All-cause mortality in dialysis patients by DM and treatment modality (HD and PD), 2001-2022: Unadjusted

	HD	PD
DM(+)	69,033	9,358
DM(-)	70,291	11,751



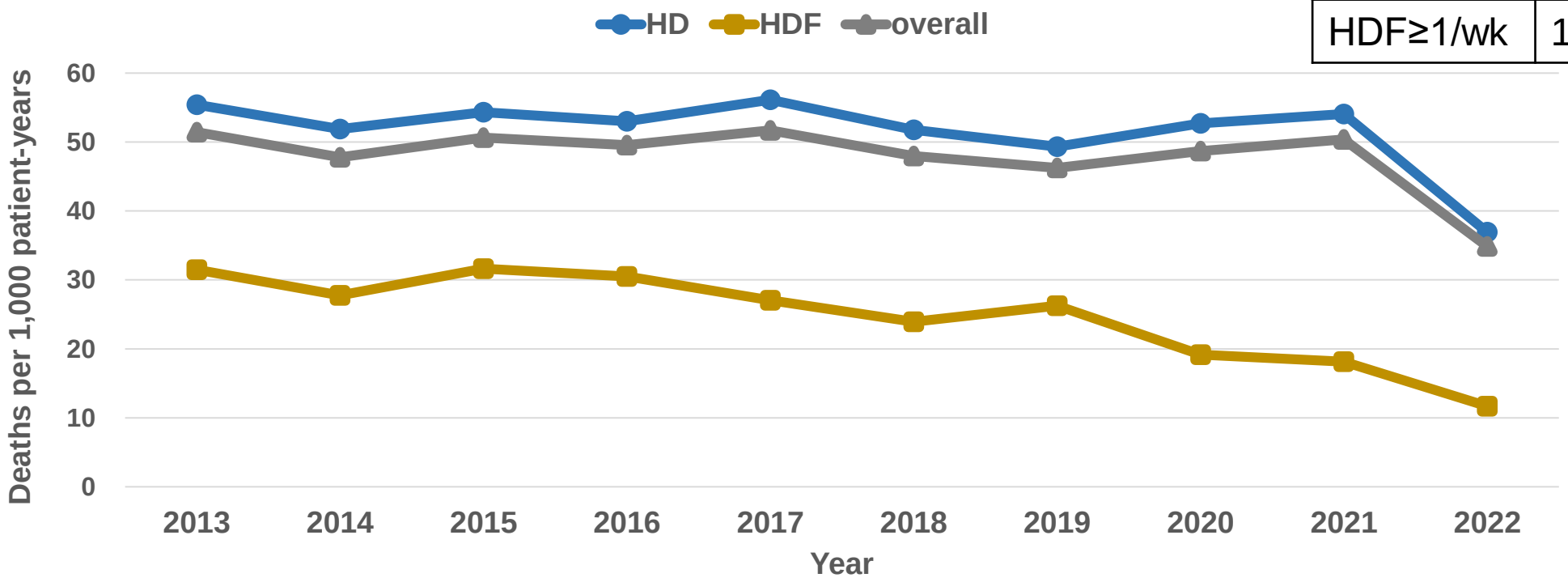
All-cause mortality in dialysis patients by DM and treatment modality (HD and PD), 2001-2022: Adjusted by age and sex

	HD	PD
DM(+)	69,033	9,358
DM(-)	70,291	11,751



All-cause mortality in hemodialysis patients, by HD technique (HD vs HDF), 2013-2022: Unadjusted

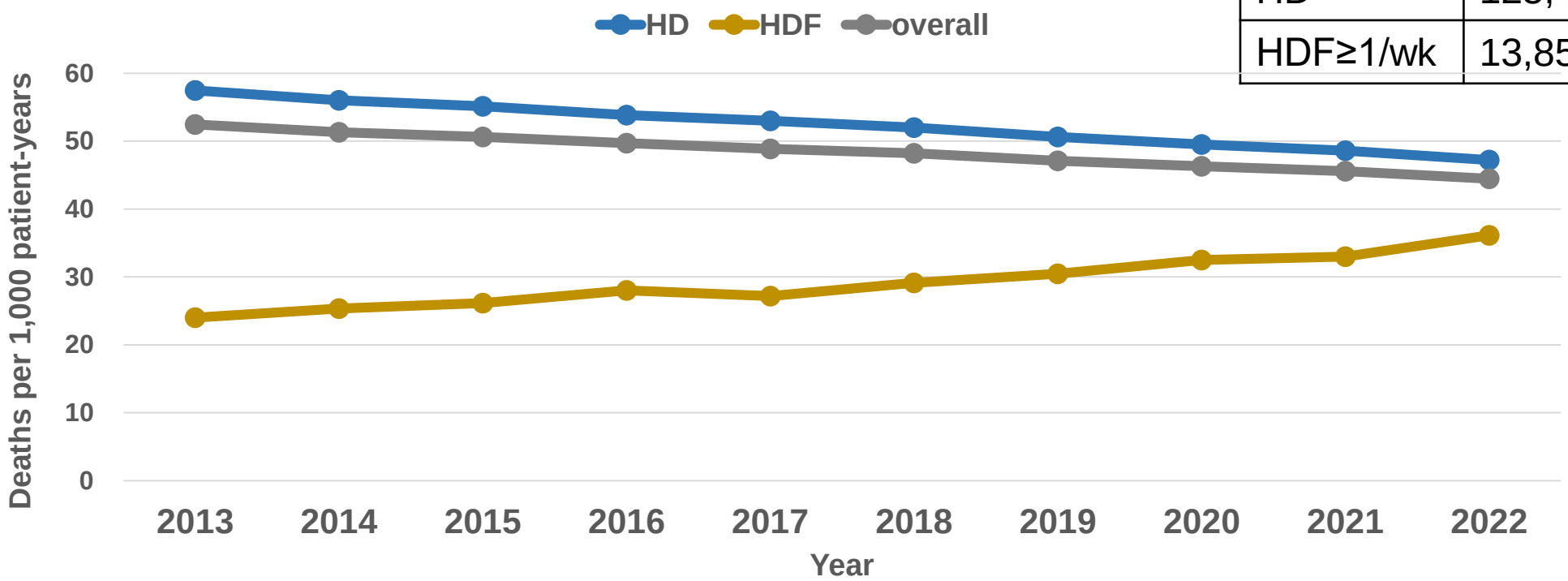
All HD	**139,324**	%
HD	125,469	90
HDF≥1/wk	13,855	10



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
HD	5763	5858	6462	6943	7225	7734	7755	8085	7885	7301
HDF ≥1/wk	964	1010	960	980	1007	914	961	935	709	501

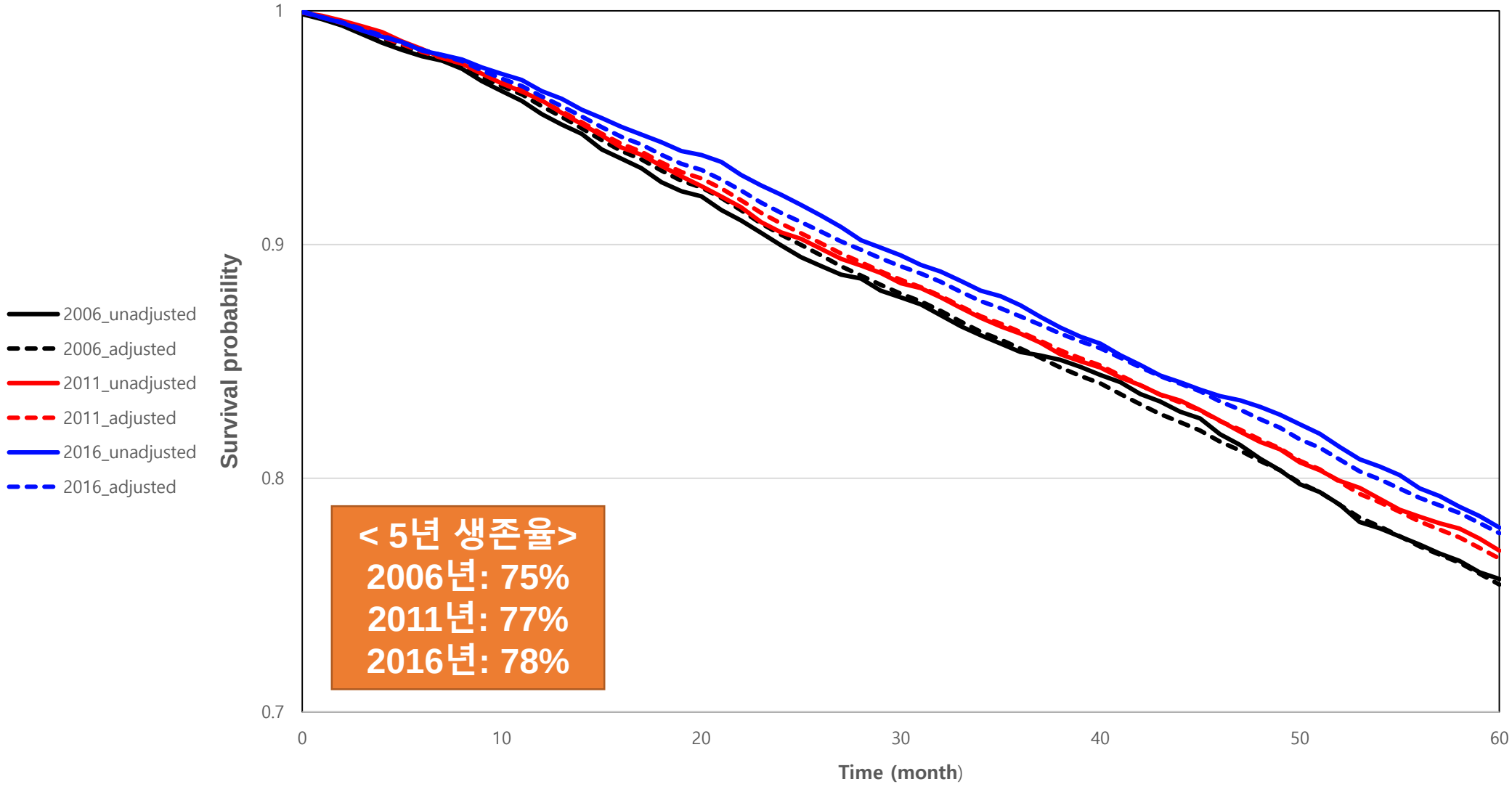
All-cause mortality in hemodialysis patients, by HD technique (HD vs HDF), 2013-2022: Adjusted by age and sex

All HD	**139,324**	%
HD	125,469	90
HDF≥1/wk	13,855	10

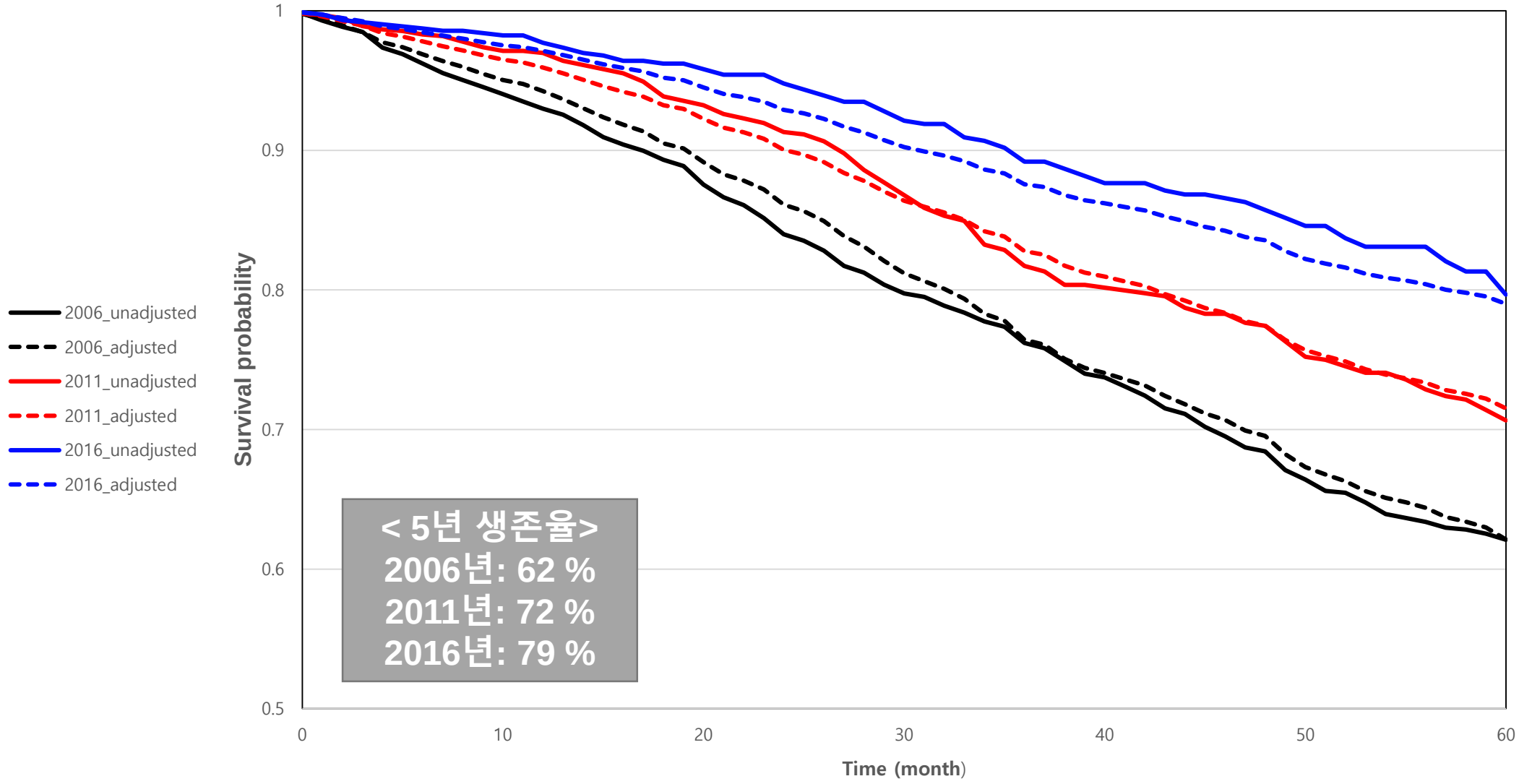


	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
HD	5763	5858	6462	6943	7225	7734	7755	8085	7885	7301
HDF ≥1/wk	964	1010	960	980	1007	914	961	935	709	501

Survival probability of incident ESRD patients over the first 5 years after HD and year of ESRD onset, 2006, 2011, and 2016

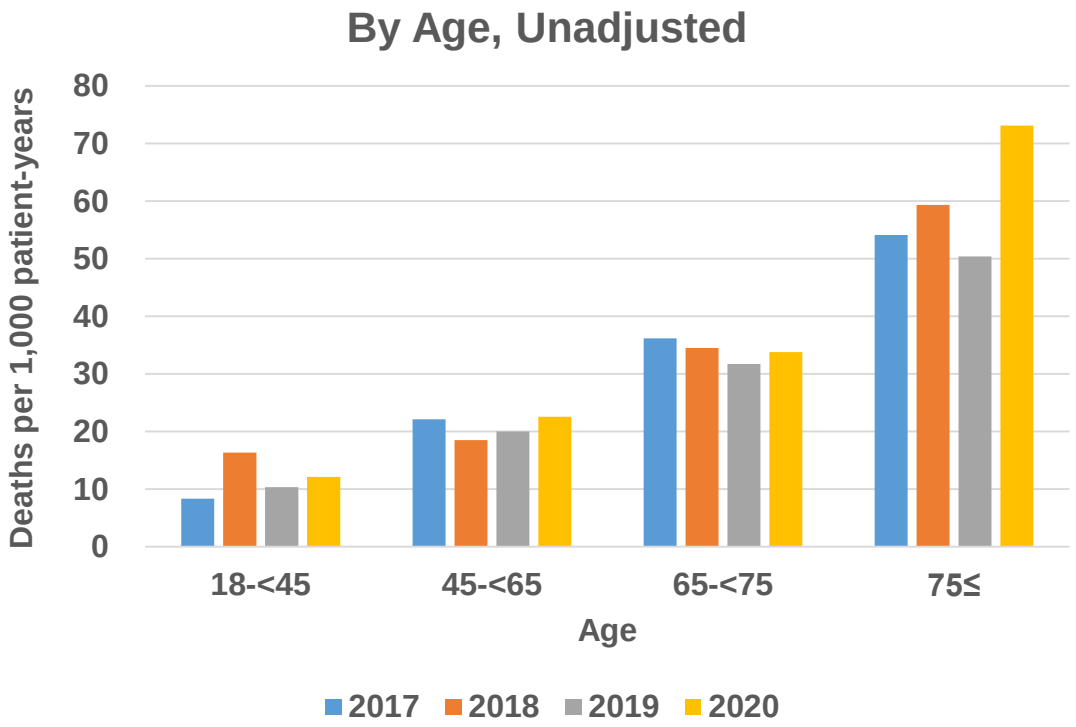


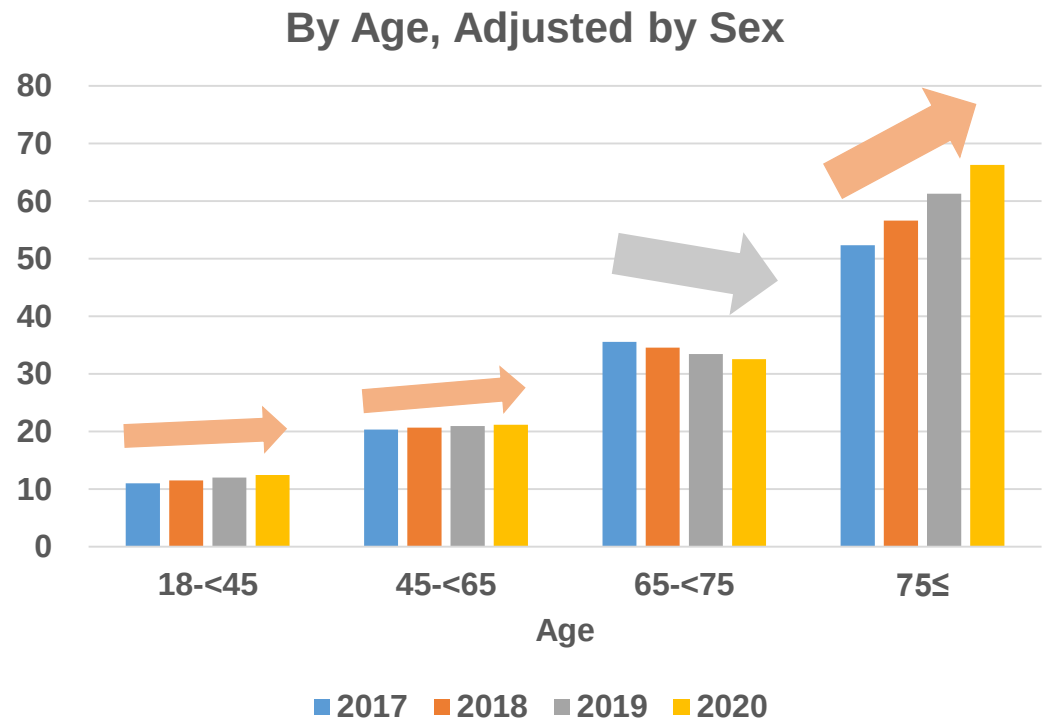
Adjusted survival of incident ESRD patients over the first 5 years after PD and year of ESRD onset, 2006, 2011, and 2016



2023 KORDS annual report- figure 3-15

The first 2-year mortality in HD patients by age, the year of dialysis initiation, 2017, 2018, 2019 and 2020





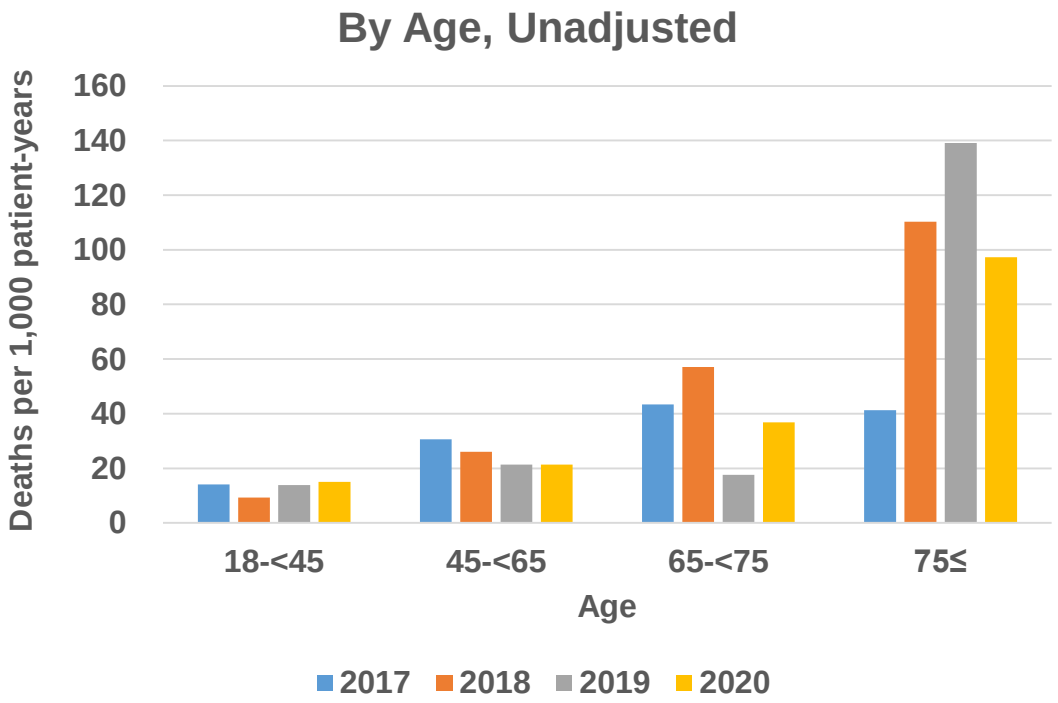
The first 2-year mortality in HD patients by age, the year of dialysis initiation, 2017, 2018, 2019 and 2020

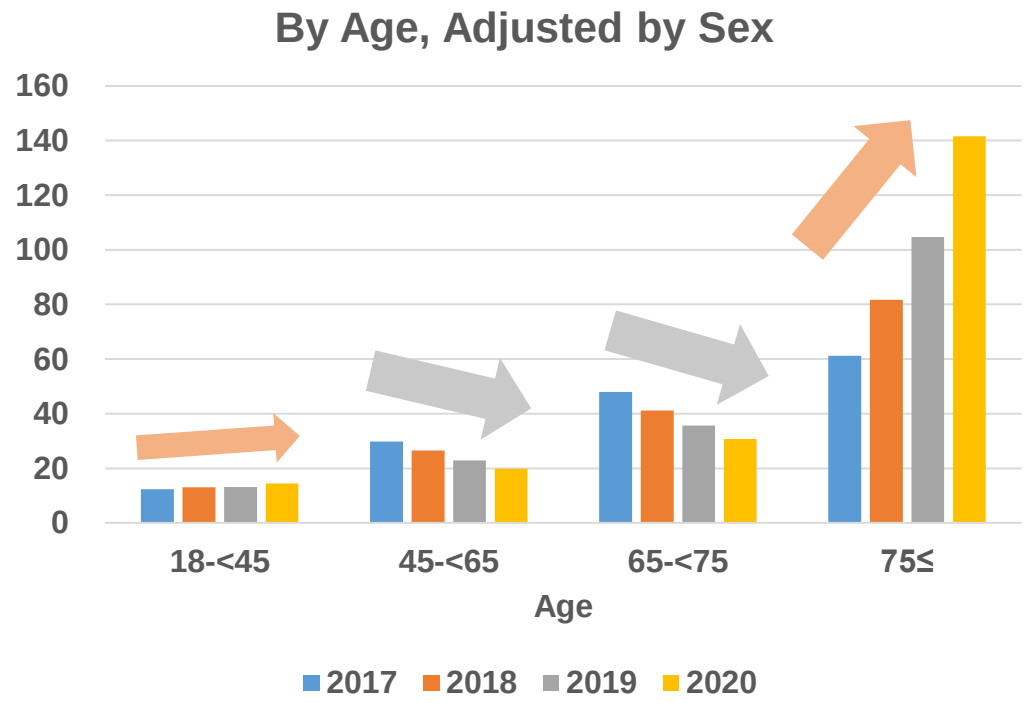
Deaths per 1,000 patient-years

	2017	2018	2019	2020
18-<45	11.0	11.5	12.0	12.4
45-<65	20.3	20.7	20.9	21.2
65-<75	35.6	34.6	33.4	32.6
75≤	52.3	56.6	61.3	66.3

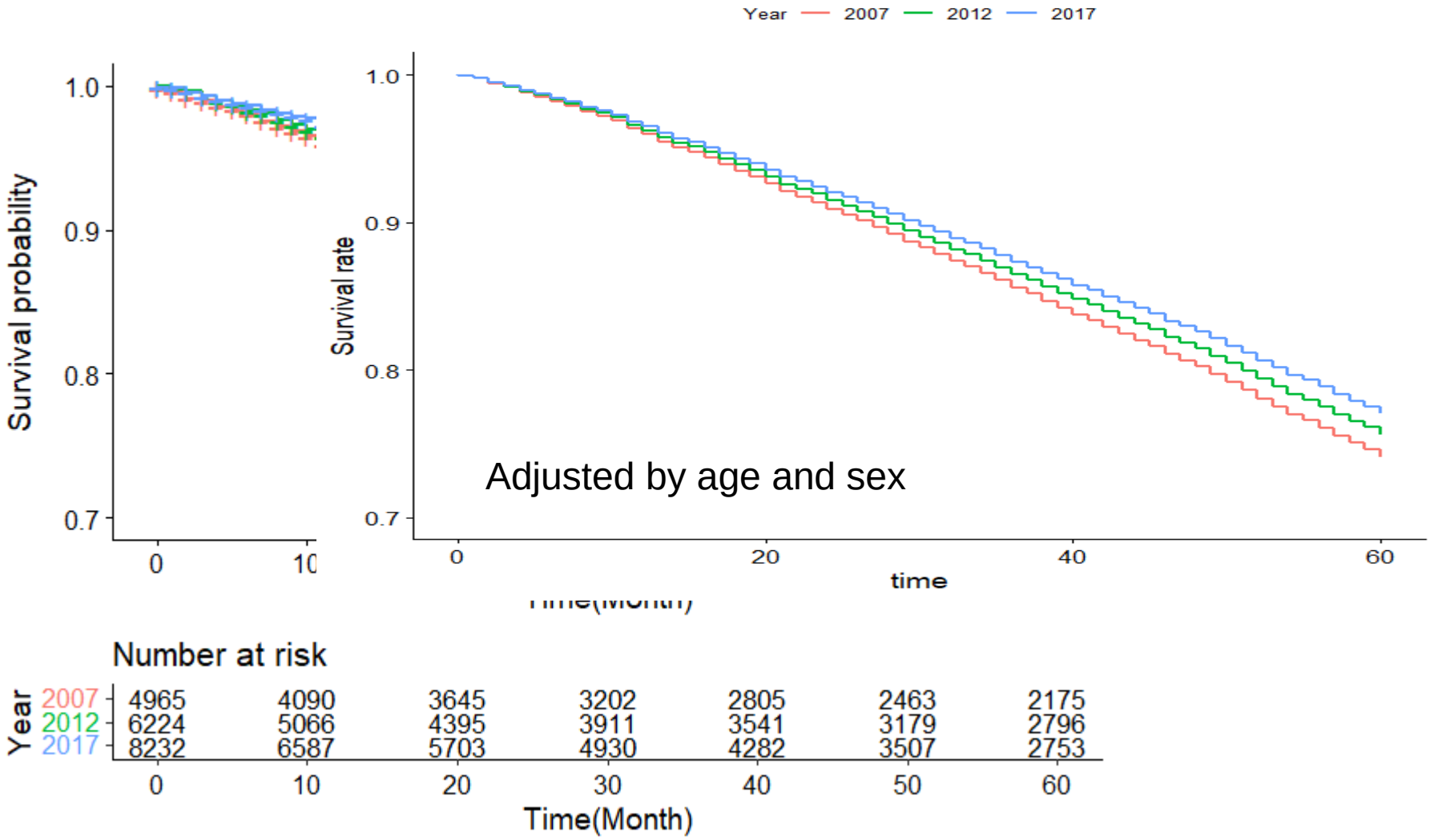
2023 KORDS annual report- figure 3-16

The first 2-year mortality in PD patients by age, the year of dialysis initiation, 2017, 2018, 2019 and 2020





Survival of incident HD patients over the first 5 years, year of ESRD onset, 2007, 2012, and 2017



r 45 months,
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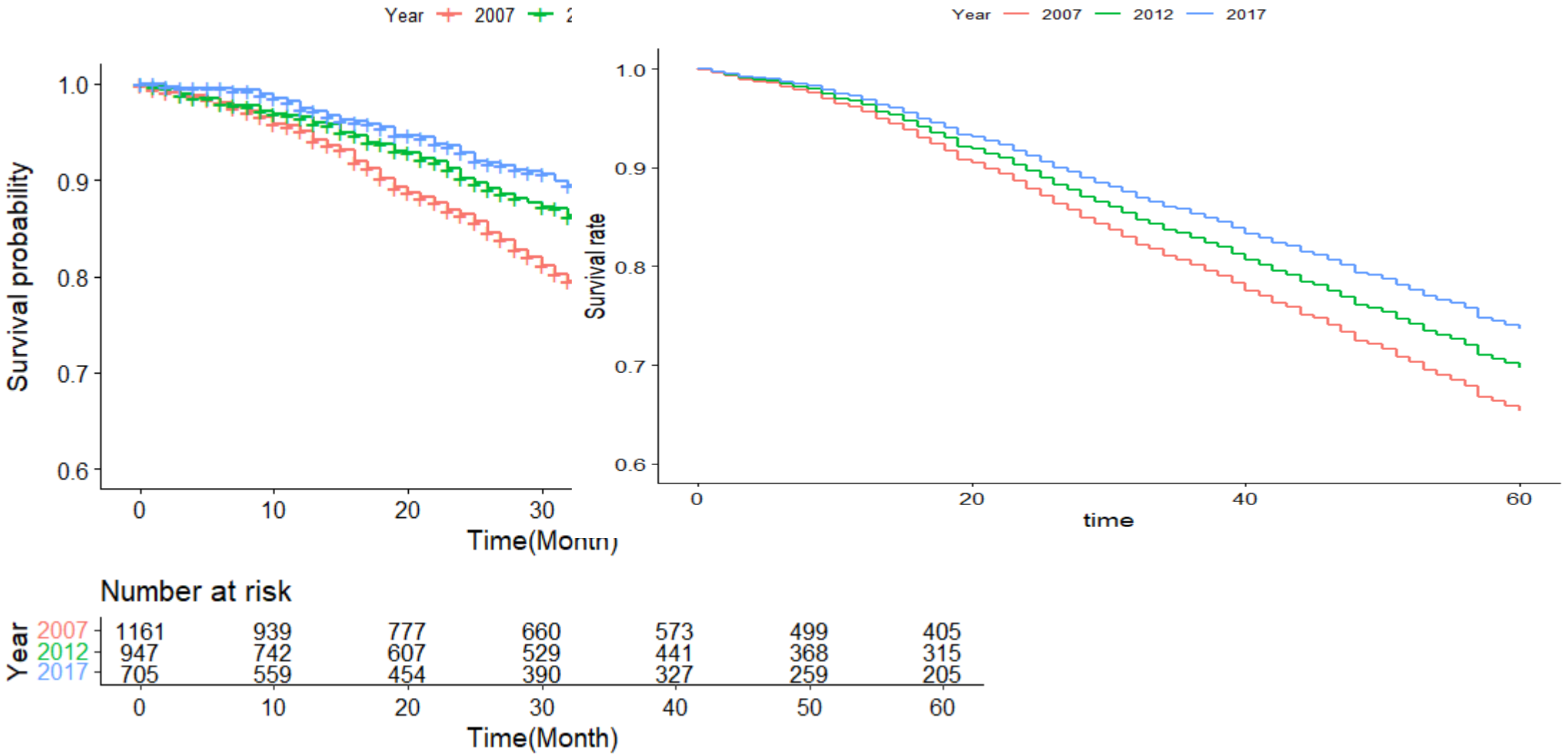
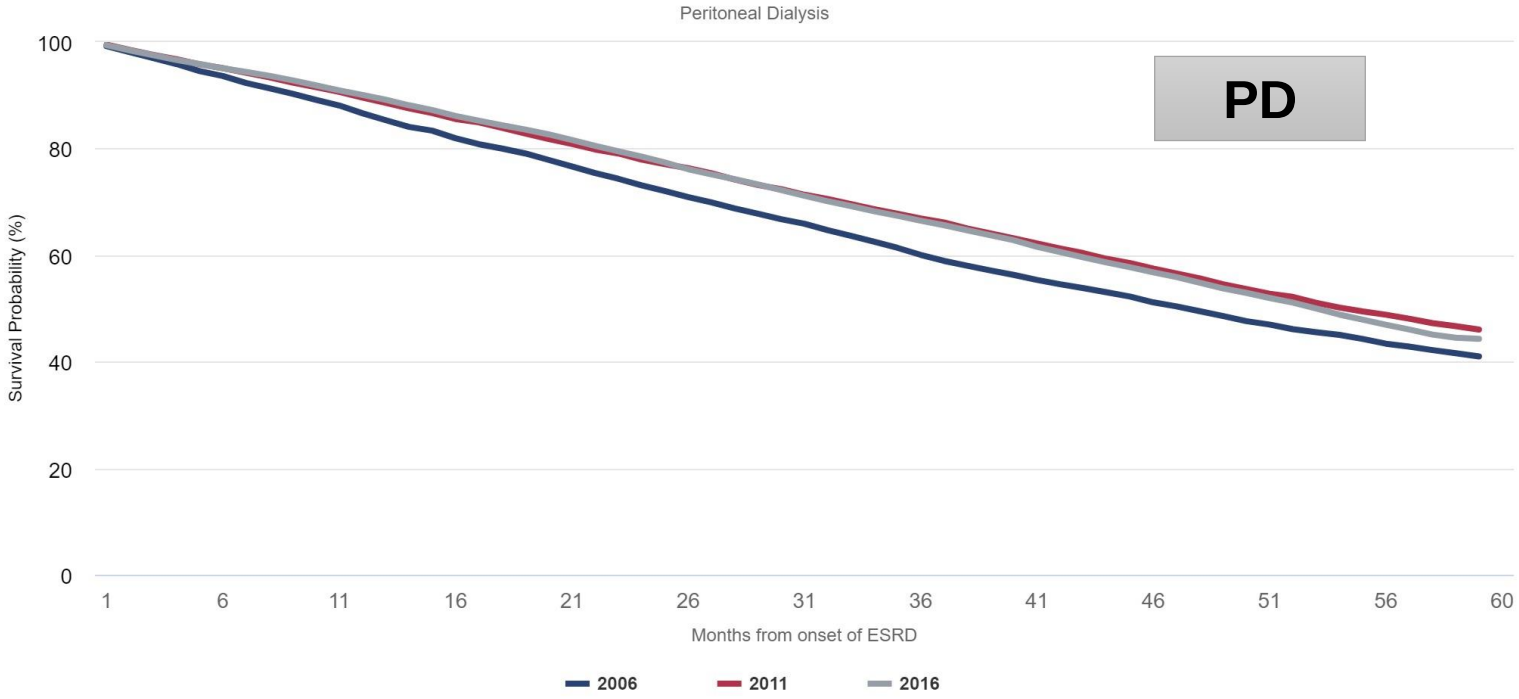
Survival of incident PD patients over the first 5 years, year of ESRD onset, 2007, 2012, and 2017



2022 USRDS

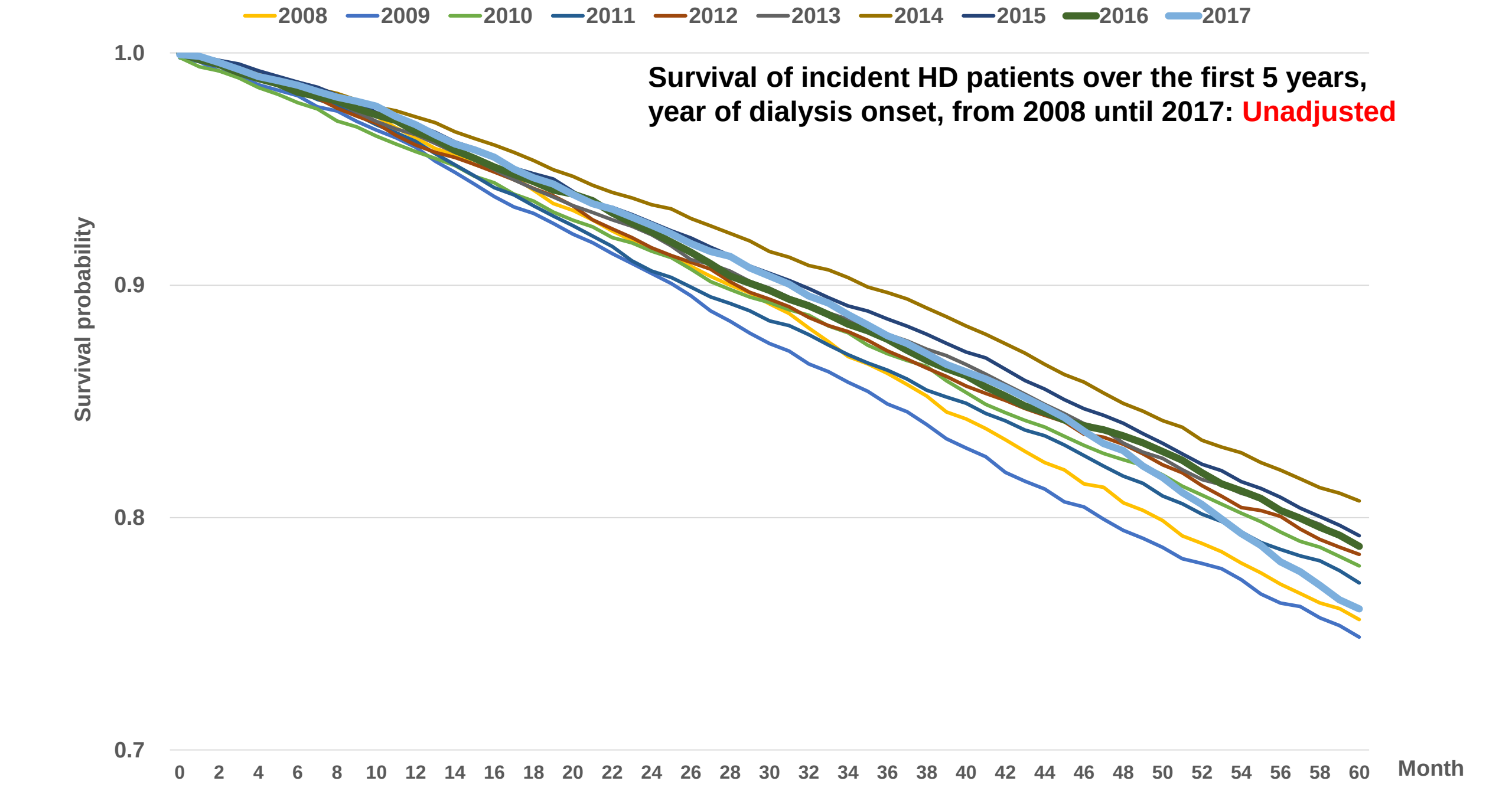
Figure 6.7 Adjusted survival of incident ESRD patients over the first 5 years after onset of ESRD, by treatment modality and year of ESRD onset, 2006, 20011, and 2016

Figure 6.7 Adjusted survival of incident ESRD patients over the first 5 years after onset of ESRD, by treatment modality and year of ESRD onset, 2006, 20011, and 2016

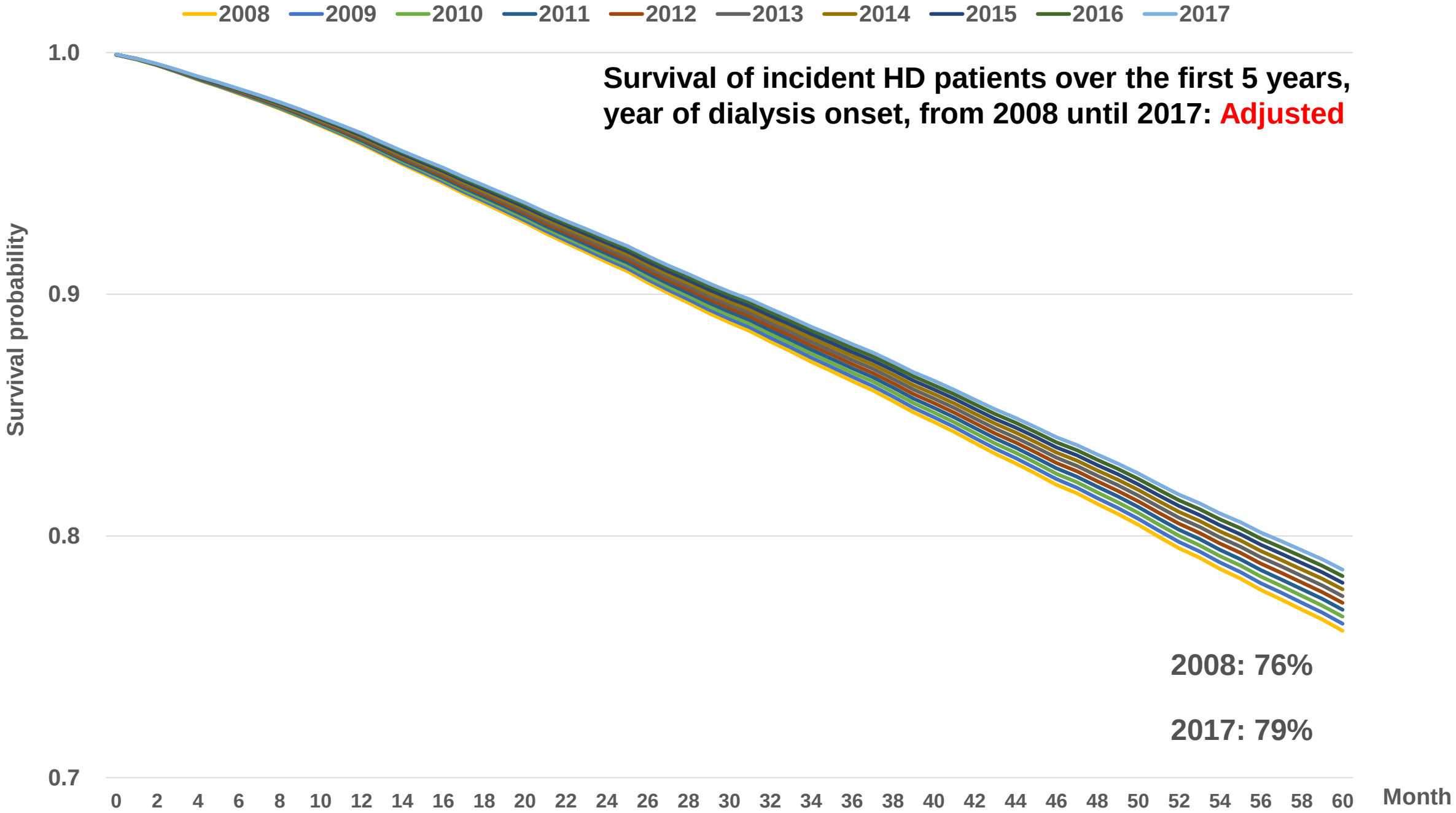


Data Source: 2022 United States Renal Data System Annual Data Report

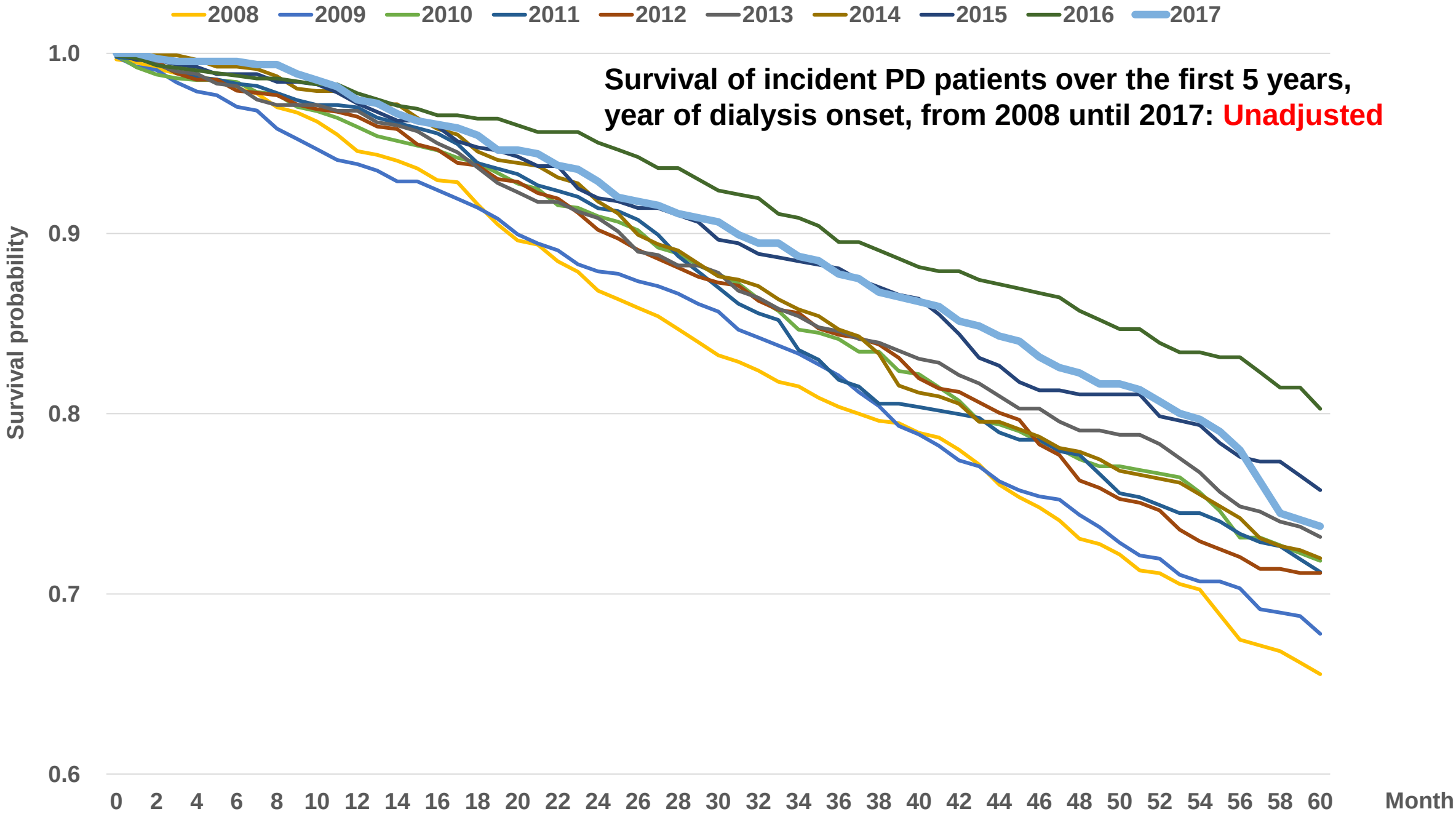
2023 KORDS annual report- Supplementary Figure 6



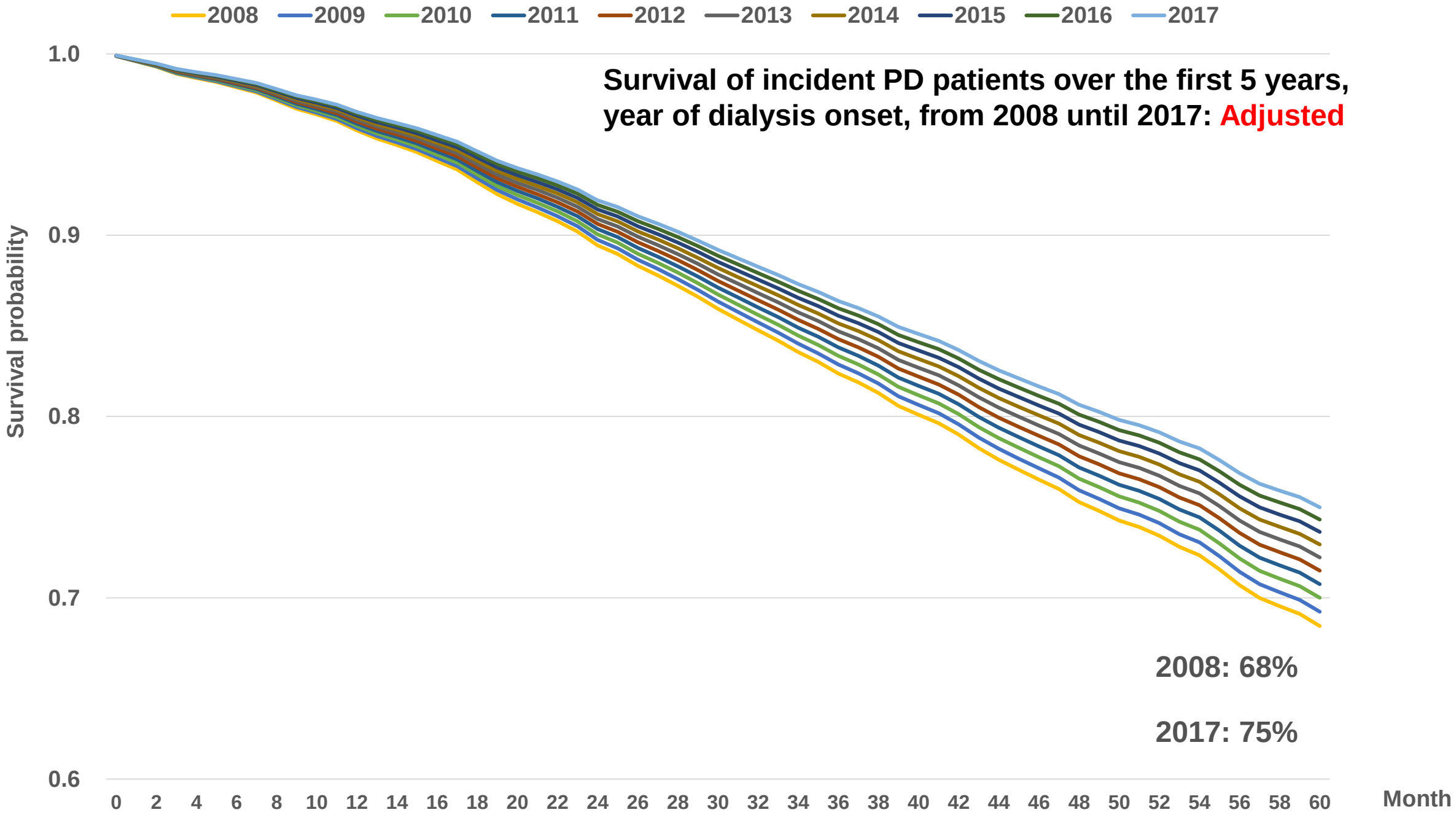
2023 KORDS annual report- figure 3-17



2023 KORDS annual report- Supplementary Figure 7



2023 KORDS annual report- figure 3-18



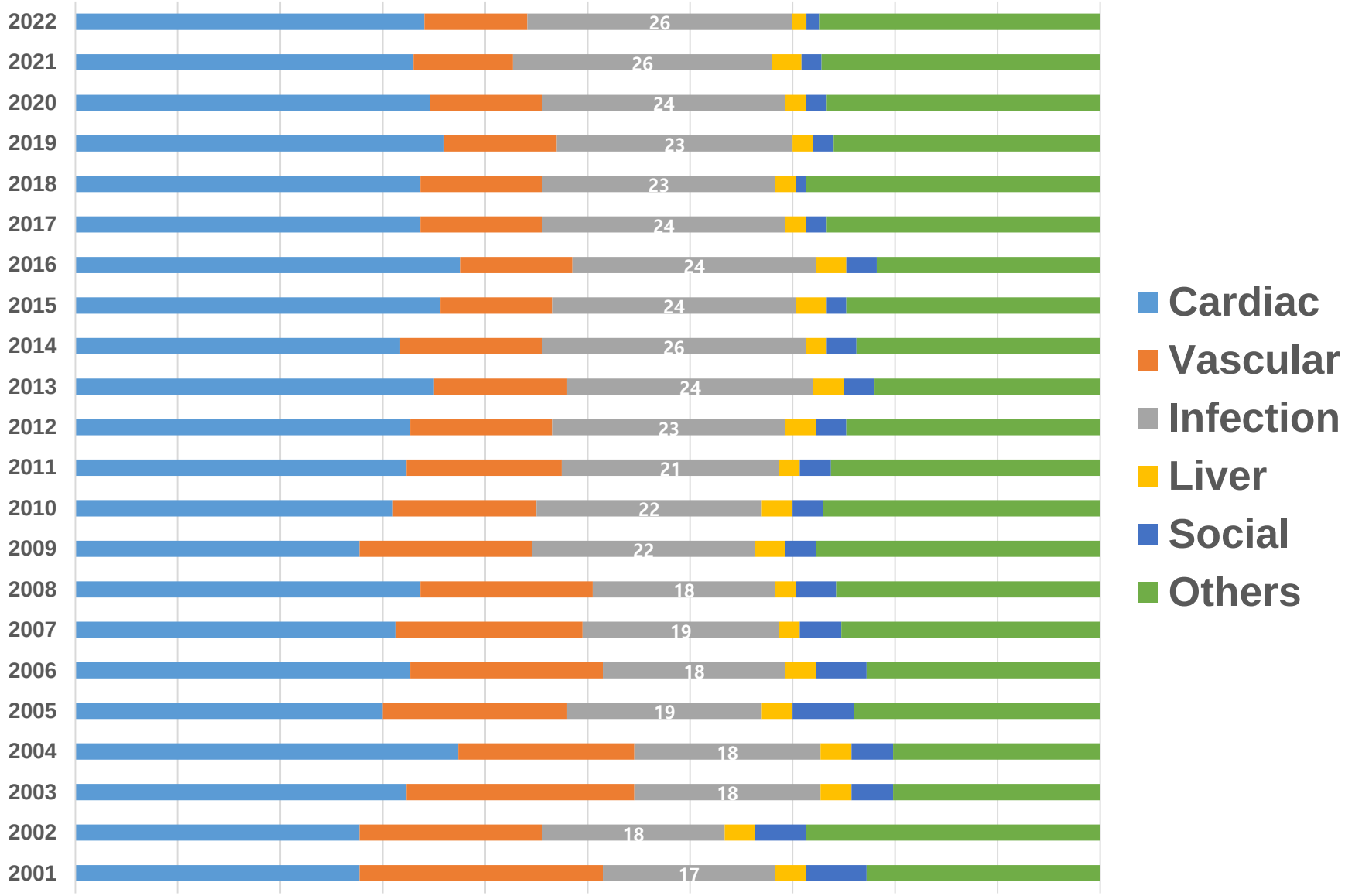
Causes of deaths

Cause-specific mortality (%) in patients with ESRD receiving dialysis, 2001-2022

	2001	2005	2007	2009	2011	2013	2015	2016	2017	2018	2019	2020	2021	2022
Cardiac	26.9	30.7	31.7	29.5	32.7	35.8	36.1	38.1	33.7	33.7	35.8	34.8	34.1	34.1
MI	7.7	8.0	7.5	8.0	6.6	7.5	8.0	5.5	6.5	6.5	7.6	6.0	6.2	5.5
cardiac arrest, uremia-associated	11.2	10.4	10.8	8.5	11.0	14.2	13.1	13.3	12.7	12.4	12.9	13.9	13.1	11.3
cardiac arrest, other	8.1	12.4	13.3	13.0	15.0	14.2	15.0	19.3	14.5	14.8	15.3	14.9	14.8	17.2
Vascular	22.7	17.0	17.8	15.9	14.1	13.3	11.8	10.8	11.4	11.5	11.2	10.7	9.5	10.1
cerebrovascular accident	15.1	12.3	13.0	11.0	8.7	8.7	6.5	6.2	6.2	5.6	6.5	6.0	4.6	4.4
pulmonary embolism	0.5	0.6	0.5	0.2	0.2	0.2	0.9	0.4	0.3	0.3	0.3	0.3	0.2	0.2
GI hemorrhage	2.7	1.7	2.7	2.3	2.2	1.2	1.4	2.0	0.8	1.7	1.8	1.3	1.4	1.3
GI embolism	0.1	0.5	0.1	0.5	0.1	0.2	0.7	0.3	0.3	0.2	0.2	0.2	0.1	0.1
others	4.3	1.9	1.6	1.9	3.0	3.0	2.4	1.9	3.7	3.7	2.4	3.0	3.3	4.0
Infection	17.8	20.1	20.2	21.9	23.1	23.5	24.6	24.5	25.2	22.6	22.9	23.6	25.5	25.8
pulmonary	4.5	4.5	4.4	5.9	8.4	8.4	8.9	9.3	7.7	8.6	8.2	8.7	10.0	10.8
septicemia	6.9	9.6	11.7	10.4	9.7	11.9	11.0	10.2	12.2	10.6	11.2	11.2	10.1	9.0
tuberculosis	0.8	0.3	0.2	0.3	0.1	0.1	1.1	0.1	0.2	0.0	0.1	0.0	0.2	0.1
peritonitis	1.1	1.4	1.1	0.8	1.0	0.5	1.1	1.2	0.7	0.6	0.6	0.7	0.7	0.5
others	4.5	4.3	2.9	4.5	4.0	2.7	2.4	3.6	4.5	2.7	2.9	2.9	4.6	5.4
Liver disease	2.6	2.7	2.2	3.1	2.1	2.4	2.6	2.3	2.0	1.6	2.3	1.7	1.9	1.4
hepatic failure d/t HBV	1.6	1.5	1.3	2.2	1.0	1.3	1.1	0.9	1.1	0.6	1.0	0.8	0.6	0.5
hepatic failure d/t others	1.0	1.2	0.8	0.9	1.1	1.1	1.5	1.5	1.0	1.0	1.4	0.9	1.3	0.9
Social	6.3	5.4	3.3	2.5	3.3	2.8	2.0	2.5	1.5	1.3	1.5	1.8	1.5	1.2
patient refused further treatment	2.1	1.1	1.1	0.5	0.4	0.3	0.3	0.5	0.1	0.0	0.3	0.2	0.2	0.2
suicide	3.3	3.3	1.5	1.3	1.4	1.3	1.0	1.5	0.8	0.8	0.8	1.1	0.9	0.7
therapy ceased for other cause	0.9	1.0	0.7	0.8	1.5	1.2	0.8	0.5	0.8	0.5	0.5	0.5	0.4	0.4
Others	23.7	24.0	24.8	27.1	24.7	22.2	23.0	21.8	26.2	29.3	26.2	27.4	27.6	27.4
cachexia	8.1	4.0	4.4	3.3	2.7	1.6	1.4	0.9	1.0	1.0	0.6	0.5	1.0	0.5
malignant	4.4	6.4	5.7	5.7	6.0	5.7	5.8	6.5	6.6	6.0	5.0	7.1	6.2	5.5
accident	0.9	1.4	1.2	1.3	1.6	1.4	1.0	1.0	1.1	1.3	1.3	1.5	1.4	1.0
uncertain	10.3	12.3	13.4	16.8	14.5	13.4	14.8	13.4	17.6	21.0	19.3	18.4	19.0	20.4

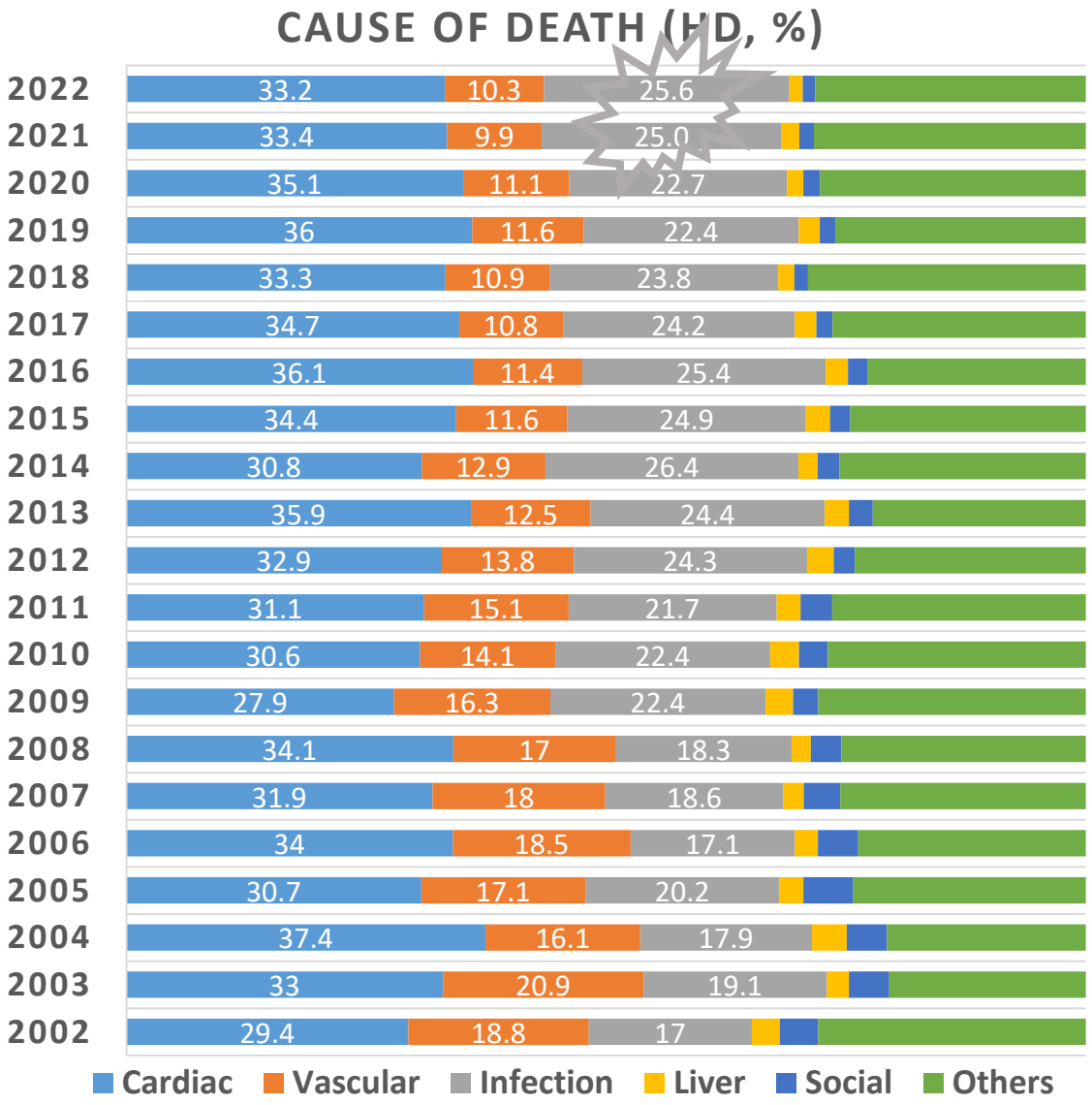
2023 KORDS annual report- Supplementary Figure 8

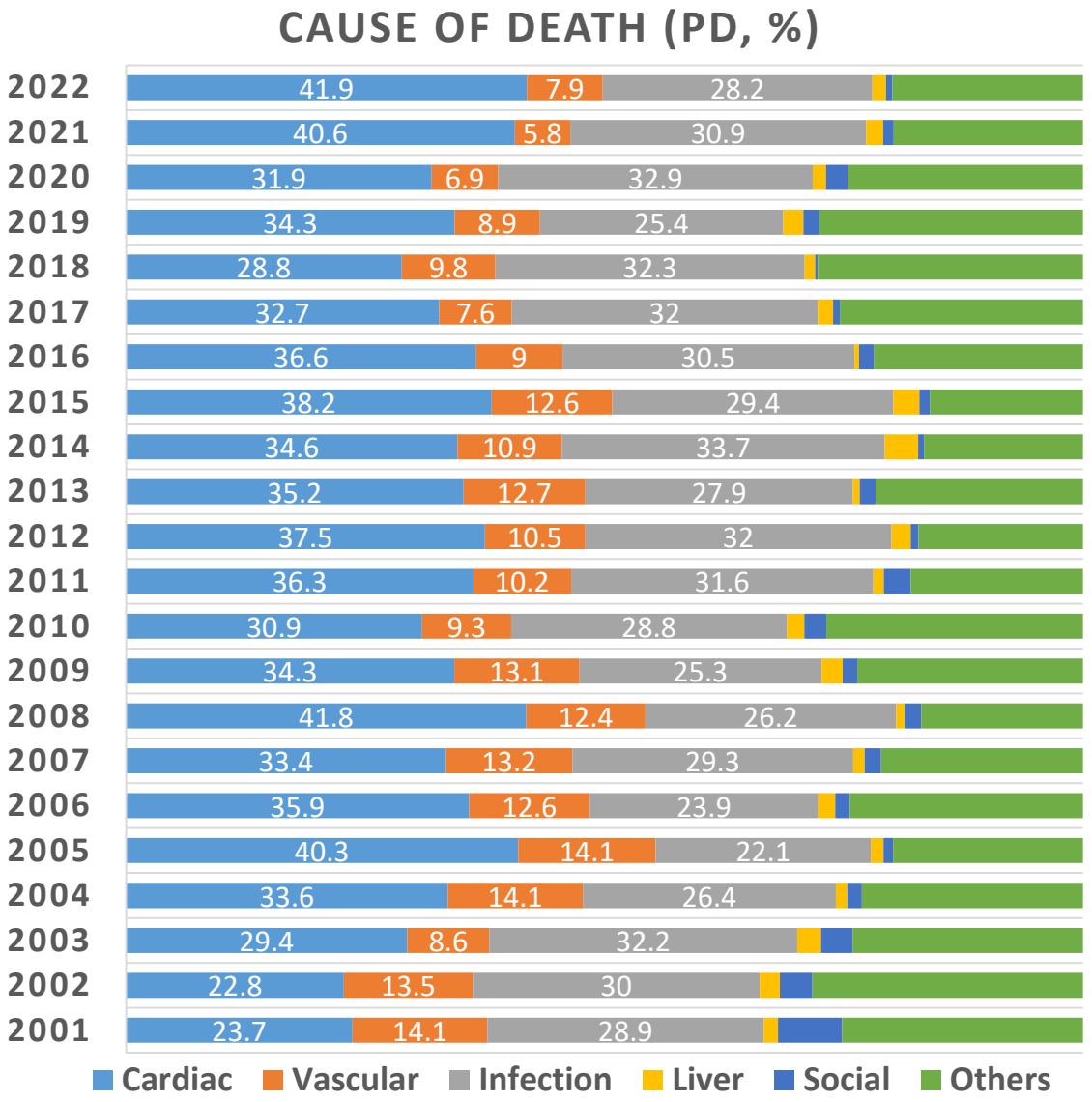
Comparison of cause-specific death



2023 KORDS annual report- figure 3-20

Comparison of cause-specific death, HD versus PD patients





Cause-specific mortality (%) in patients with ESRD, who died in 2022

	Overall		HD		PD	
	n	%	n	%	n	%
Cardiac	1040	34.1	918	33.2	122	41.9
MI	169	5.5	163	5.9	6	2.1
cardiac arrest, uremia-associated	346	11.3	309	11.2	37	12.7
cardiac arrest, other	525	17.2	446	16.1	79	27.1
Vascular	307	10.1	284	10.3	23	7.9
cerebrovascular accident	134	4.4	125	4.5	9	3.1
pulmonary embolism	6	0.2	5	0.2	1	0.3
GI hemorrhage	40	1.3	37	1.3	3	1.0
GI embolism	4	0.1	4	0.1	0	0.0
others	123	4.0	113	4.1	10	3.4
Infection	788	25.8	706	25.6	82	28.2
pulmonary	331	10.8	302	10.9	29	10.0
septicemia	274	9.0	243	8.8	31	10.7
tuberculosis	3	0.1	3	0.1	0	0.0
peritonitis	15	0.5	8	0.3	7	2.4
others	165	5.4	150	5.4	15	5.2
Liver disease	43	1.4	39	1.4	4	1.4
hepatic failure d/t HBV	14	0.5	12	0.4	2	0.7
hepatic failure d/t others	29	0.9	27	1.0	2	0.7
Social	38	1.2	36	1.3	2	0.7
patient refused further treatment	5	0.2	5	0.2	0	0.0
suicide	22	0.7	21	0.8	1	0.3
therapy ceased for other cause	11	0.4	10	0.4	1	0.3
Other	837	27.4	779	28.2	58	19.9
cachexia	14	0.5	12	0.4	2	0.7
malignant	169	5.5	158	5.7	11	3.8
accident	32	1.0	32	1.2	0	0.0
uncertain	622	20.4	577	20.9	45	15.5

대한 신장학회 등록 사업 등록 현황

등록사업에 참여한 의료기관 수 및 응답률

년도	2019년		2020년		2021년		2022년	
지역	총의료기관수	응답률	총의료기관수	응답률	총의료기관수	응답률	총의료기관수	응답률
서울	185	63.2%	199	70.4%	214	68.7%		
부산	62	56.5%	65	73.8%	74	70.3%		
대구	43	58.1%	45	86.7%	48	70.8%		
인천	45	40.0%	52	73.1%	60	58.3%		
광주	35	42.9%	35	71.4%	35	65.7%		
대전	19	68.4%	22	77.3%	25	68%		
경기	185	46.5%	209	69.4%	236	57.2%		
강원	27	48.1%	29	79.3%	32	56.3%		
충북	31	54.8%	35	68.6%	36	63.9%		
충남	42	50.0%	44	75.0%	44	56.8%		
전북	29	48.3%	29	72.4%	30	50%		
전남	38	39.5%	40	67.5%	39	41%		
경북	47	51.1%	47	76.6%	54	55.6%		
경남	64	42.2%	69	76.8%	76	53.9%		
울산	17	58.8%	17	70.6%	18	72.2%		
제주	13	53.8%	14	85.7%	15	73.3%		
세종	3	66.7%	4	50.0%	5	80%		
전국	885	51.9%	955	72.8%	1041	61.4%		

요약

- 전체 말기 신부전 환자 유병률의 지속적인 증가.
- 노령 투석 환자의 지속적인 증가.
- 원인 신질환에서 당뇨병성 신증의 비율 절반 유지.
- 투석 환자의 사망률 지속적인 감소 추세. 특히 혈액 투석과 복막투석 신환의 5년 생존률의 지속적인 사망률 감소 추세.
- 당뇨 및 고령 환자에서 복막 투석 사망률이 혈액 투석 사망률보다 높음.
- 복막 투석 연관 복막염 감소세 유지.
- 대한신장학회 등록 사업의 전국적 등록률 일시적 감소.

감사의 말씀

- 본 연례 보고가 가능할 수 있었던 것은 말기 신부전 환자 등록에 참여해주신 전국의 인공 신장실 담당의료진의 노고 덕분입니다. 등록해주신 자료를 바탕으로 양질의 결과를 만들어 보고 할 수 있도록 저희 등록 위원회는 더욱 열심히 하겠습니다.
- 더불어 보고서 작성에 도움을 주신 신장학회 사무 선생님, 정선아 선생님, 투석용 의료물품 공급업체 (Baxter Korea, FMC Korea, 보령, B-braun Korea)에도 감사드립니다.

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THE KOREAN SOCIETY OF NEPHROLOGY

대한신장학회 등록위원회

KORDS
(KOrean Renal Data System)

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