

POST-PANDEMIC IPD SURGE IN GERMANY WITH STRONGLY INCREASED PCV13 SEROTYPE LEVELS

M. van der Linden and A. Itzek

German Reference Laboratory for Streptococci (GRLS) and Institute of Medical Microbiology, RWTH-Aachen, Germany

Mark van der Linden
University Hospital RWTH Aachen
Institute of Medical Microbiology
Reference Laboratory for Streptococci
Pauwelsstrasse 30, 52074 Aachen, Germany
mlinden@ukaachen.de

BACKGROUND

Streptococcus pneumoniae remains a leading cause of infectious disease among children and older adults. Childhood vaccination with pneumococcal conjugate vaccine (PCV) was initiated in Germany in 2006, resulting in strong direct and indirect effects. In the first year of the SARS-CoV-2 pandemic, a substantial reduction in IPD cases was reported, slowly increasing to pre-pandemic levels in the following two years. Starting December 2022, a surge in IPD was observed.

METHODS

Isolates were serotyped using the Neufeld Quellung reaction. Species identification was confirmed using bile-, optochin- and PCR-tests.

RESULTS

SARS-CoV-2 reached Germany at the beginning of March 2020. As a consequence of non-pharmaceutical intervention measures (NPIs) a strong reduction in IPD case numbers was observed across all age groups (**Fig.1**).

During season 2020-2021, at the peak of the pandemic, prevalence of PCV13 serotypes was strongly reduced among children aged 0-1 years (10%), 2-4 years (12%) and 5-17 years (20%), (**Figs 2-4**).

Among adults, in 2020-2021, the prevalence of PCV13 serotypes remained unchanged at around 30%, with 26.4% among adults aged 18-49 years, 50-59 years (32.7%), 60-75 years (32.1%) and >75 years (29.7%), (**Figs 5-8**).

In the late pandemic season 2021-2022, an increase in PCV13 serotype prevalence was observed among all age groups in children (0-1 years: 27.6%, 2-4 years: 39.4%, 5-17 years: 40.8%), and in the younger two age groups in adults (18-49 years: 37.2%, 50-59 years: 37.1%), but to a lesser extend in older adults (60-75 years: 33.7%, >75 years: 35.5%; **Figs 2-8**).

After relieve of NPIs in season 2022-2023, a surge in IPD cases far above pre-pandemic levels was observed in all age groups, with a persisting high prevalence of PCV13 serotypes among older children (0-1 years: 25.6%, 2-4 years: 50.0%, 5-17 years: 38.5%), and an increasing PCV13 serotype prevalence among all adult age groups (18-49 years: 44.1%, 50-59 years: 42.9%, 60-75 years: 42.4%, >75 years: 41.6%; **Figs 2-8**).

In the current season, 2023-2024, PCV13 serotype prevalence appears to be returning to lower levels (**Figs 2-8**).

Serotypes with increased prevalence during the surge were 3, 19A and 19F (children, adults), as well as serotype 4 (adults only; **Tables 1** and **2**).

CONCLUSIONS

- During the SARS-CoV-2 pandemic (2020-2021) PCV13 serotype prevalence was strongly reduced among children, but not among adults.
- In the late pandemic season 2021-2022, PCV13 serotypes increased among children and adults under 60 years of age.
- After the SARS-CoV-2 pandemic and relieve of NPIs (2022-2023), a surge in IPD was observed in all age groups, with an increased prevalence of PCV13 serotypes 3, 4, 19F and 19A.
- The origin of these effects remain elusive.

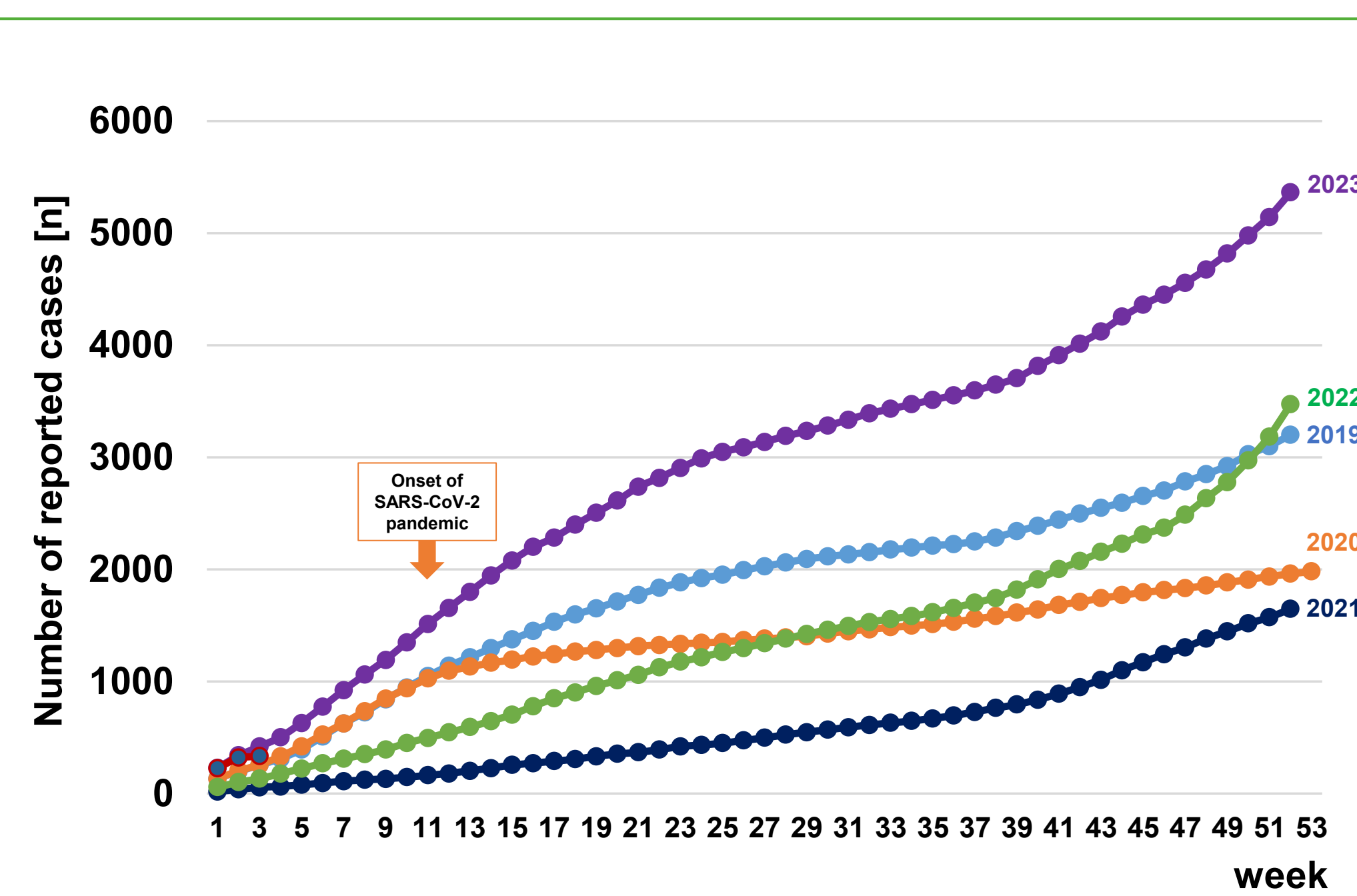


Fig. 1: Cumulative number of reported IPD cases among individuals of all ages in Germany

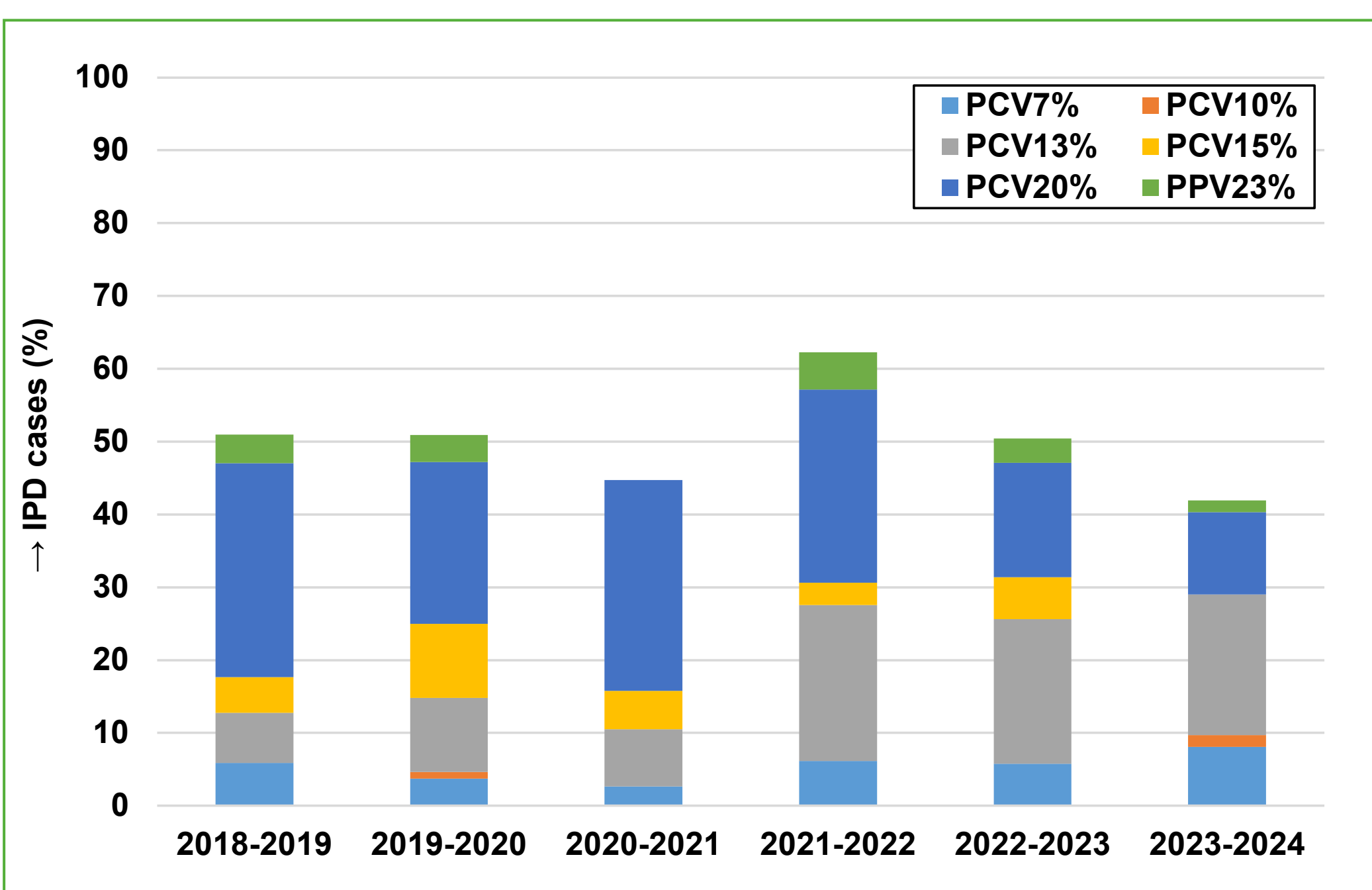


Fig. 2: Coverage of different vaccine formulations of IPD cases among children 0-1 years of age in Germany

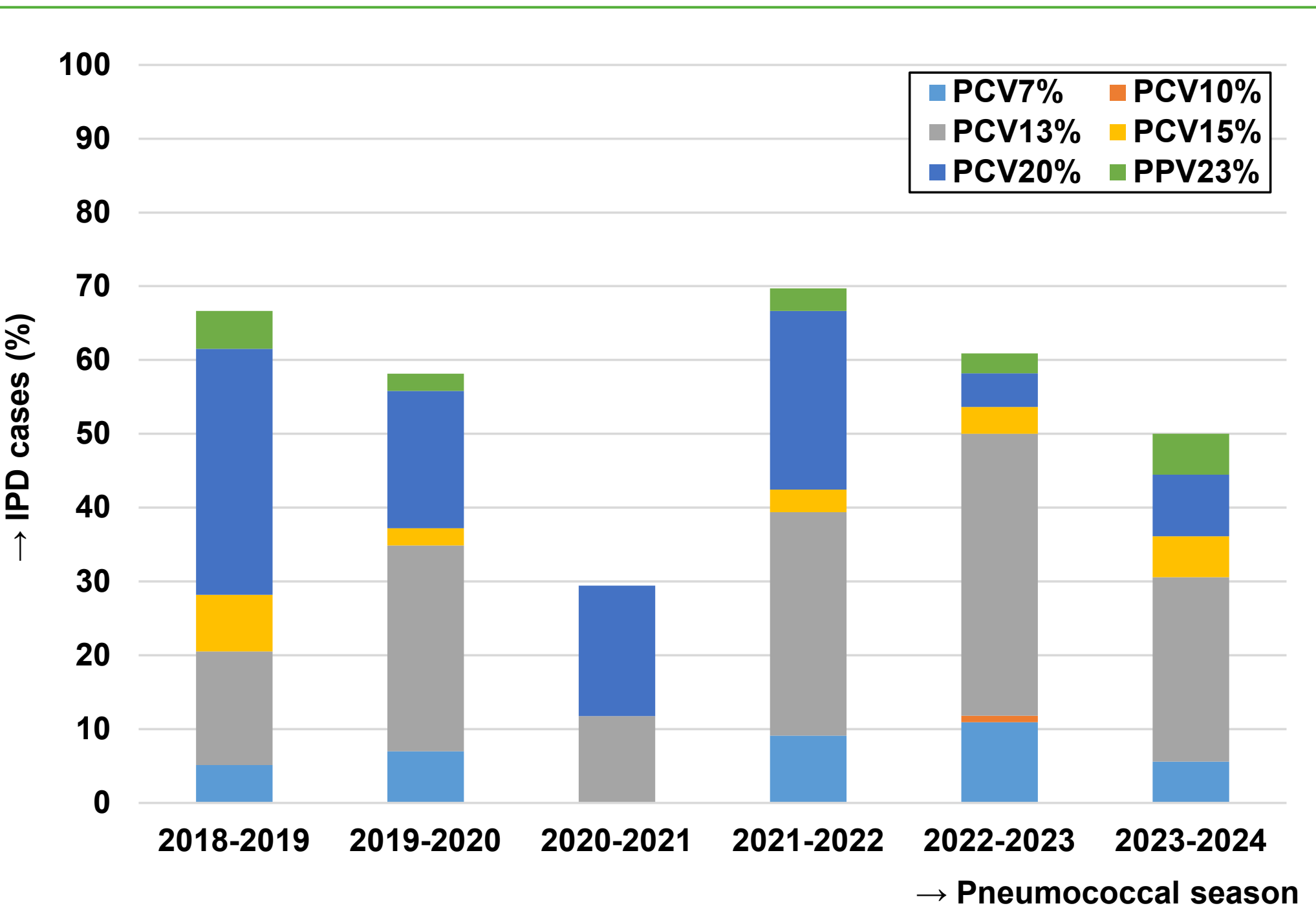


Fig. 3: Coverage of different vaccine formulations of IPD cases among children 2-4 years of age in Germany

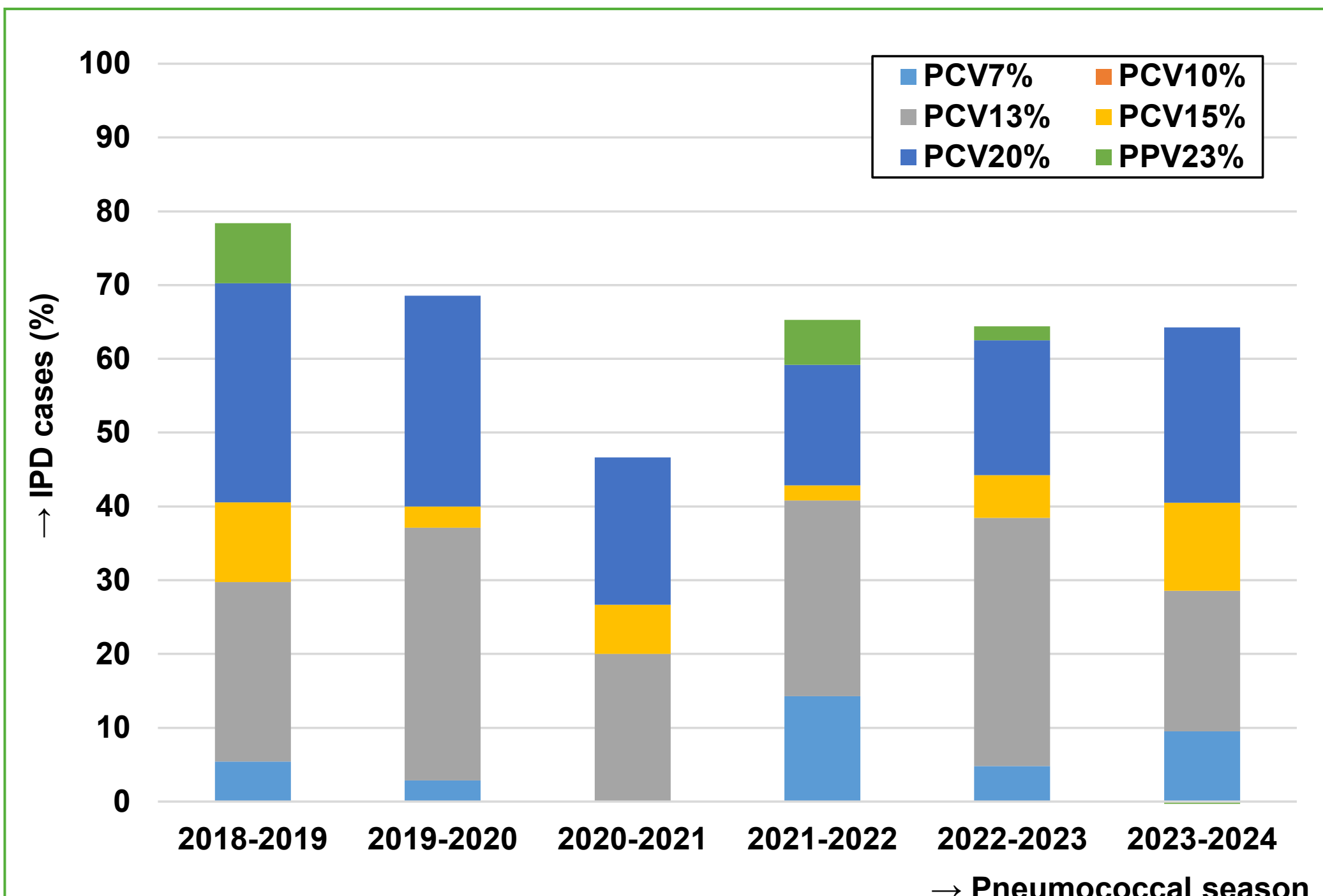


Fig. 4: Coverage of different vaccine formulations of IPD cases among children 5-17 years of age in Germany

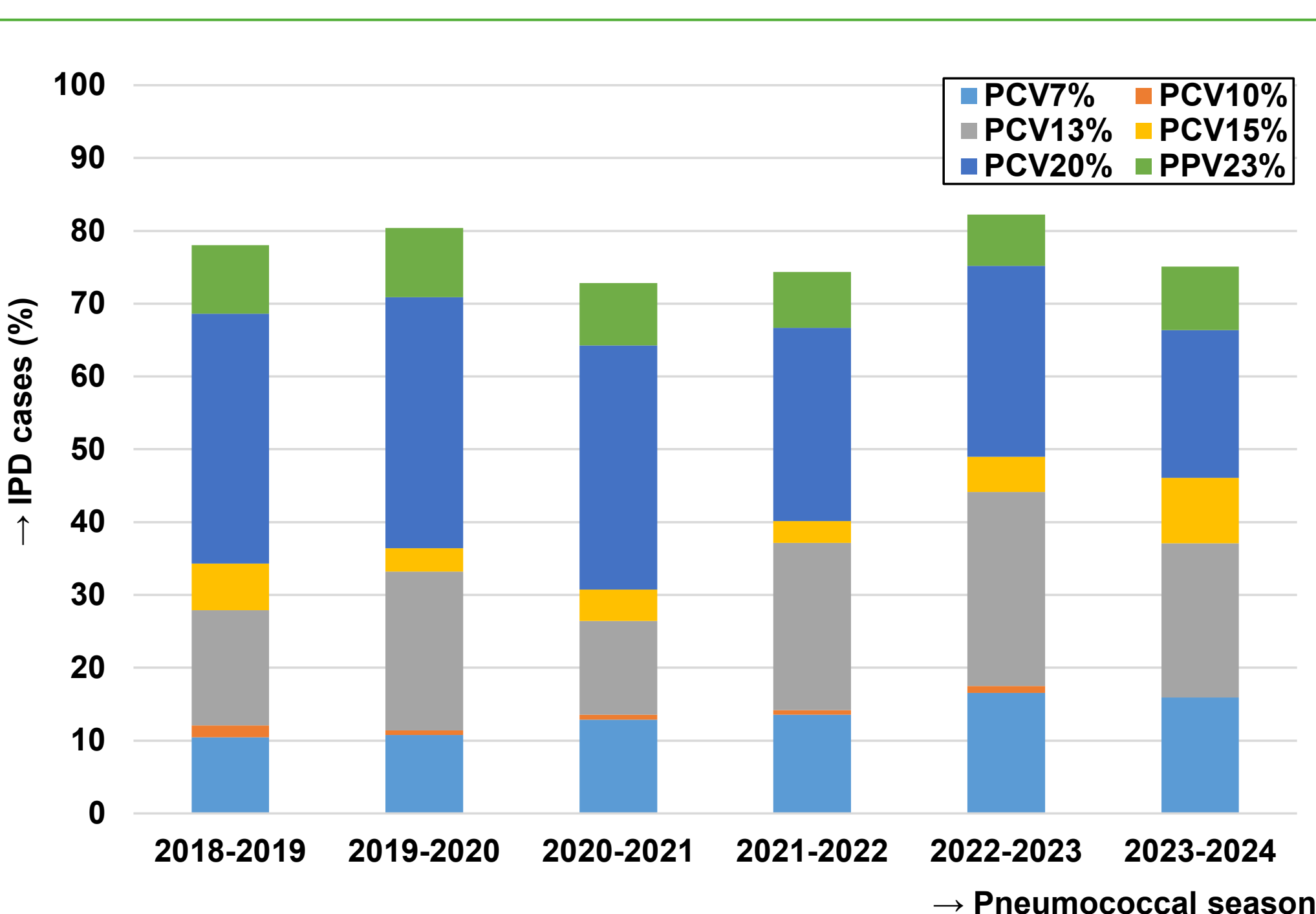


Fig. 5: Coverage of different vaccine formulations of IPD cases among adults 18-49 years of age in Germany

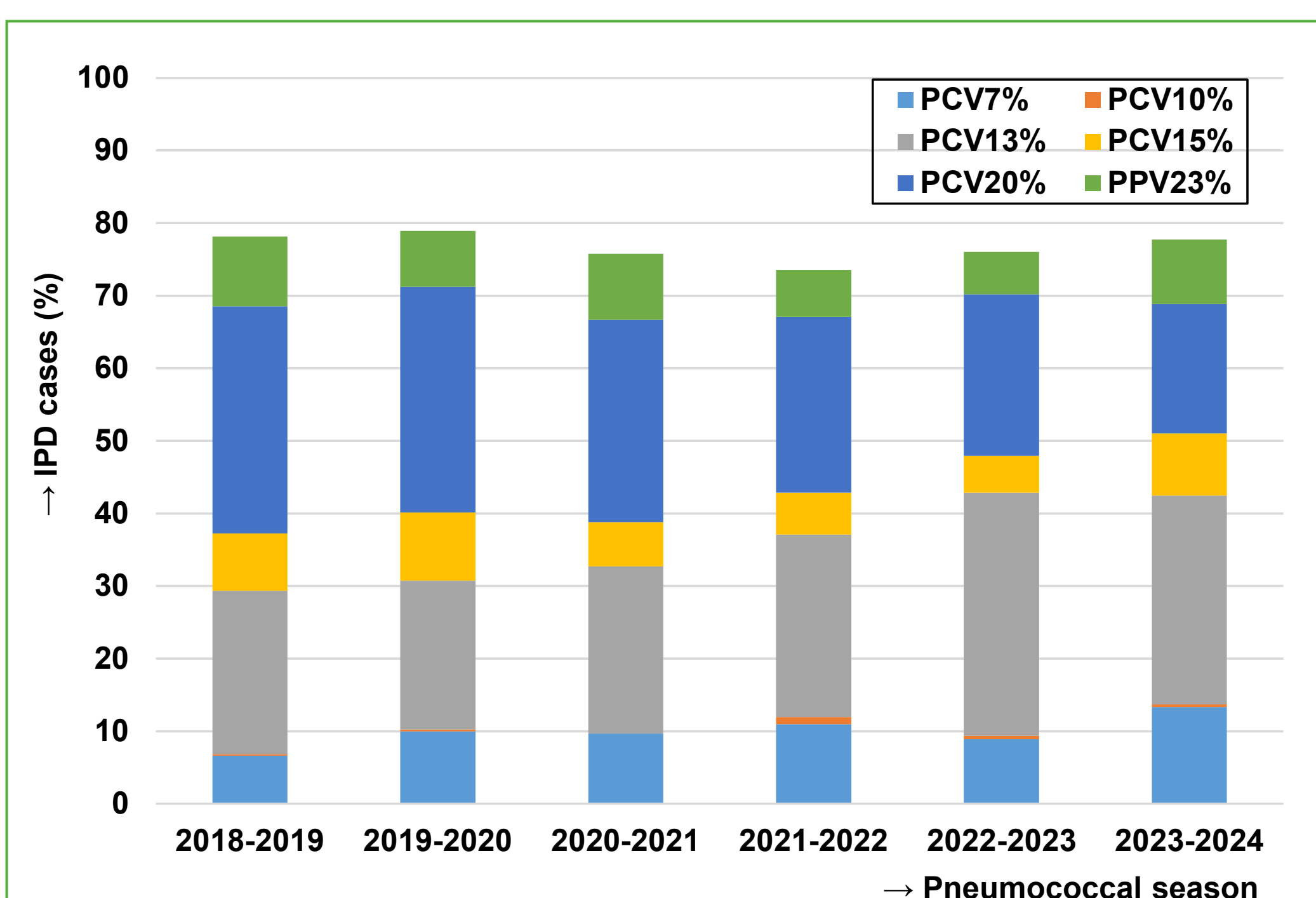


Fig. 6: Coverage of different vaccine formulations of IPD cases among adults 50-59 years of age in Germany

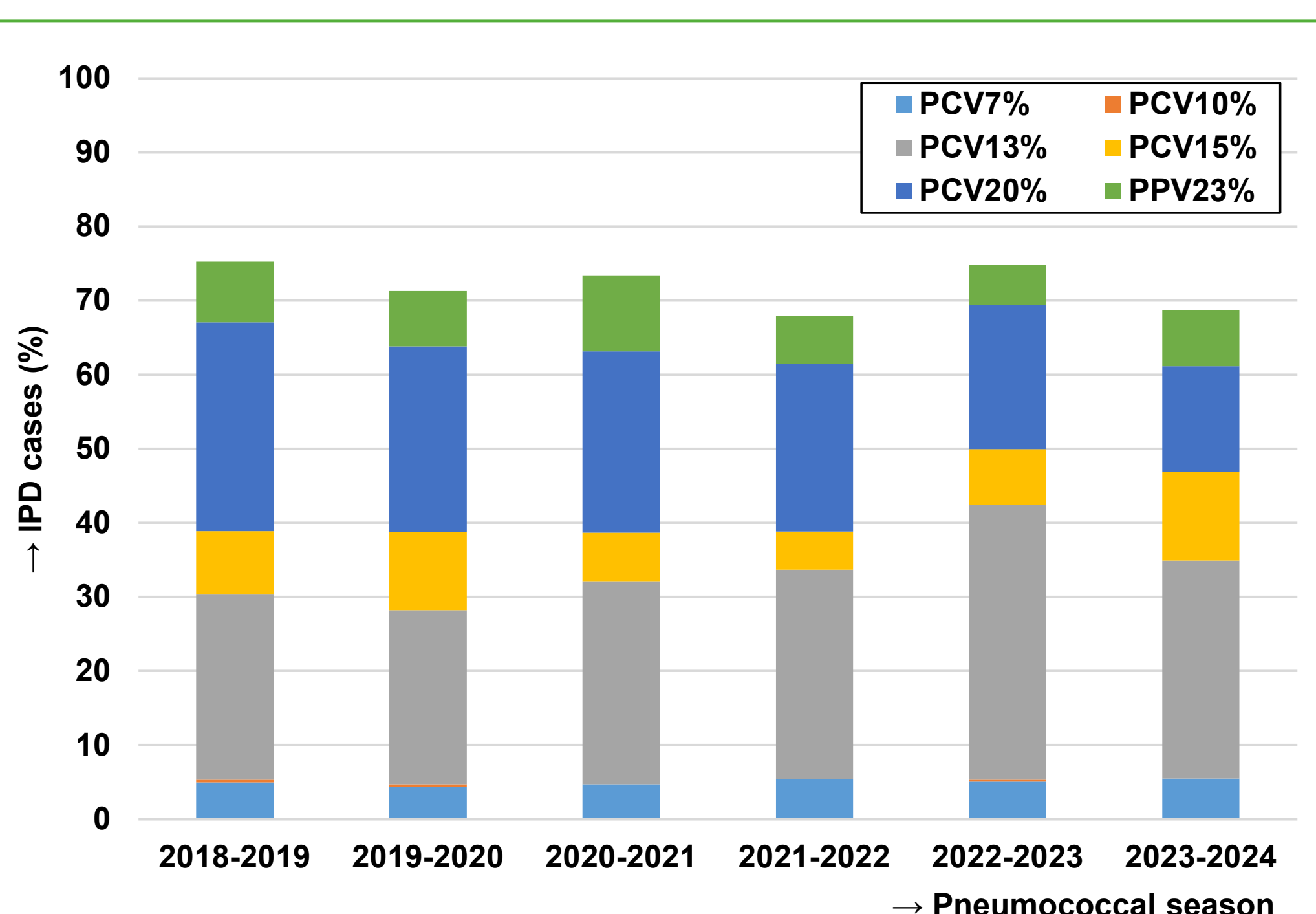


Fig. 7: Coverage of different vaccine formulations of IPD cases among adults 60-75 years of age in Germany

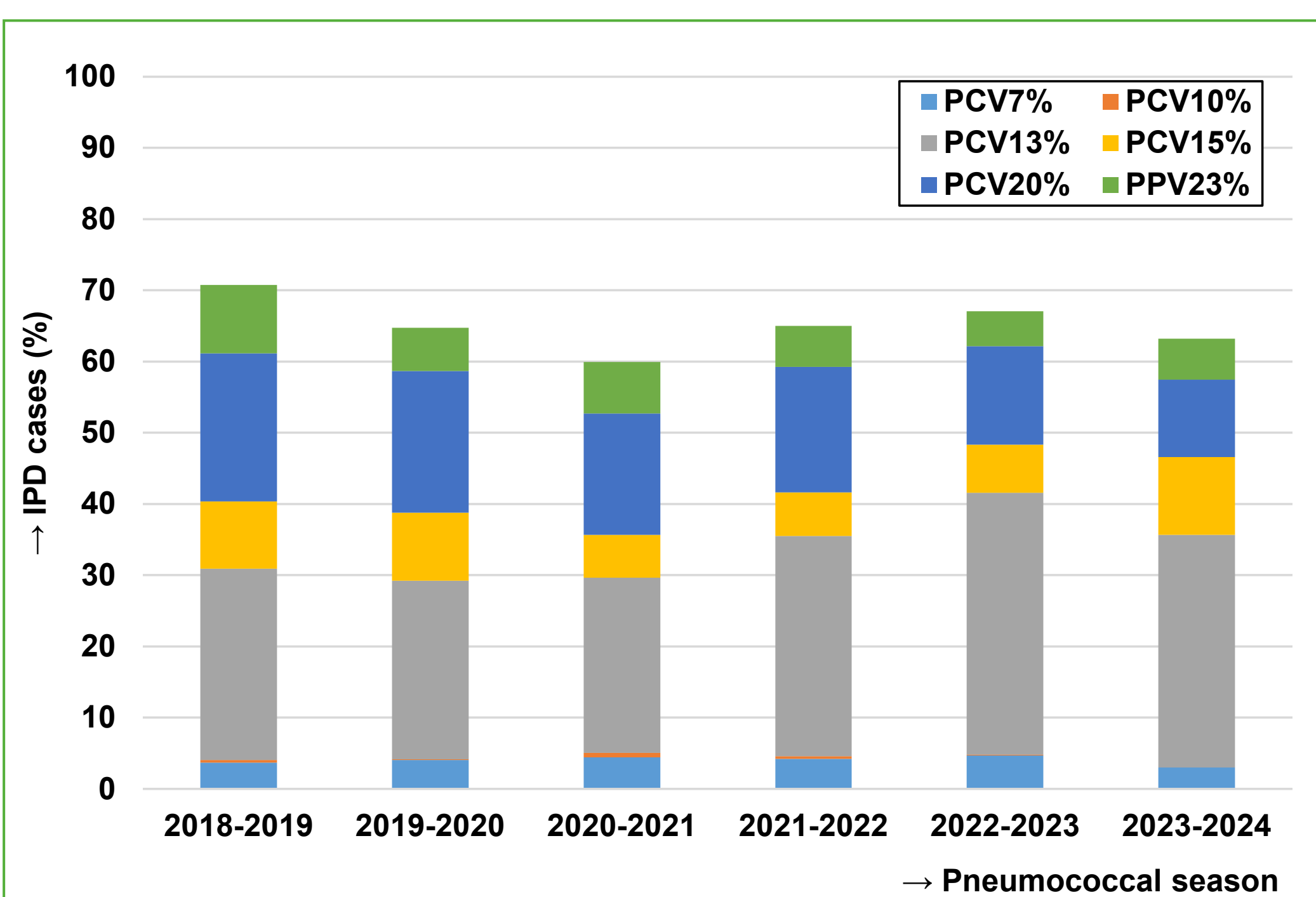


Fig. 8: Coverage of different vaccine formulations of IPD cases among adults >75 years of age in Germany

Table 1: Serotype prevalence in IPD cases among children aged 0-17 years in Germany

Serotype	2018-2019	%	Serotype	2019-2020	%	Serotype	2020-2021	%	Serotype	2021-2022	%	Serotype	2022-2023	%	Serotype	2023-2024	%
total	177	100.0	total	186	100.0	total	70	100.0	total	213	100.0	total	335	100.0	total	140	100.0
PFV23	107	60.5	PFV23	104	55.9	PCV20	29	41.4	PFV23	139	65.3	PFV23	195	58.2	PFV23	70	50.0
PCV20	98	55.4	PCV20	99	53.2	PFV23	29	41.4	PCV20	129	60.6	PCV20	186	55.5	PCV20	68	48.6
PCV15	44	24.9	PCV15	57	30.6	PCV15	12	17.1	PCV15	79	37.1	PCV15	143	42.7	PCV15	48	34.3
PCV13	32	18.1	PCV13	44	23.7	PCV13	9	12.9	PCV13	73	34.3	PCV13	126	37.6	PCV13	41	29.3
PCV10	10	5.6	PCV10	9	4.8	PCV10	1	1.4	PCV10	19	8.9	PCV10	25	7.5	PCV10	12	8.6
PCV7	10	5.6	PCV7	8	4.3	PCV7	1	1.4	PCV7	19	8.9	PCV7	24	7.2	PCV7	11	7.9
10A	21	11.9	3	27	14.5	15C	10	14.3	3	37	17.4	3	73	21.8	38	20	14.3
23B	17	9.6	24F	21	11.3	23B	10	14.3	15C	24	11.3	24F	35	10.4	24F	18	12.9
15B	12	6.8	10A	12	6.5	24F	8	11.4	19A	17	8.0	19A	26	7.8	3	18	12.9
19A	11	6.2	23B	11	5.9	10A	7	10.0	19F	15	7.0	19F	16	4.8	23B	11	7.9
3	10	5.6	15C	10	5.4	19A	6	8.6	10A	15	7.0	23B	15	4.5	19A	10	7.1
15C	10	5.6	19A	8	4.3	11A	4	5.7	15B	14	6.6	22F	14	4.2	19F	8	5.7
22F	9	5.1	8	8	4.3	8	3	4.3	8	12	5.6	10A	13	3.9	8	7	5.0
12F	9	5.1	12F	8	4.3	23A	3	4.3	23B	9	4.2	15B	11	3.3	22F	6	4.3
19F	7	4.0	15B	8	4.3	3	2	2.9	35F	8	3.8	23A	11	3.3	10A	6	4.3
8	7	4.0	22F	7	3.8	22F	2	2.9	24F	7	3.3	35F	11	3.3	11A	5	3.6
24F	7	4.0	35F	7	3.8	12F	2	2.9	11A	5	2.3	8	9	2.7	15C	4	2.9
9N	6	3.4	33F	6	3.2	6B	1	1.4	17F	5	2.3	11A	9	2.7	7C	3	2.1
38	6	3.4	11A	6	3.2	33F	1	1.4	16F	5	2.3	38	9	2.7	NT	2	1.4
11A	5	2.8	38	6	3.2	15B	1	1.4	22F	4	1.9	9N	8	2.4	9N	2	1.4
27	4	2.3	19F	5	2.7	7B	1	1.4	12F	4	1.9	15C	8	2.4	35F	2	1.4
33F	3	1.7	15A	4	2.2	7C	1	1.4	9N	3	1.4	35B	6	1.8	35B	2	1.4
17F	3	1.7	21	4	2.2	15A	1	1.4	21	3	1.4	6C	5	1.5	15B	2	1.4
21	3	1.7	27	4	2.2	16F	1	1.4	35B	3	1.4	7C	5	1.5	4	2	1.4
23A	3	1.7	35B	3	1.6	28A	1	1.4	33F	2	0.9	15A	5	1.5	14	1	0.7
35B	3	1.7	6B	2	1.1	28F	1	1.4	20	2	0.9	16F	5	1.5	7F	1	0.7
29F	2	1.1	9N	2	1.1	35B	1	1.4	10B	2	0.9	24B	5	1.5	6A	1	0.7
10B	2	1.1	20	2	1.1	35F	1	1.4	10F	2	0.9	21	4	1.2	33F	1	0.7
15A	2	1.1	10B	2	1.1	Serogr. 35	1	1.4	27	2	0.9	33F	3	0.9	23A	1	0.7
28F	2	1.1	16F	2	1.1	NT	1	1.4	38	2	0.9	17F	3	0.9	17F	1	0.7

Table 2: Serotype prevalence in IPD cases among adults aged ≥18 years in Germany

Serotype	2018-2019	%	Serotype	2019-2020	%	Serotype	2020-2021	%	Serotype	2021-2022	%	Serotype	2022-2023	%	Serotype	2023-2024	%
total	3183	100.0	total	2393	100.0	total	1001	100.0	total	2264	100.0	total	4958	100.0	total	2472	100.0
PCV20	2365	74.3	PCV20	1705	71.2	PCV20	696	69.5	PCV20	1554	68.6	PCV20	3627	73.2	PCV20	1696	68.6
PCV15	1231	38.7	PCV15	925	38.7	PCV15	367	36.7	PCV15	920	40.6	PCV15	2429	49.0	PCV15	1166	47.2
PCV13	959	30.1	PCV13	709	29.6	PCV13	307	30.7	PCV13	801	35.4	PCV13	2102	42.4	PCV13	899	36.4
PCV10	187	5.9	PCV10	149	6.2	PCV10	69	6.9	PCV10	166	7.3	PCV10	359	7.2	PCV10	171	6.9
PCV7	171	5.4	PCV7	142	5.9	PCV7	66	6.6	PCV7	158	7.0	PCV7	343	6.9	PCV7	170	6.9
3	643	20.2	3	450	18.8	3	198	19.8	3	513	22.7	3	1510	30.5	3	635	25.7
8	446	14.0	8	344	14.4	8	156	15.6	8	282	12.5	8	552	11.1	22F	239	9.7
22F	231	7.3	22F	181	7.6	9N	65	6.5	19A	113	5.0	22F	302	6.1	8	189	7.6
9N	203	6.4	9N	124	5.2	22F	46	4.6	23B	109	4.8	9N	218	4.4	9N	124	5.0
12F	157	4.9	12F	111	4.6	23B	39	3.9	9N	105	4.6	19A	214	4.3	23A	108	4.4
19A	118	3.7	19A	96	4.0	19A	37	3.7	22F	102	4.5	23A	181	3.7	38	105	4.2
23B	99	3.1	23A	78	3.3	35F	37	3.7	4	92	4.1	4	179	3.6	4	104	4.2
11A	98	3.1	23B	78	3.3	23A	35	3.5	11A	79	3.5	23B	159	3.2	24F	94	3.8
10A	91	2.9	4	70	2.9	4	33	3.3	35F	78	3.4	11A	153	3.1	19A	92	3.7
23A	86	2.7	15A	68	2.8	11A	33	3.3	15A	70	3.1	24F	144	2.9	23B	80	3.2
15A	81	2.5	24F	66	2.8	15A	29	2.9	10A	66	2.9	15A	126	2.5	11A	72	2.9
35F	78	2.5	11A	66	2.8	23A	27	2.7	23A	66	2.9	35F	108	2.2	35F	59	2.4
4	67	2.1	10A	59	2.5	16F	24	2.4	35B	53	2.3	10A	103	2.1	10A	55	2.2
24F	62	1.9	35F	48	2.0	35B	23	2.3	24F	49	2.2	19F	90	1.8	7C	53	2.1
6C	59	1.9	6C	47	2.0	24F	19	1.9	15B	47	2.1	6C	89	1.8	15A	53	2.1
15B	56	1.8	30F	37	1.5	33F	14	1.4	6C	47	2.1	15B	80	1.6	19F	35	1.4
38	56	1.8	15B	37	1.5	33F	14	1.4	7C	42	1.9	7C	79	1.6	42	34	1.4
16F	54	1.7	33F	35	1.5	6C	14	1.4	16F	38	1.7	16F	67	1.4	6C	30	1.2
15B	53	1.7	35B	35	1.5	15C	14	1.4	19F	36	1.6	35B	67	1.4	15C	31	1.3
35B	45	1.4	38	35	1.5	17F	13	1.3	31	31	1.4	31	56	1.1	35B	29	1.2
19F	43	1.4	16F	34	1.4	17F	13	1.3	17F	24	1.1	38	56	1.1	33F	28	1.1
33F	41	1.3	30F	30	1.3	12F	12	1.2	24	24	1.1	12F	38	0.8	31	28	1.1
17F	39	1.2	17F	27	1.2	17F	12	1.2	15C	20	0.9	17F	38	0.8	15B	24	1.0
15C	37	1.2	15B	26	1.1	7C	9	0.9	33F	17	0.8	15C	37	0.7	16F	24	1.0