

# PFAS and dl-POPs in Air by Expert Laboratory



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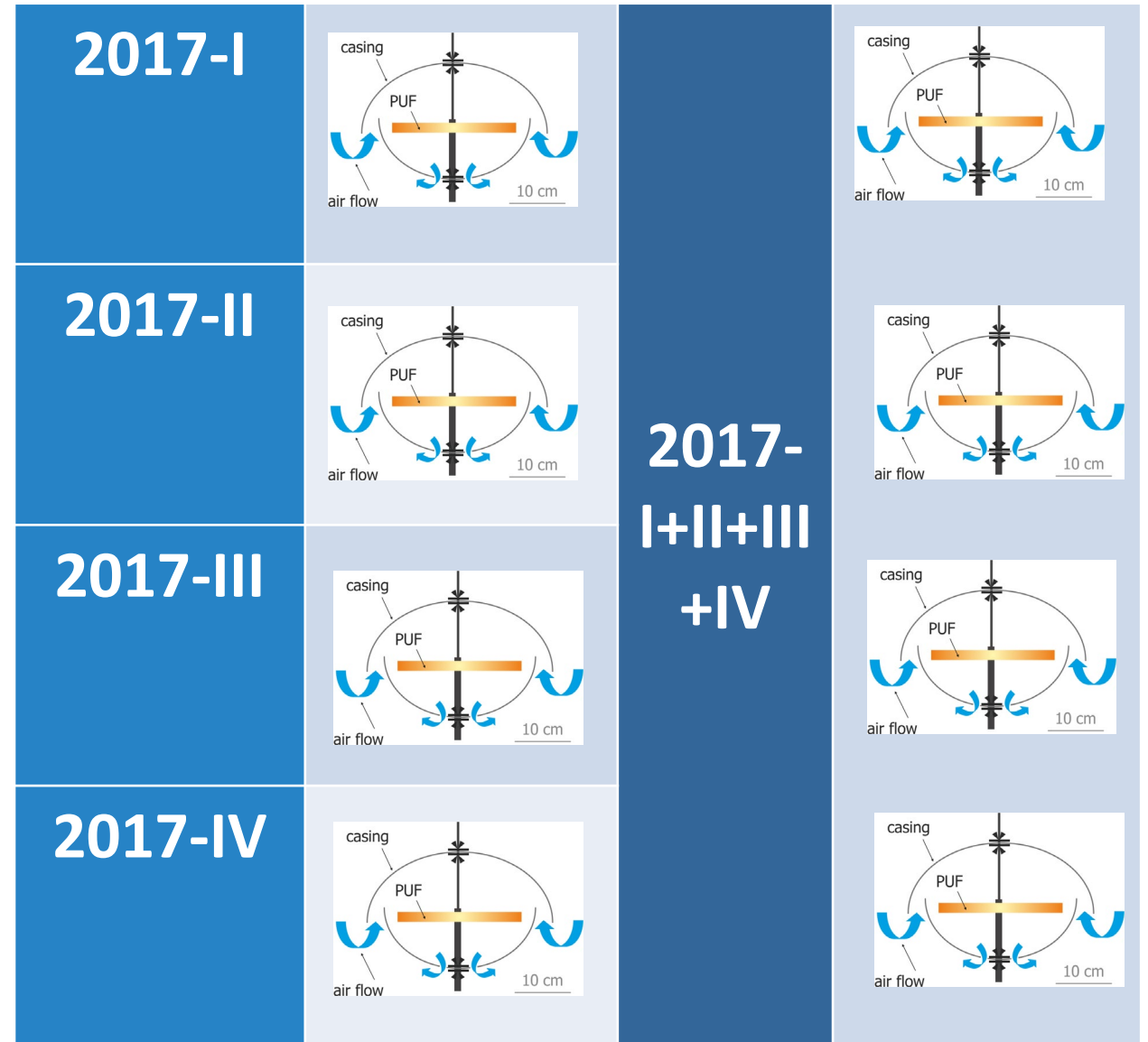
# Core matrix "air"

- dl-POPs in PAS PUFs
  - already included and analyzed in GMP1 (reference years 2010/2011)
  - from GMP1: 45 results available for comparison
  - From GMP2: 182 results available
- PFAS
  - From GMP1: not included, no data for comparison available
  - From GMP2: More than 350 PUFs received and analyzed
    - \* Some PUFs so deteriorated that no identification and quantification was possible
    - \* Multiple analyses with single PUFs for PFAS and PFOS precursors (only FOSA detectable) and combinations of PUFs from the same year; esp. to quantify the PFOS precursors
    - \* 9 samples from Zambia very exceptional

# Samples - Reporting

All samples/results are defined as

- ISO-3 code for country
- Sampling Year – YYYY
- Season (I, II, III or IV)
  
- Each season is defined as 90 days or 3 months
  
- Results are normalized to 1 PUF and 3 months exposure



# Sampling time and samples

Region	Africa	Africa	Africa	Africa	Africa	Africa	Africa
Sampling year	2017	2017-I	2017	2017	2017	2018+2019	2018+2019
Season code	I	I+II+III	IV	I+II+III+IV		I+II+III+I	
Year-season	2017-I	Uganda	2017-IV	2017-I+II+III+IV		2018+2019-I+II+III+I	
Exposure months	9 months	normalized 3 months	3 months	12 months	normalized 3 months	15 months	normalized 3 months
# of periods	P3	P1 calc	P1	P4	P1	P5	P1
Denominator	3		1				
Full country name	Uganda	Uganda	Uganda	Uganda	Uganda	Uganda	Uganda
Country ISO-3	UGA		UGA				
Sample ID	UGA (2017-I)	UGA (2017-I+II+III)	UGA (2017-IV)	UGA (2017-I+II+III+IV)	UGA (2017-I+II+III+IV)	UGA (2018+2019-I+II+III+I)	UGA (2018+2019-I+II+III+I)
	pg/3 PUF	pg/PUF	pg/PUF	pg/4 PUF	pg/PUF	pg/5 PUF	pg/PUF
2378-CI4DD	1.87	0.62	<0.4806	2.03	0.51	2.09	0.42
12378-CI5DD	3.84	1.28	<1.1393	4.43	1.11	5.88	1.18
123478-CI6DD	<1.5372	<1.5372	<0.5224	0.96	0.24	2.13	0.43
123678-CI6DD	2.98	0.99	0.73	3.06	0.77	2.73	0.55
123789-CI6DD	2.73	0.91	<0.6528	2.12	0.53	3.04	0.61
1234678-CI7DD	8.55	2.85	3.14	11.01	2.75	14.33	2.87
CI8DD	17.66	5.89	7.46	25.85	6.46	33.65	6.73
2378-CI4DF	17.54	5.85	4.63	23.20	5.80	27.05	5.41
12378-CI5DF	14.07	4.69	3.65	14.68	3.67	24.80	4.96
23478-CI5DF	13.06	4.35	3.64	14.99	3.75	24.66	4.93
123478-CI6DF	7.57	2.52	1.40	10.12	2.53	13.42	2.68
123678-CI6DF	7.31	2.44	2.88	9.49	2.37	13.80	2.76
123789-CI6DF	<1.1259	<1.1259	<0.8475	<2.0027	<2.0027	<0,8969	<0,8969
234678-CI6DF	5.11	1.70	1.67	6.44	1.61	8.75	1.75
1234678-CI7DF	7.29	2.43	3.19	10.47	2.62	15.54	3.11
1234789-CI7DF	<1.0666	<1.0666	<0.9142	1.37	0.34	2.18	0.44
CI8DF	3.14	1.05	<2.0673	3.71	0.93	4.17	0.83
<b>2005-TEQPCDD/PCDF</b>	<b>14.54</b>	<b>4.85</b>	<b>2.40</b>	<b>17.18</b>	<b>4.29</b>	<b>23.53</b>	<b>4.71</b>
PCB 77	191.17	63.72	80.35	249.40	62.35	514.59	102.92
PCB 81	20.59	6.86	7.49	26.96	6.74	45.51	9.10
PCB 126	32.15	10.72	7.66	39.71	9.93	57.55	11.51
PCB 169	5.05	1.68	<1.8958	<9.6971	<9.6971	10.45	2.09
PCB 105	971.61	323.87	236.45	1,092.51	273.13	1,841.10	368.22
PCB 114	63.51	21.17	15.32	73.90	18.47	110.12	22.02
PCB 118	2,362.17	787.39	524.32	2,714.90	678.73	3,689.68	737.94
PCB 123	22.44	7.48	9.60	40.32	10.08	53.79	10.76
PCB 156	202.00	67.33	33.53	237.34	59.34	194.72	38.94
PCB 157	46.83	15.61	9.14	49.89	12.47	50.68	10.14
PCB 167	88.37	29.46	18.42	98.87	24.72	91.95	18.39
PCB 189	8.49	2.83	3.68	11.92	2.98	10.79	2.16
<b>WHO2005-TEQPCB</b>	<b>3.51</b>	<b>1.17</b>	<b>0.80</b>	<b>4.13</b>	<b>1.03</b>	<b>6.31</b>	<b>1.26</b>
<b>WHO2005-TEQttotal</b>	<b>18.04</b>	<b>6.01</b>	<b>3.20</b>	<b>21.31</b>	<b>5.33</b>	<b>29.85</b>	<b>5.97</b>

# Definitions – World Bank indicators

Income according to World Bank classification (WBC)

WBC class	GNI per capita, Atlas method (current US\$)
High income	> 12,375
Upper middle income	3,996-12,375
Lower middle income	1,026-3,995
Low income	<= 1,025

Population density based on World Bank statistics

PD_Code	Range: Inhabitants <i>per</i> km <sup>2</sup>
A	<24.9999
B	>25-<99.99
C	>100-<499.9
D	>500-<999.99
E	>1,000-<10,000
F	>10,000

# PAS/PUF Results – dl-POPs

## A.1 GMP1 and GMP2 - All

# Overview number of samples dl-POPs - GMP1+GMP2

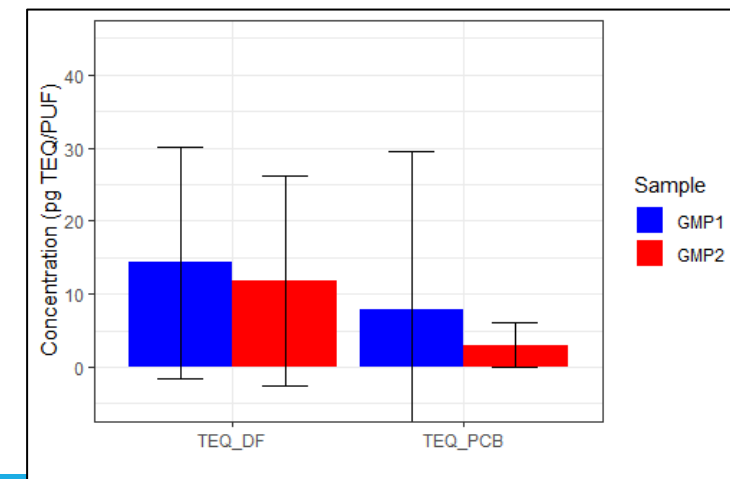
	Africa (N=94)	Asia (N=28)	GRULAC (N=79)	PAC (N=26)	Overall (N=227)
<b>Region</b>					
<b>Africa</b>	94 (100%)	0 (0%)	0 (0%)	0 (0%)	94 (41.4%)
<b>Asia</b>	0 (0%)	28 (100%)	0 (0%)	0 (0%)	28 (12.3%)
<b>GRULAC</b>	0 (0%)	0 (0%)	79 (100%)	0 (0%)	79 (34.8%)
<b>PAC</b>	0 (0%)	0 (0%)	0 (0%)	26 (100%)	26 (11.5%)
<b>GMP</b>					
<b>GMP1</b>	10 (10.6%)	0 (0%)	27 (34.2%)	8 (30.8%)	45 (19.8%)
<b>GMP2</b>	84 (89.4%)	28 (100%)	52 (65.8%)	18 (69.2%)	182 (80.2%)

Status:  
2020-10-01

# Overview results dl-POPs – GMP1+GMP2

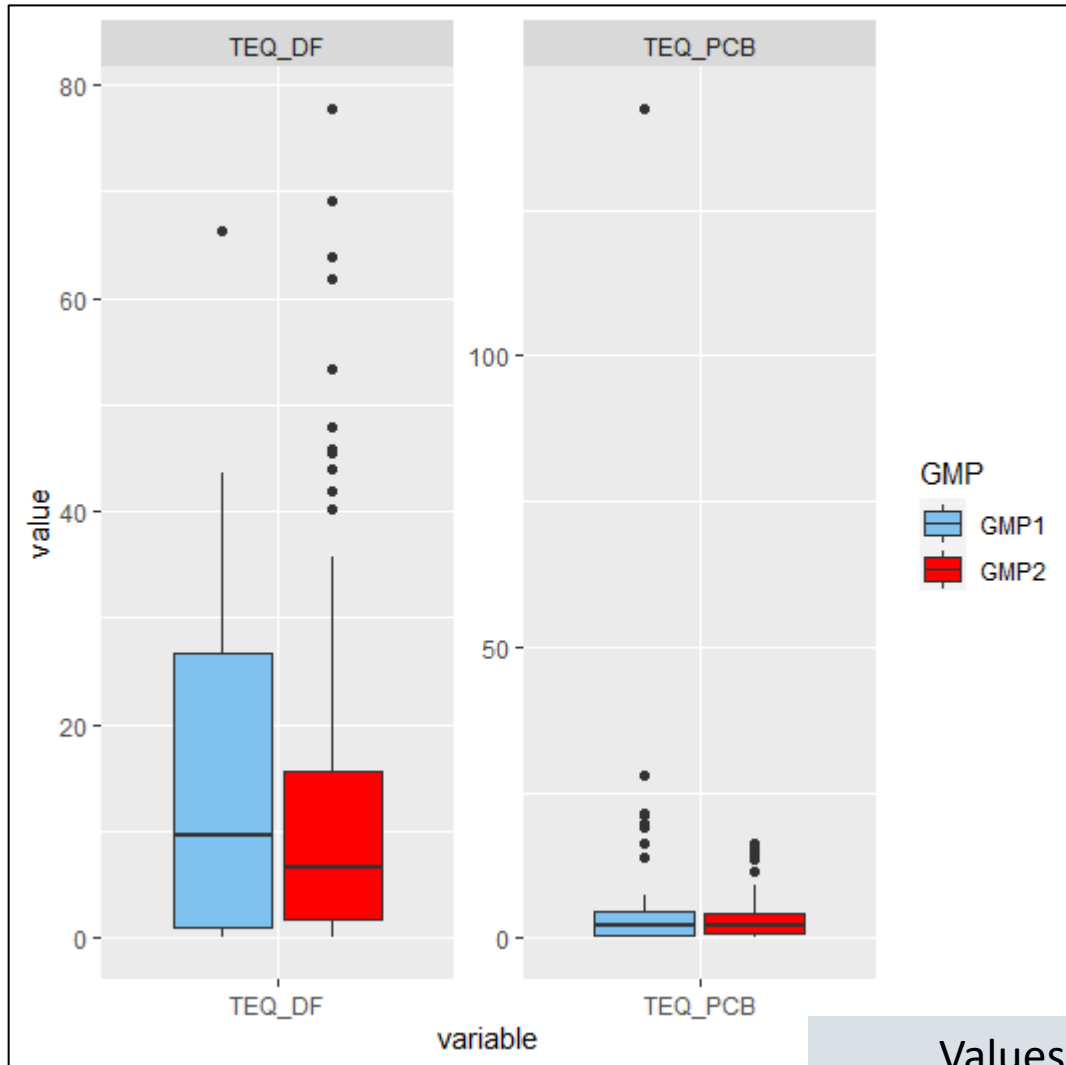
	Africa (N=94)	Asia (N=28)	GRULAC (N=79)	PAC (N=26)	Overall (N=227)
<b>TEQ_DF (pg TEQ/PUF)</b>					
Mean (SD)	13.3 (18.0)	13.5 (12.3)	13.1 (12.3)	4.90 (7.12)	12.3 (14.7)
Median [Min, Max]	3.62 [0.0552, 77.7]	9.80 [0.162, 40.3]	11.1 [0, 66.3]	1.00 [0.000495, 27.0]	6.80 [0, 77.7]
<b>TEQ_PCB (pg TEQ/PUF)</b>					
Mean (SD)	3.53 (4.12)	3.32 (2.51)	5.76 (16.3)	0.982 (1.22)	3.99 (10.1)
Median [Min, Max]	1.94 [0.000374, 20.9]	3.10 [0.00305, 8.57]	2.92 [0.00369, 142]	0.438 [0, 4.32]	2.25 [0, 142]

	GMP1 (N=45)	GMP2 (N=182)	Overall (N=227)
<b>TEQ_DF (pg TEQ/PUF)</b>			
Mean (SD)	14.3 (15.9)	11.8 (14.4)	12.3 (14.7)
Median [Min, Max]	9.70 [0, 66.3]	6.59 [0.000495, 77.7]	6.80 [0, 77.7]
<b>TEQ_PCB (pg TEQ/PUF)</b>			
Mean (SD)	7.91 (21.6)	3.02 (3.03)	3.99 (10.1)
Median [Min, Max]	2.11 [0, 142]	2.25 [0.000374, 16.4]	2.25 [0, 142]

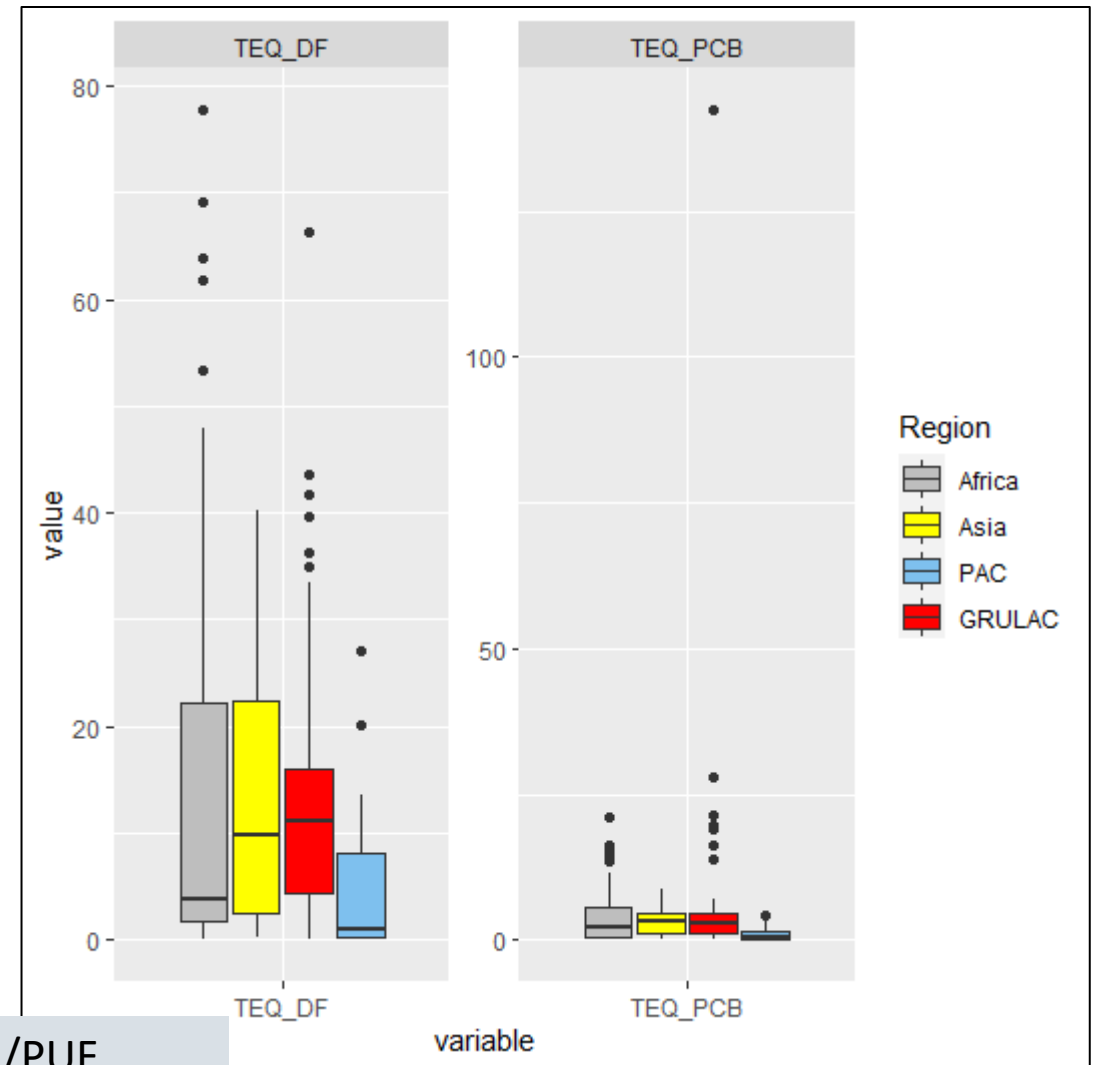




# GMP1 vs. GMP2

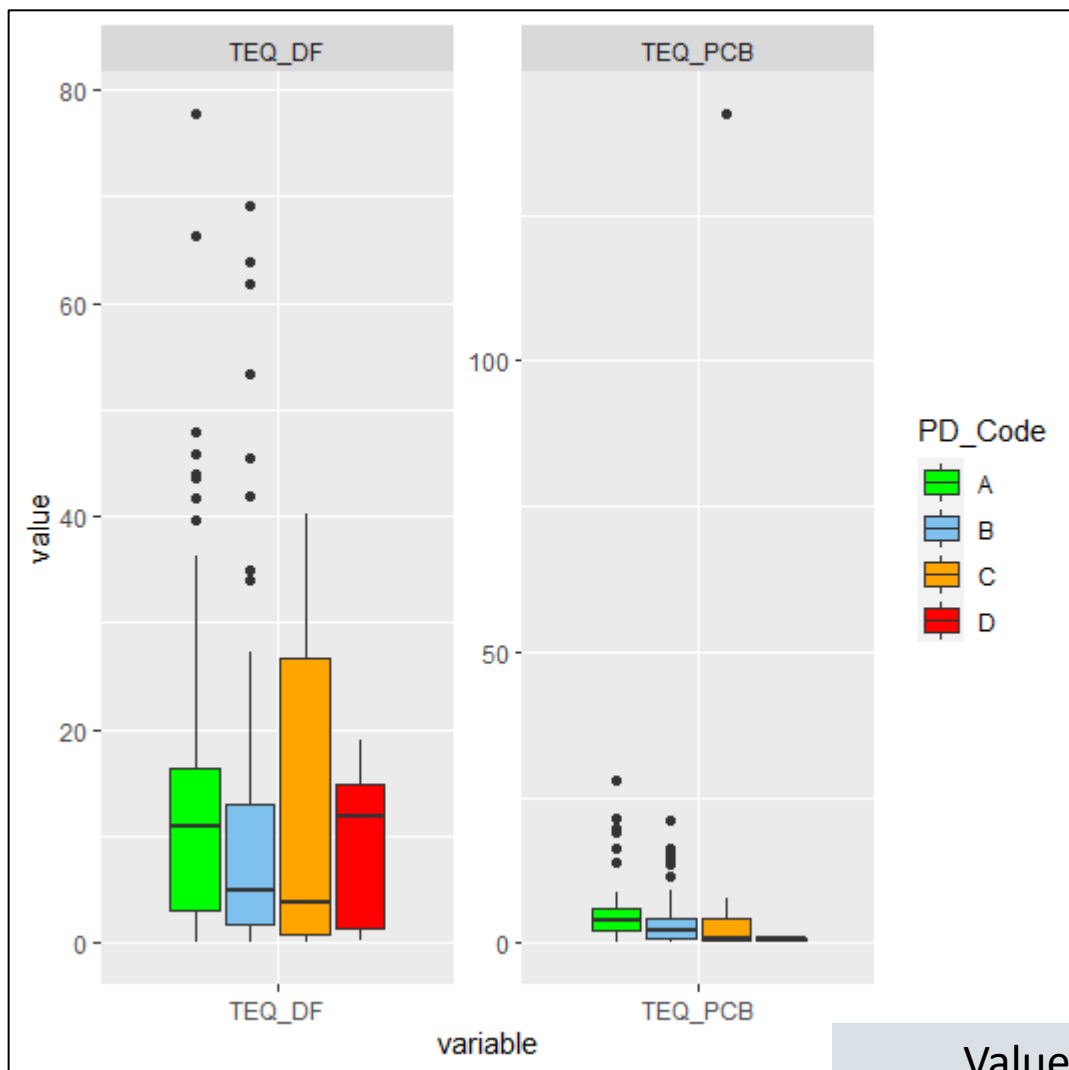


# Regions

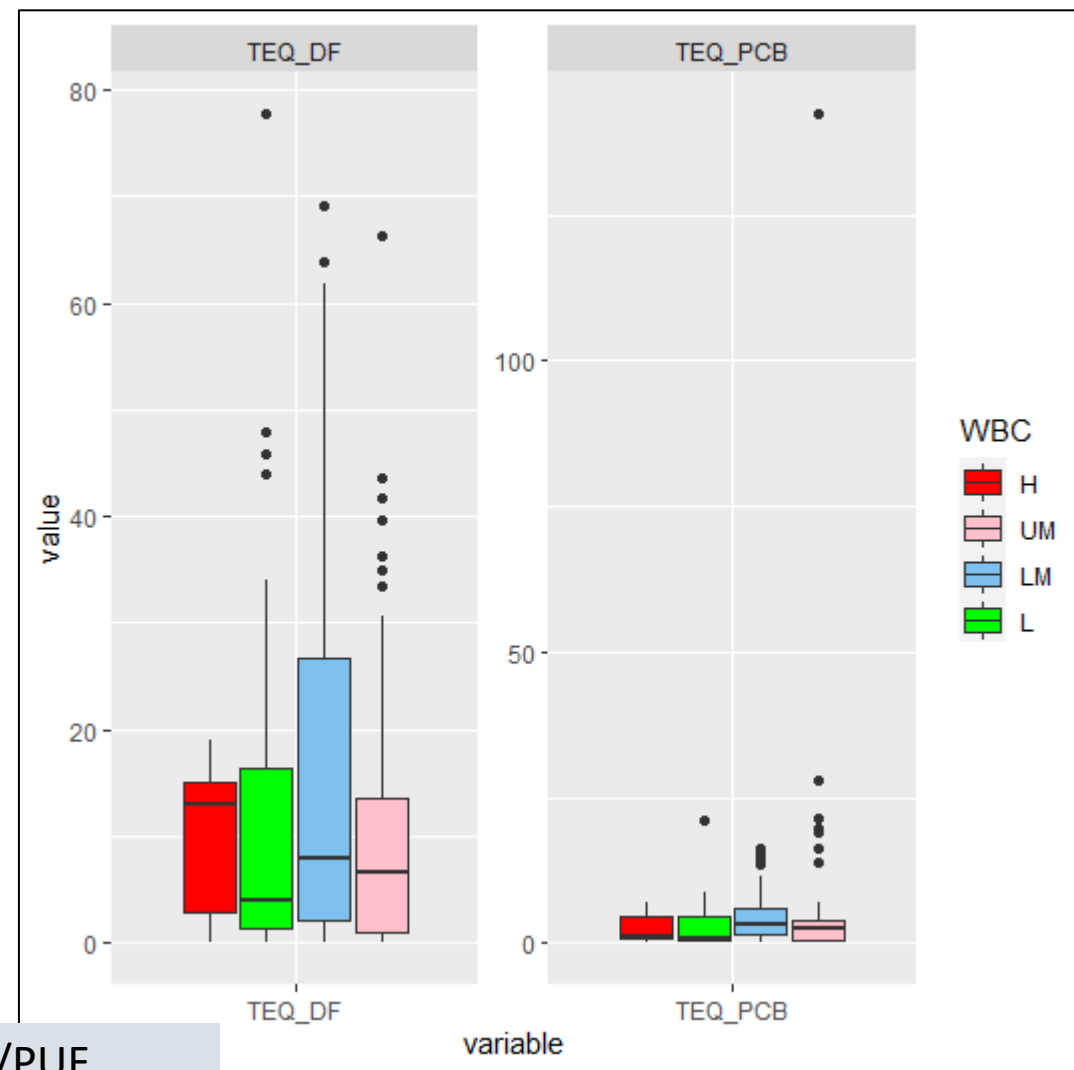


Values in pg TEQ/PUF

# Population density

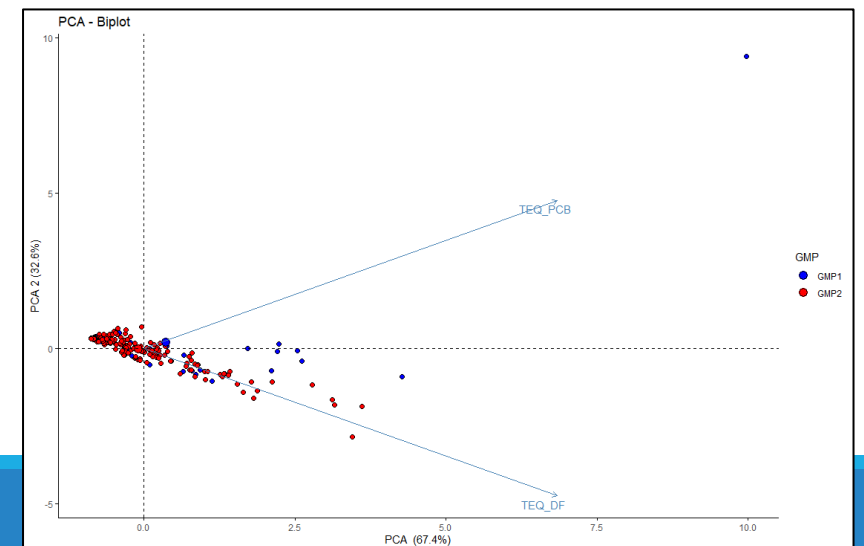
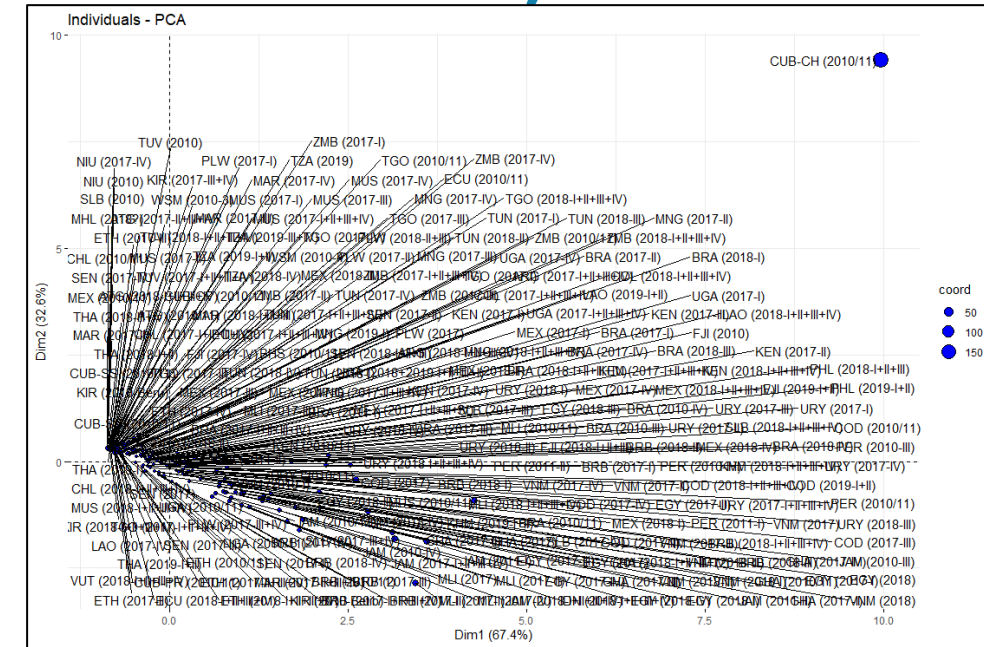
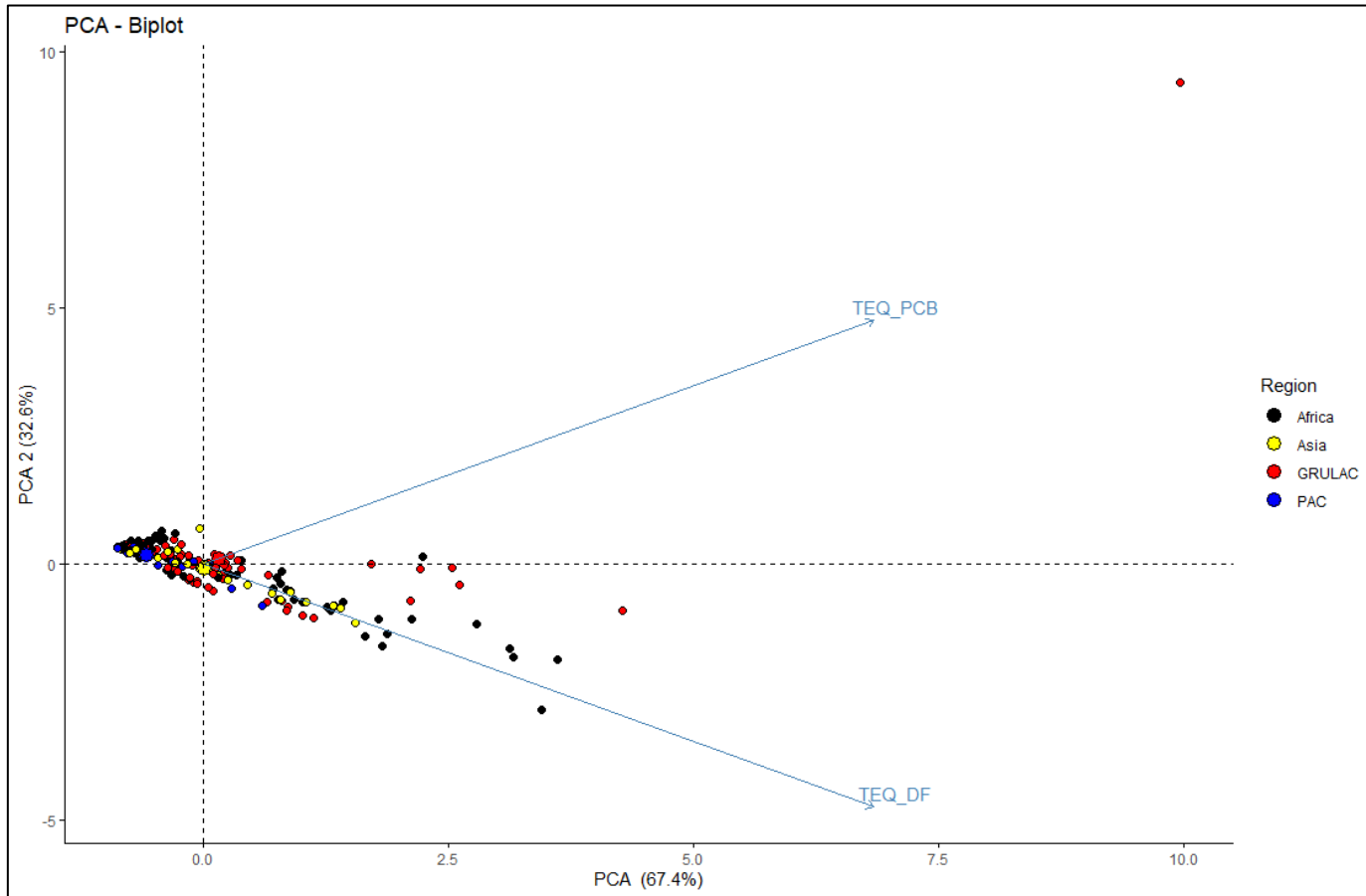


# Income



Values in pg TEQ/PUF

# Samples GMP1 and GMP2 (distribution)



# PAS/PUF Results – dl-POPs

## A.2 GMP 2 - Across All Projects

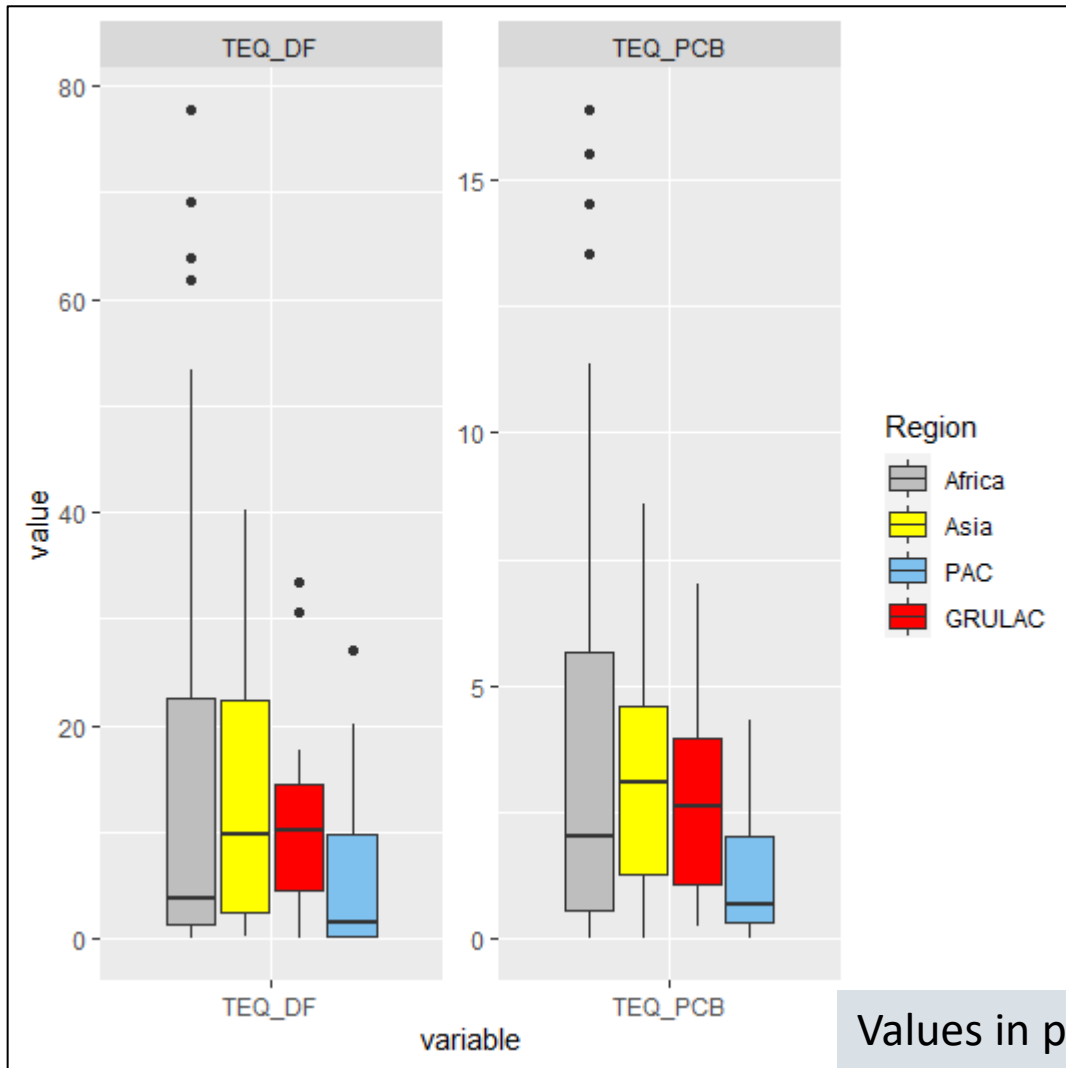
# Number/classification PAS/PUFs GMP2 for dl-POPs

	Africa (N=83)	Asia (N=28)	GRULAC (N=52)	PAC (N=19)	Overall (N=182)
<b>Region</b>					
<b>Africa</b>	83 (100%)	0 (0%)	0 (0%)	0 (0%)	83 (45.6%)
<b>Asia</b>	0 (0%)	28 (100%)	0 (0%)	0 (0%)	28 (15.4%)
<b>GRULAC</b>	0 (0%)	0 (0%)	52 (100%)	0 (0%)	52 (28.6%)
<b>PAC</b>	0 (0%)	0 (0%)	0 (0%)	19 (100%)	19 (10.4%)
<b>YYYY</b>					
<b>Y2017</b>	58 (69.9%)	9 (32.1%)	26 (50.0%)	11 (57.9%)	104 (57.1%)
<b>Y2018</b>	21 (25.3%)	12 (42.9%)	26 (50.0%)	7 (36.8%)	66 (36.3%)
<b>Y2019</b>	4 (4.8%)	7 (25.0%)	0 (0%)	1 (5.3%)	12 (6.6%)
<b>Sample</b>					
<b>a</b>	27 (32.5%)	11 (39.3%)	20 (38.5%)	12 (63.2%)	70 (38.5%)
<b>q</b>	56 (67.5%)	17 (60.7%)	32 (61.5%)	7 (36.8%)	112 (61.5%)

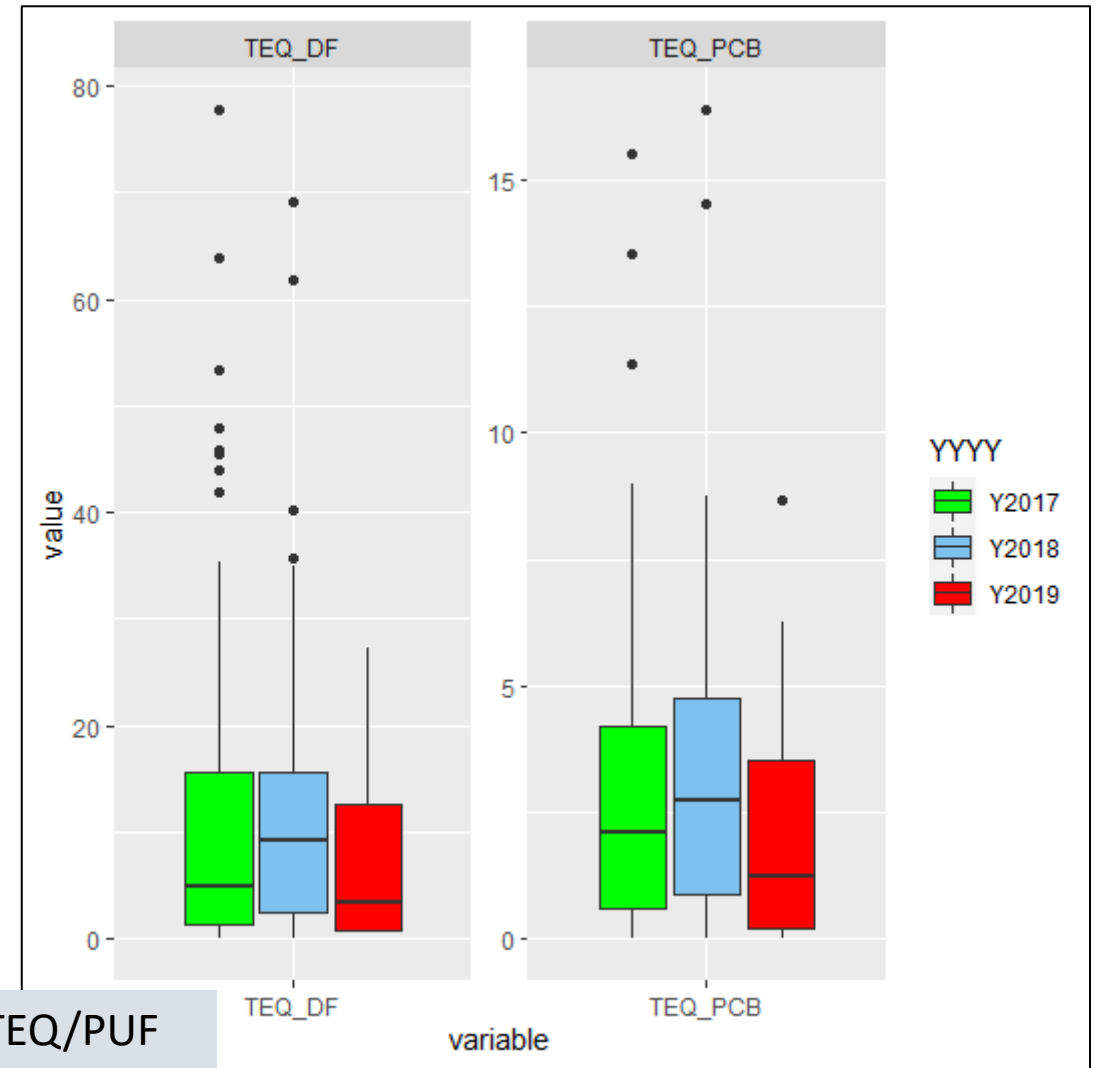
# Summary results PAS/PUFs GMP2 for dl-POPs

	Africa (N=83)	Asia (N=28)	GRULAC (N=52)	PAC (N=19)	Overall (N=182)
<b>DF (pg TEQ/PUF)</b>					
Mean (SD)	13.6 (18.7)	13.5 (12.3)	10.2 (6.92)	5.75 (7.76)	11.8 (14.4)
Median [Min, Max]	3.77 [0.0552, 77.7]	9.80 [0.162, 40.3]	10.2 [0.141, 33.5]	1.49 [0.000495, 27.0]	6.59 [0.000495, 77.7]
<b>PCB (pg TEQ/PUF)</b>					
Mean (SD)	3.47 (3.82)	3.32 (2.51)	2.79 (1.87)	1.22 (1.26)	3.02 (3.03)
Median [Min, Max]	2.03 [0.000374, 16.4]	3.10 [0.00305, 8.57]	2.60 [0.253, 7.01]	0.675 [0.00234, 4.32]	2.25 [0.000374, 16.4]

# Regions

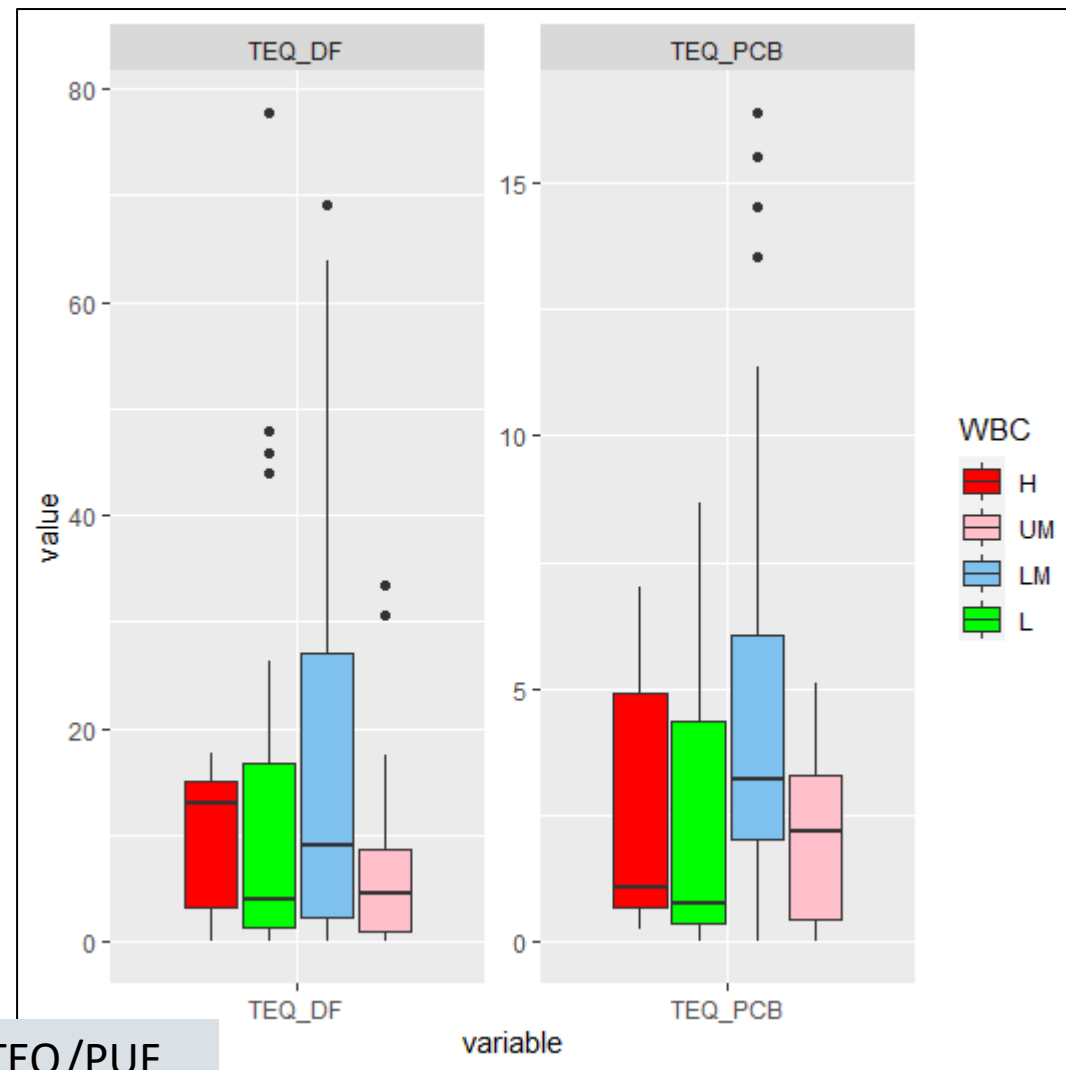
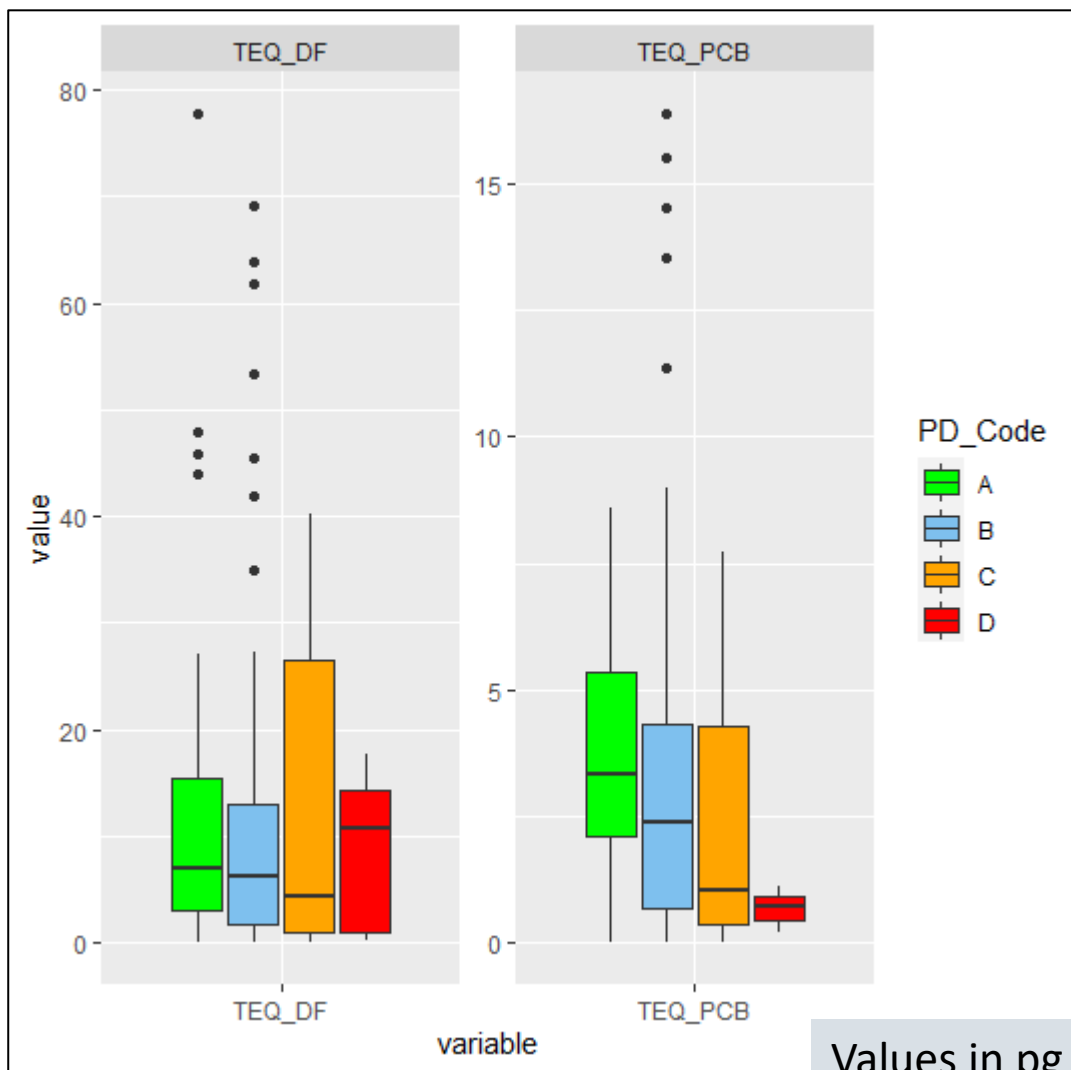


# Sampling year



# Population density

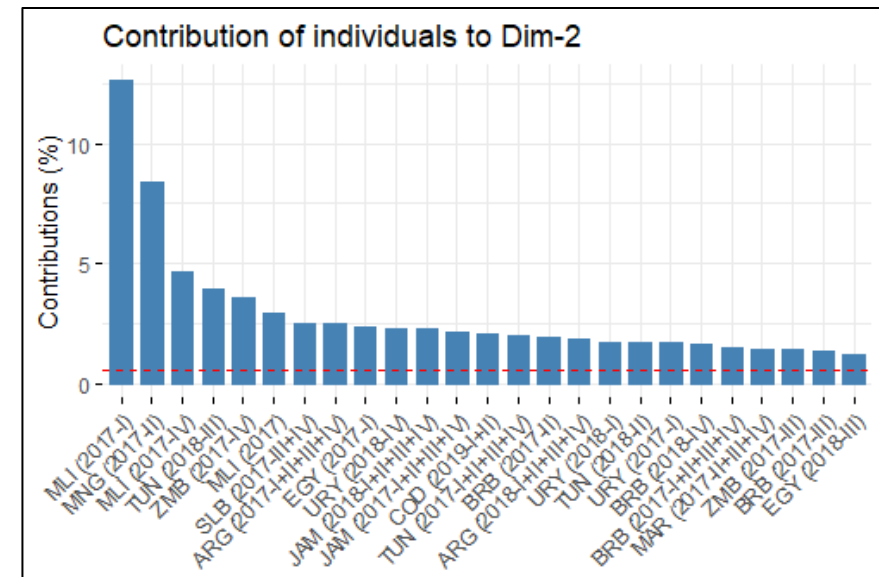
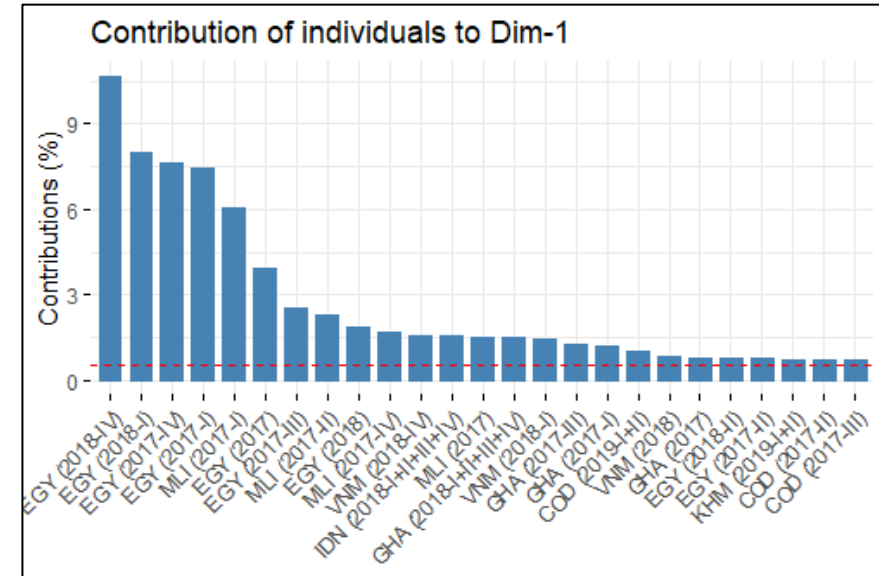
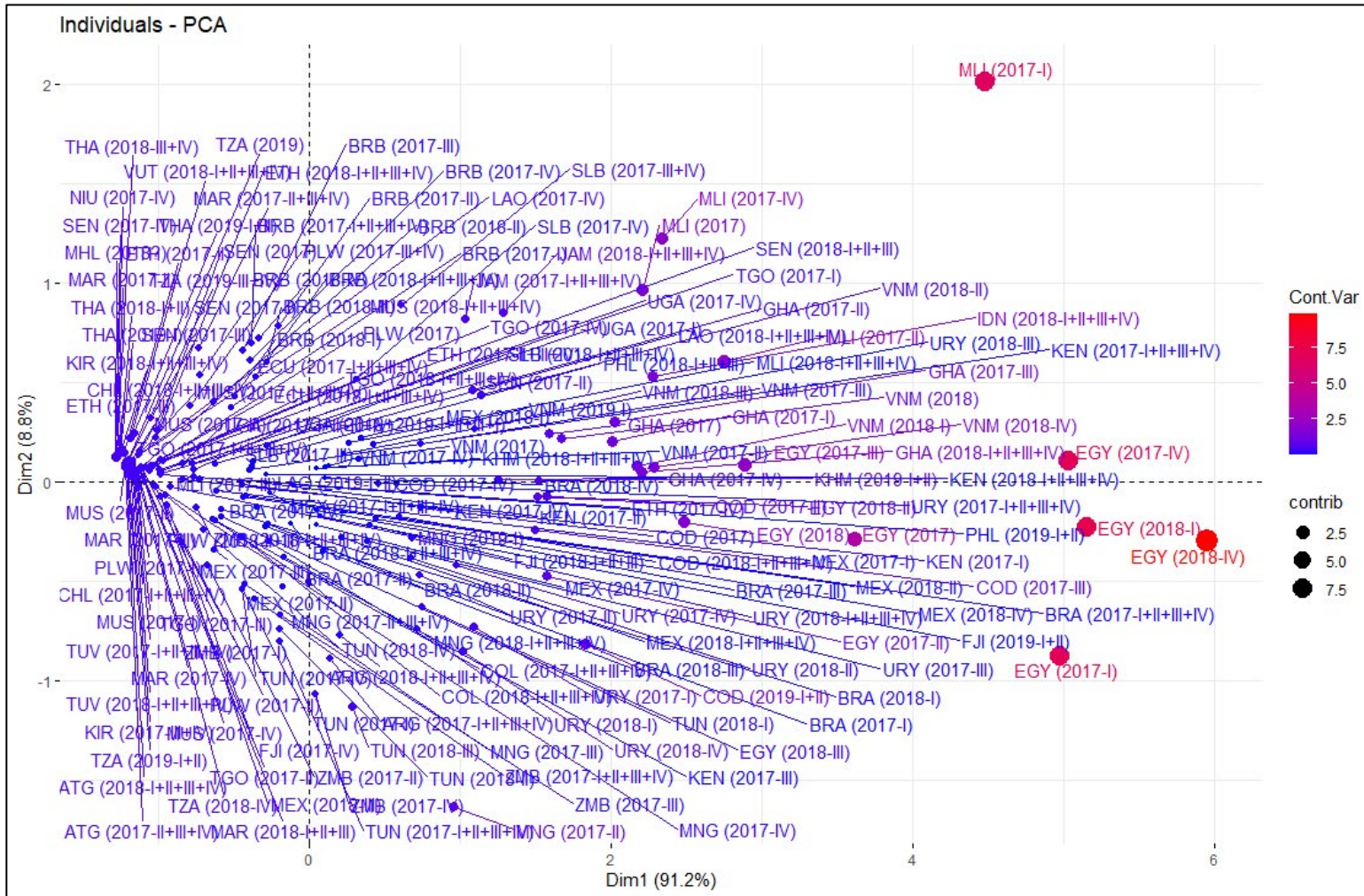
# Income



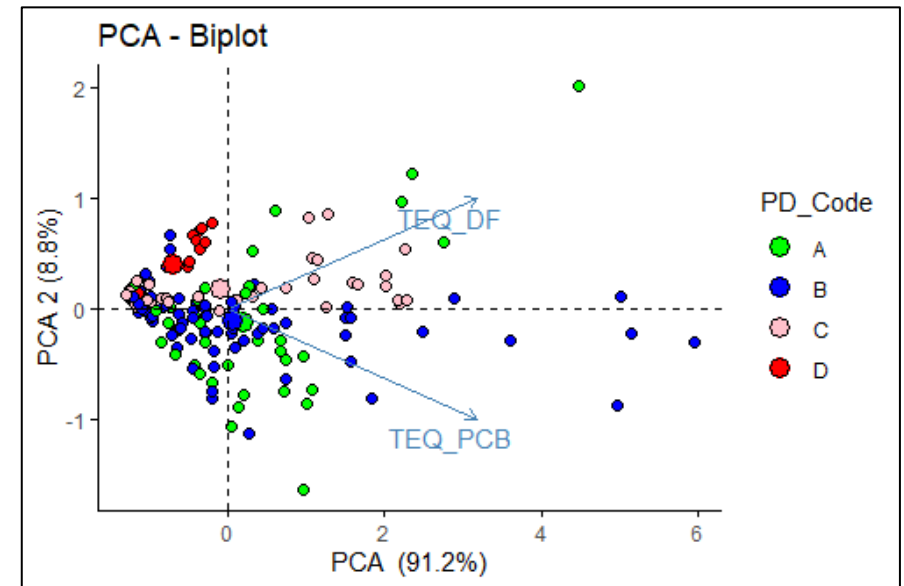
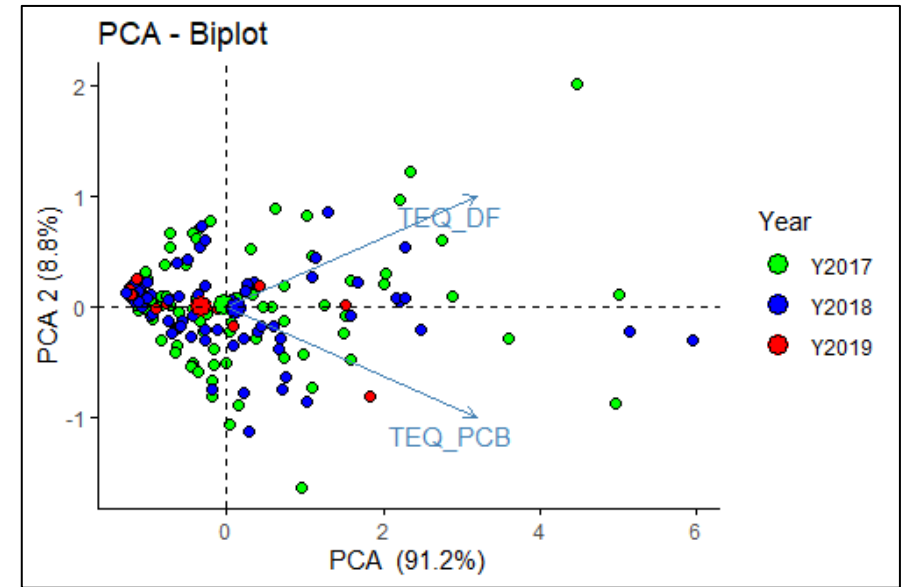
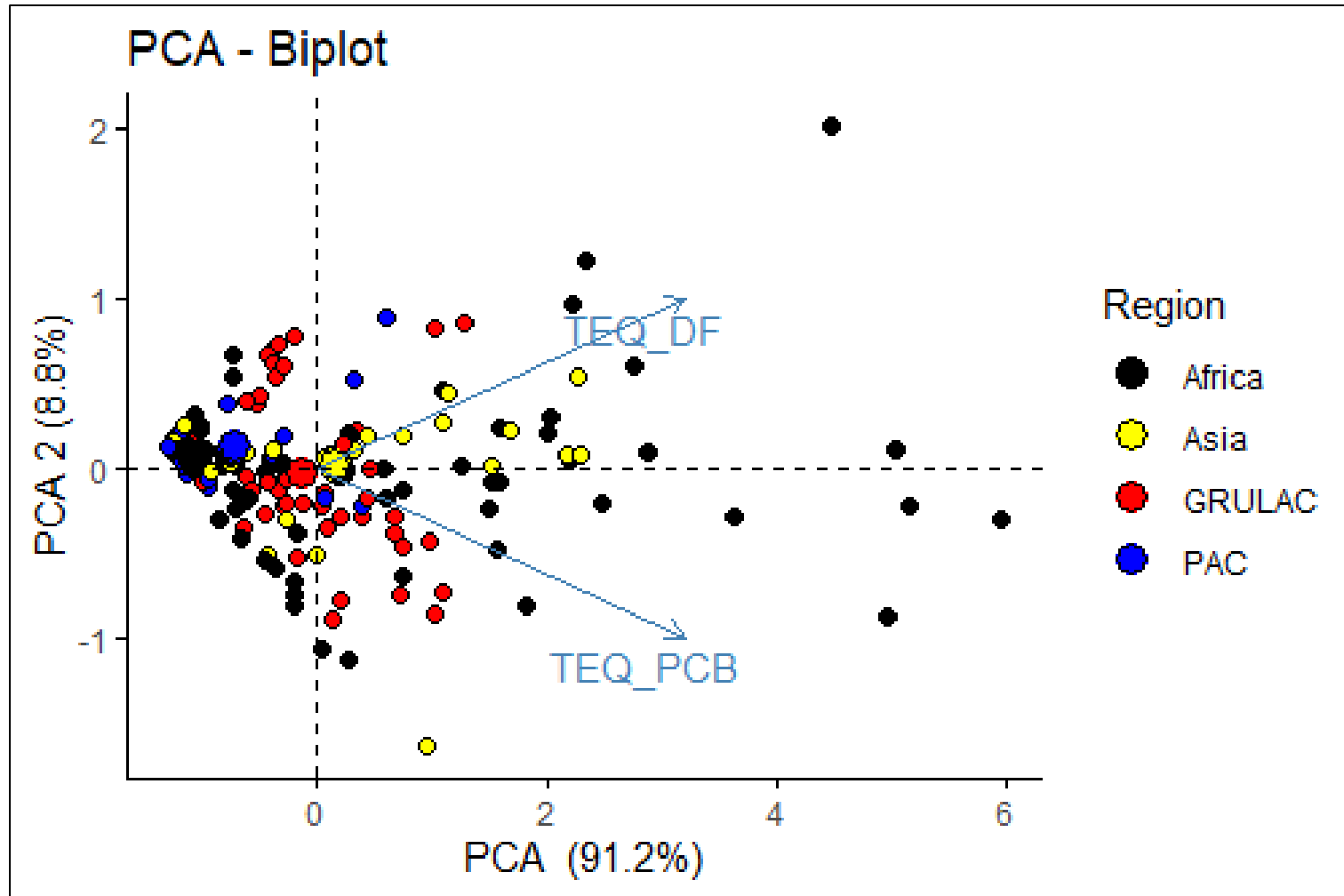
Values in pg WHO<sub>2005</sub>-TEQ/PUF



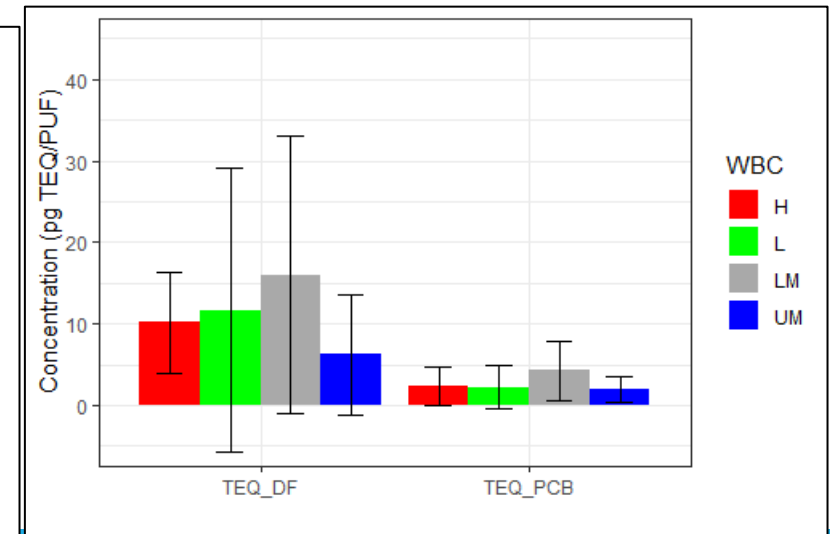
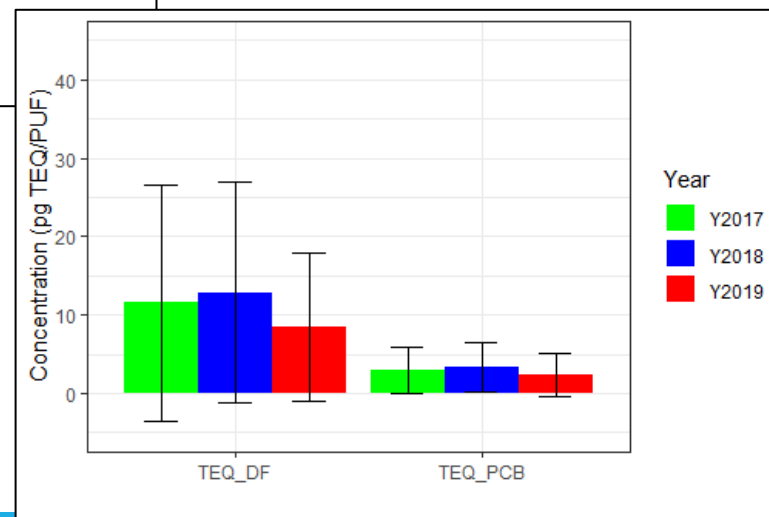
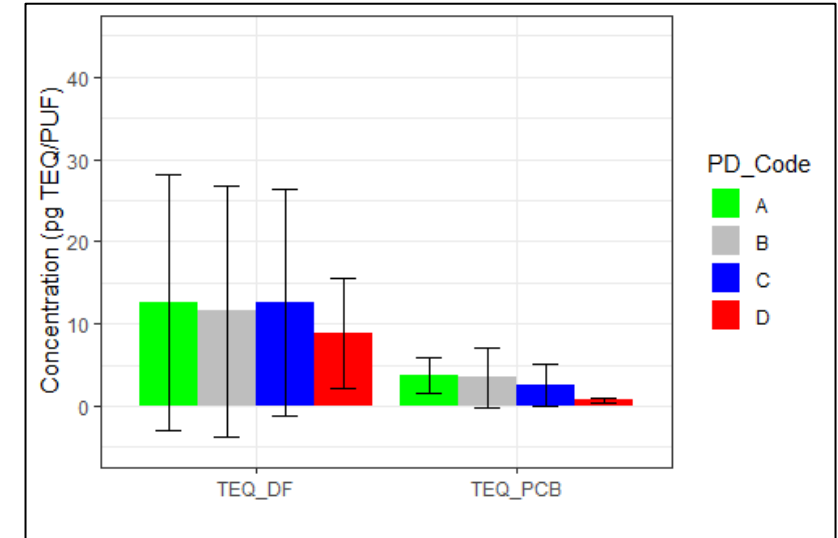
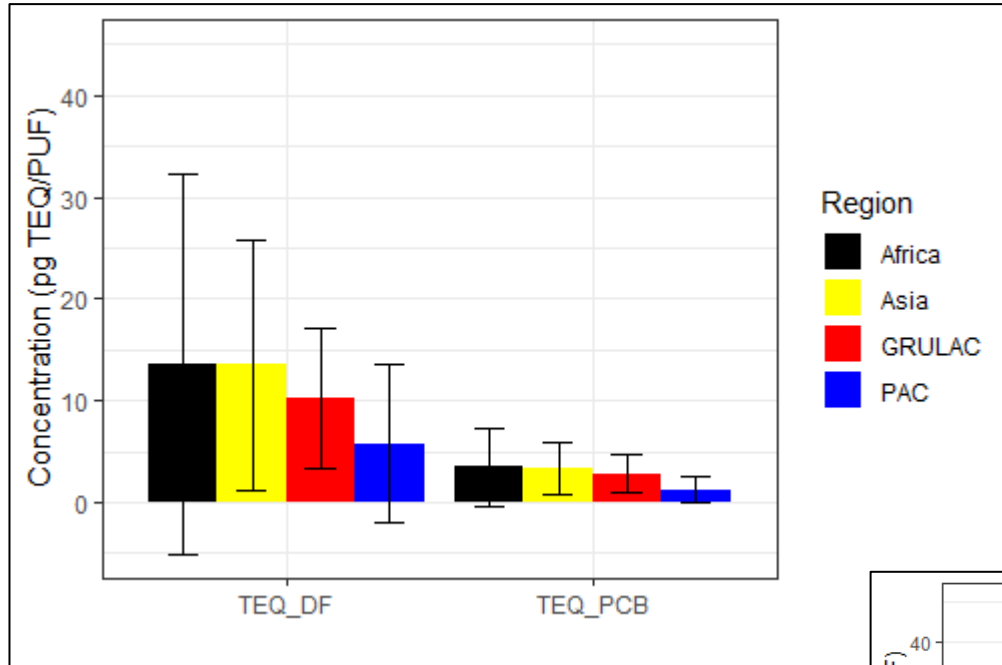
# PCA, variance GMP2 dl-POPs



# PCA dl-POPs GMP2



# Mean values and SD (standard deviation) - GMP2



# dl-POPs Results

## A.4 Africa

Country name	ISO-3	Project Region	WBC 2017	WBC 2018	PD 2017	PD 2018
Congo DR	COD	Africa	L	L	B	B
Egypt	EGY	Africa	LM	LM	B	B
Ethiopia	ETH	Africa	L	L	C	C
Ghana	GHA	Africa	LM	LM	C	C
Kenya	KEN	Africa	LM	LM	B	B
Mali	MLI	Africa	L	L	A	A
Mauritius	MUS	Africa	UM	UM	D	D
Morocco	MAR	Africa	LM	LM	B	B
Nigeria	NGA	Africa	LM	LM	C	C
Senegal	SEN	Africa	L	LM	B	B
Tanzania	TZA	Africa	L	L	B	B
Togo	TGO	Africa	L	L	C	C
Tunisia	TUN	Africa	LM	LM	B	B
Uganda	UGA	Africa	L	L	C	C
Zambia	ZMB	Africa	LM	LM	A	A

# Number/classification of PUFs in Africa dl-POPs

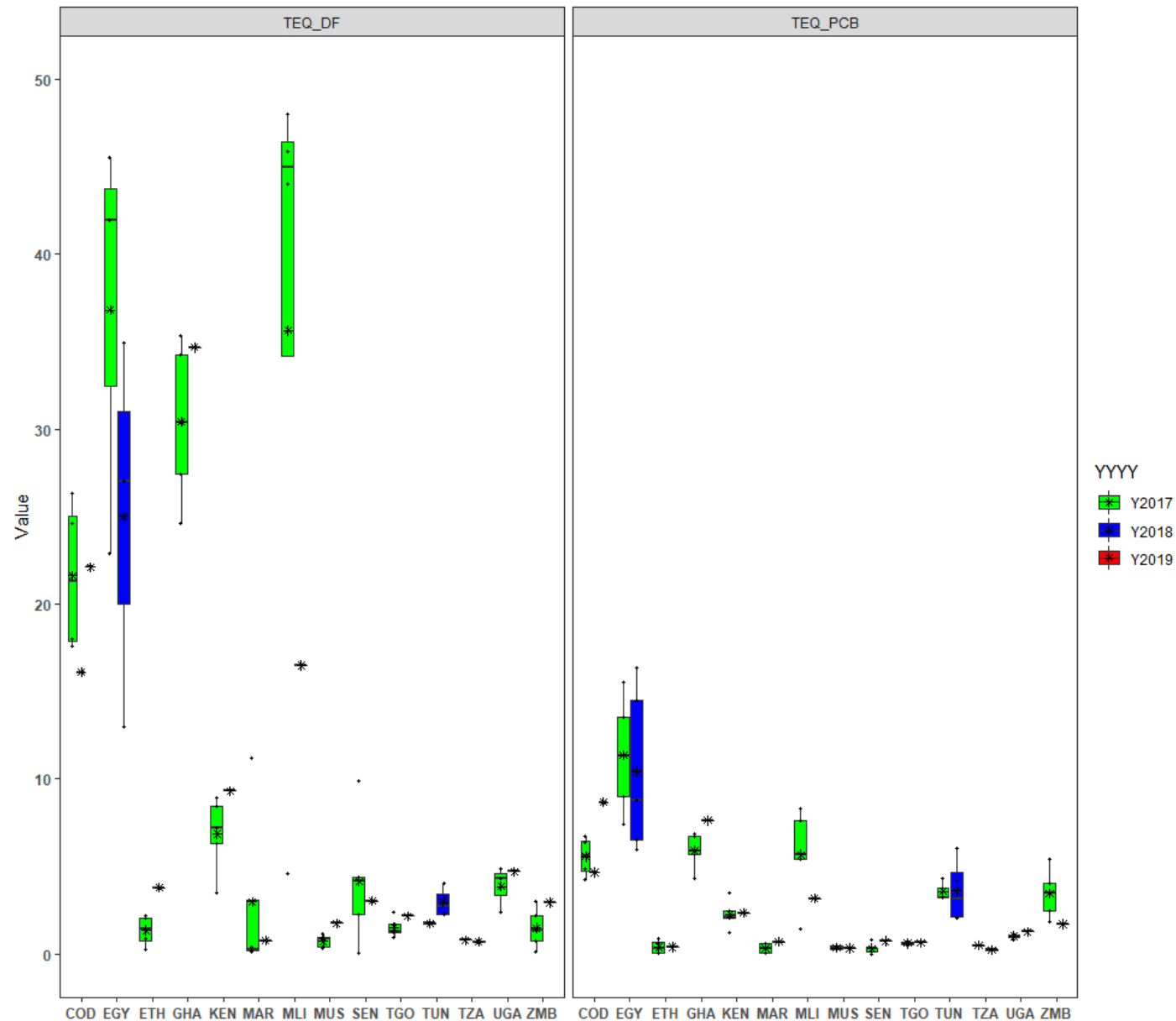
	COD (N=6)	EGY (N=10)	ETH (N=5)	GHA (N=6)	KEN (N=6)	MAR (N=5)	MLI (N=6)	MUS (N=6)	SEN (N=6)	TGO (N=6)	TUN (N=7)	TZA (N=4)	UGA (N=4)	ZMB (N=6)	Overall (N=83)
<b>Region</b>															
Africa	6 (100%)	10 (100%)	5 (100%)	6 (100%)	6 (100%)	5 (100%)	6 (100%)	6 (100%)	6 (100%)	6 (100%)	7 (100%)	4 (100%)	4 (100%)	6 (100%)	83 (100%)
<b>YYYY</b>															
Y2017	4 (66.7%)	5 (50.0%)	4 (80.0%)	5 (83.3%)	5 (83.3%)	4 (80.0%)	5 (83.3%)	5 (83.3%)	5 (83.3%)	5 (83.3%)	3 (42.9%)	0 (0%)	3 (75.0%)	5 (83.3%)	58 (69.9%)
Y2018	1 (16.7%)	5 (50.0%)	1 (20.0%)	1 (16.7%)	1 (16.7%)	1 (20.0%)	1 (16.7%)	1 (16.7%)	1 (16.7%)	1 (16.7%)	4 (57.1%)	1 (25.0%)	1 (25.0%)	1 (16.7%)	21 (25.3%)
Y2019	1 (16.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (75.0%)	0 (0%)	0 (0%)	4 (4.8%)
<b>Sample</b>															
a	3 (50.0%)	2 (20.0%)	2 (40.0%)	2 (33.3%)	2 (33.3%)	2 (40.0%)	2 (33.3%)	2 (33.3%)	2 (33.3%)	2 (33.3%)	1 (14.3%)	1 (25.0%)	2 (50.0%)	2 (33.3%)	27 (32.5%)
q	3 (50.0%)	8 (80.0%)	3 (60.0%)	4 (66.7%)	4 (66.7%)	3 (60.0%)	4 (66.7%)	4 (66.7%)	4 (66.7%)	4 (66.7%)	6 (85.7%)	3 (75.0%)	2 (50.0%)	4 (66.7%)	56 (67.5%)

# Summary Results Africa dl-POPs in PUFs (1)

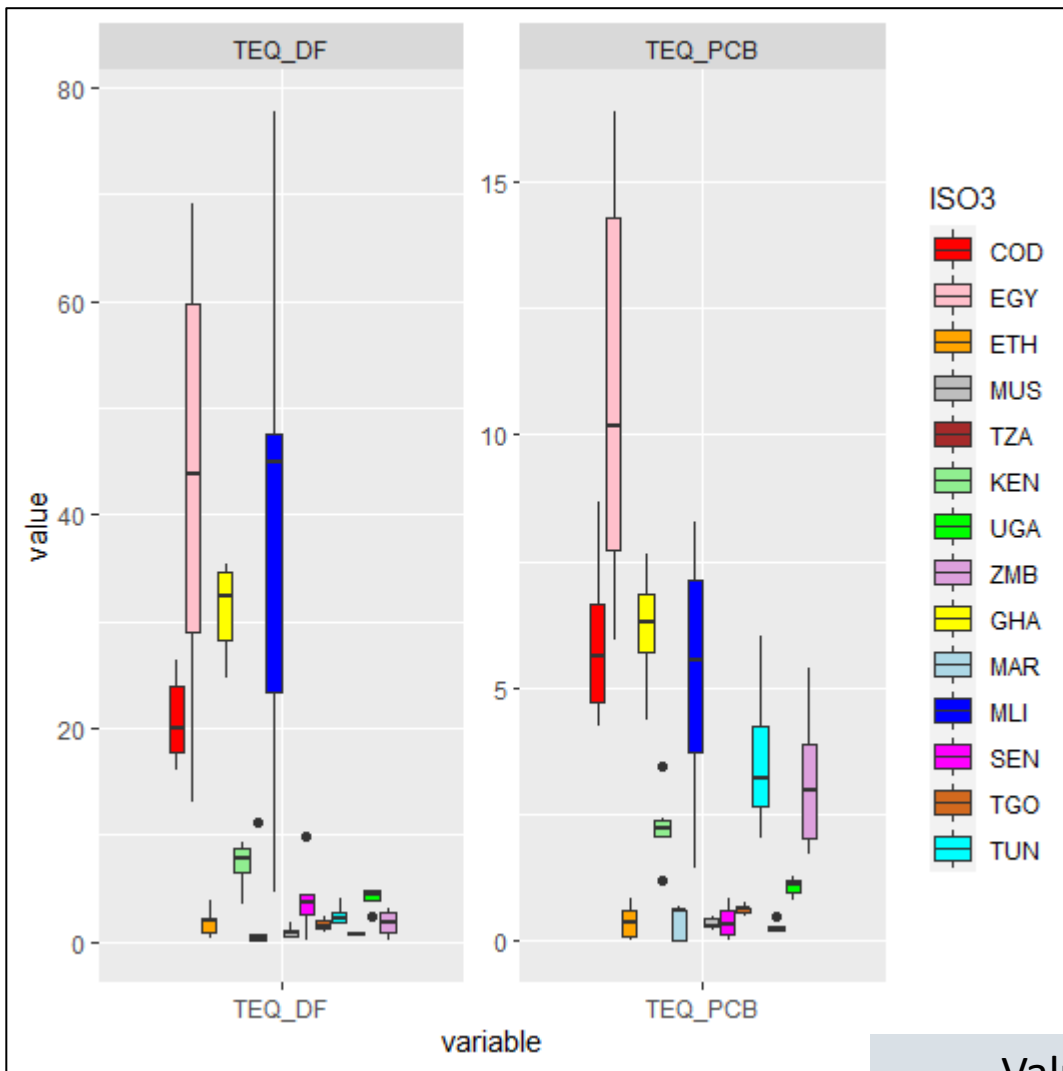
	COD (N=6)	EGY (N=10)	ETH (N=5)	KEN (N=6)	MUS (N=6)	TZA (N=4)	UGA (N=4)	ZMB (N=6)	Overall (N=83)
<b>DF</b>									
Mean (SD)	20.8 (4.17)	43.4 (18.9)	1.83 (1.34)	7.27 (2.17)	0.893 (0.521)	0.713 (0.105)	4.06 (1.13)	1.72 (1.20)	13.6 (18.7)
Median [Min, Max]	20.1 [16.1, 26.4]	43.8 [13.0, 69.2]	2.02 [0.283, 3.77]	7.81 [3.47, 9.32]	0.893 [0.329, 1.75]	0.736 [0.575, 0.806]	4.50 [2.40, 4.85]	1.77 [0.0929, 3.02]	3.77 [0.0552, 77.7]
<b>PCB</b>									
Mean (SD)	5.93 (1.67)	10.9 (3.88)	0.382 (0.351)	2.26 (0.727)	0.344 (0.115)	0.282 (0.127)	1.07 (0.200)	3.16 (1.42)	3.47 (3.82)
Median [Min, Max]	5.63 [4.26, 8.67]	10.2 [5.95, 16.4]	0.383 [0.0105, 0.843]	2.21 [1.21, 3.46]	0.307 [0.216, 0.487]	0.227 [0.201, 0.471]	1.10 [0.802, 1.26]	2.99 [1.69, 5.39]	2.03 [0.000374, 16.4]

	GHA (N=6)	MAR (N=5)	MLI (N=6)	SEN (N=6)	TGO (N=6)	TUN (N=7)	Overall (N=83)
<b>DF (pg TEQ/PUF)</b>							
Mean (SD)	31.1 (4.41)	2.53 (4.86)	39.5 (25.8)	3.96 (3.29)	1.60 (0.566)	2.44 (0.892)	13.6 (18.7)
Median [Min, Max]	32.3 [24.6, 35.4]	0.365 [0.115, 11.2]	45.0 [4.62, 77.7]	3.59 [0.0552, 9.88]	1.48 [0.918, 2.37]	2.24 [1.69, 4.07]	3.77 [0.0552, 77.7]
<b>PCB (pg TEQ/PUF)</b>							
Mean (SD)	6.18 (1.15)	0.391 (0.342)	5.26 (2.60)	0.377 (0.334)	0.611 (0.0937)	3.59 (1.39)	3.47 (3.82)
Median [Min, Max]	6.29 [4.34, 7.62]	0.614 [0.0137, 0.691]	5.54 [1.44, 8.27]	0.315 [0.000374, 0.825]	0.625 [0.491, 0.754]	3.22 [2.03, 6.03]	2.03 [0.000374, 16.4]

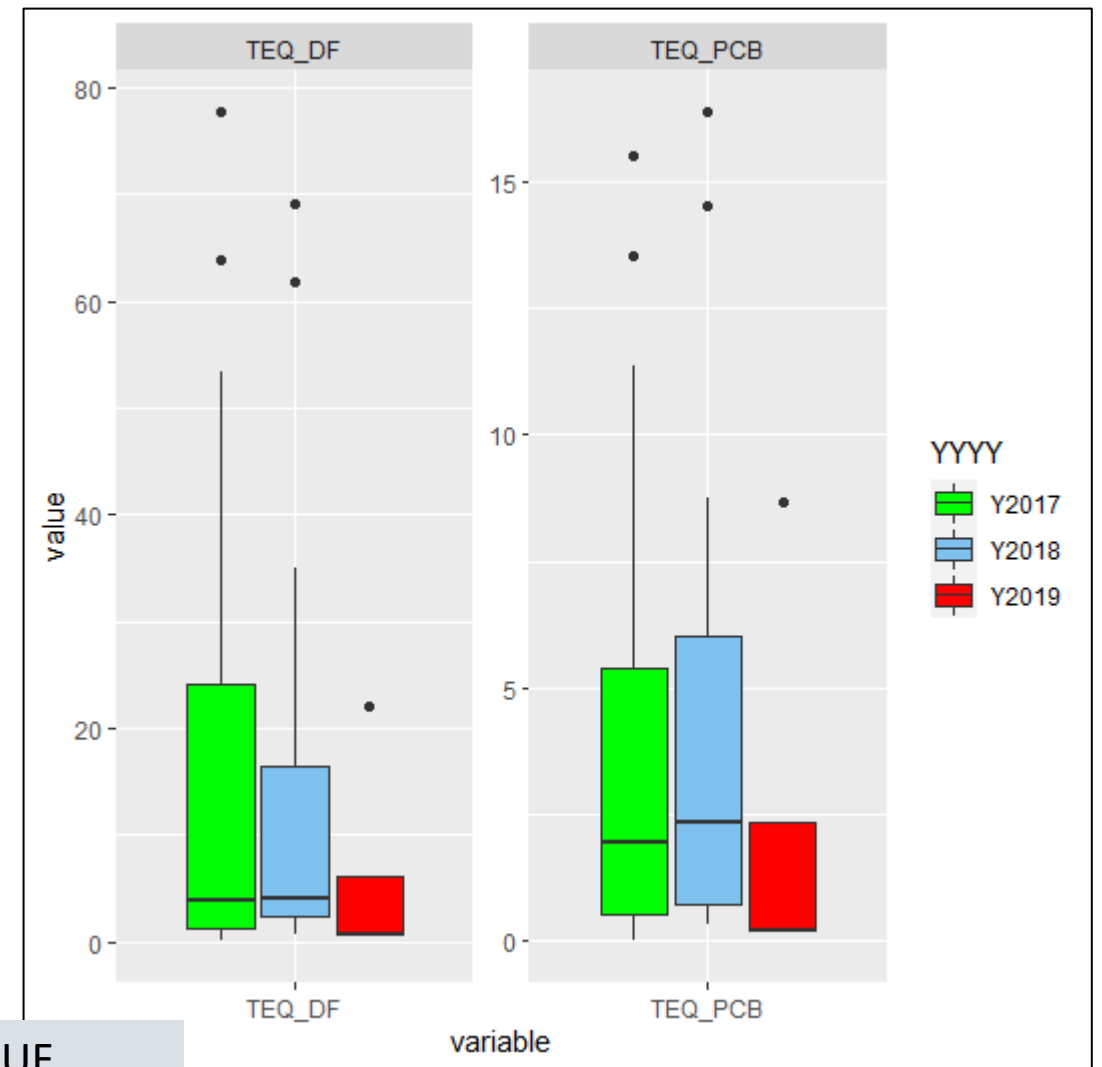
# TEQs for PCDD/PCDF and PCB according to year and country (pg TEQ/PUF)



# Country



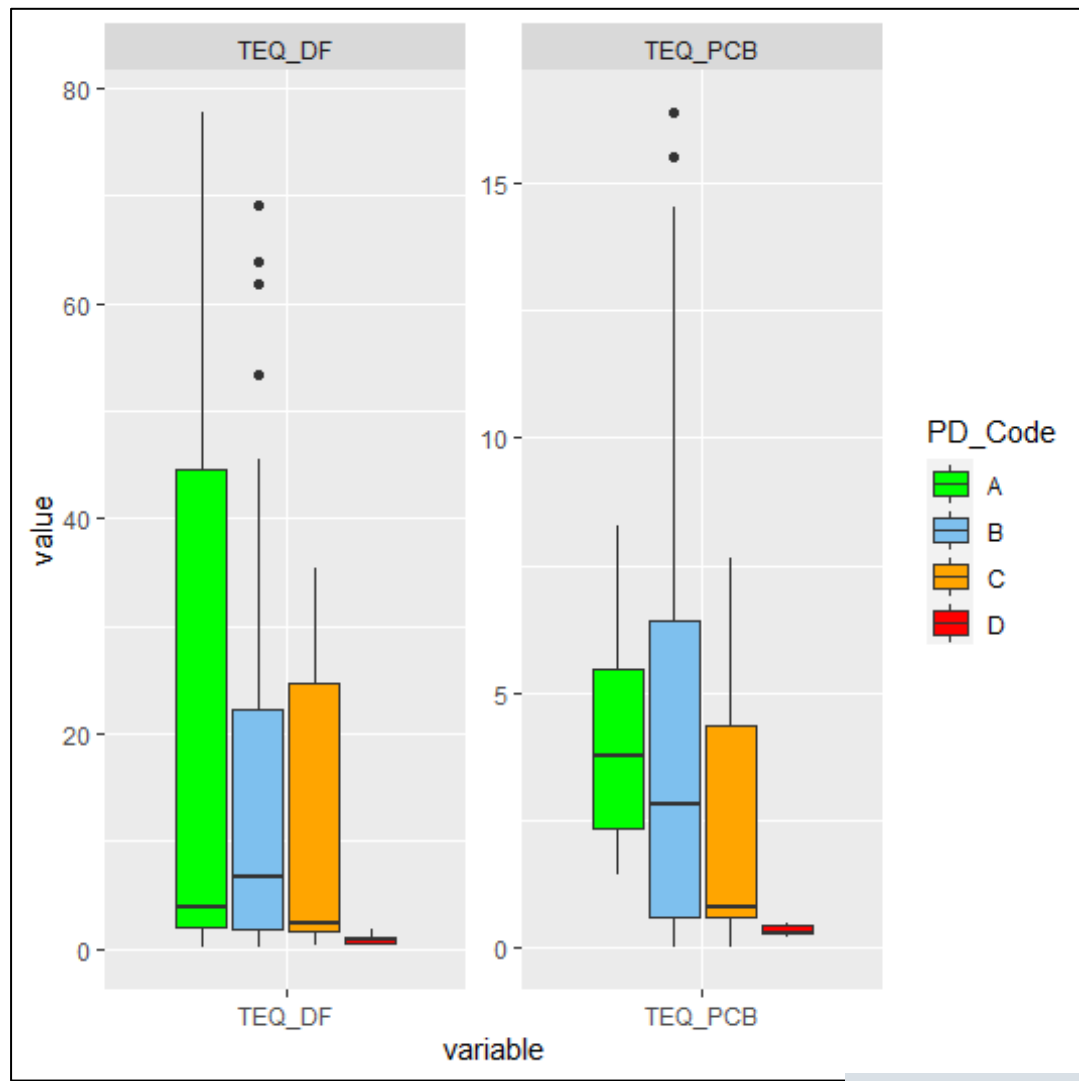
# Sampling year



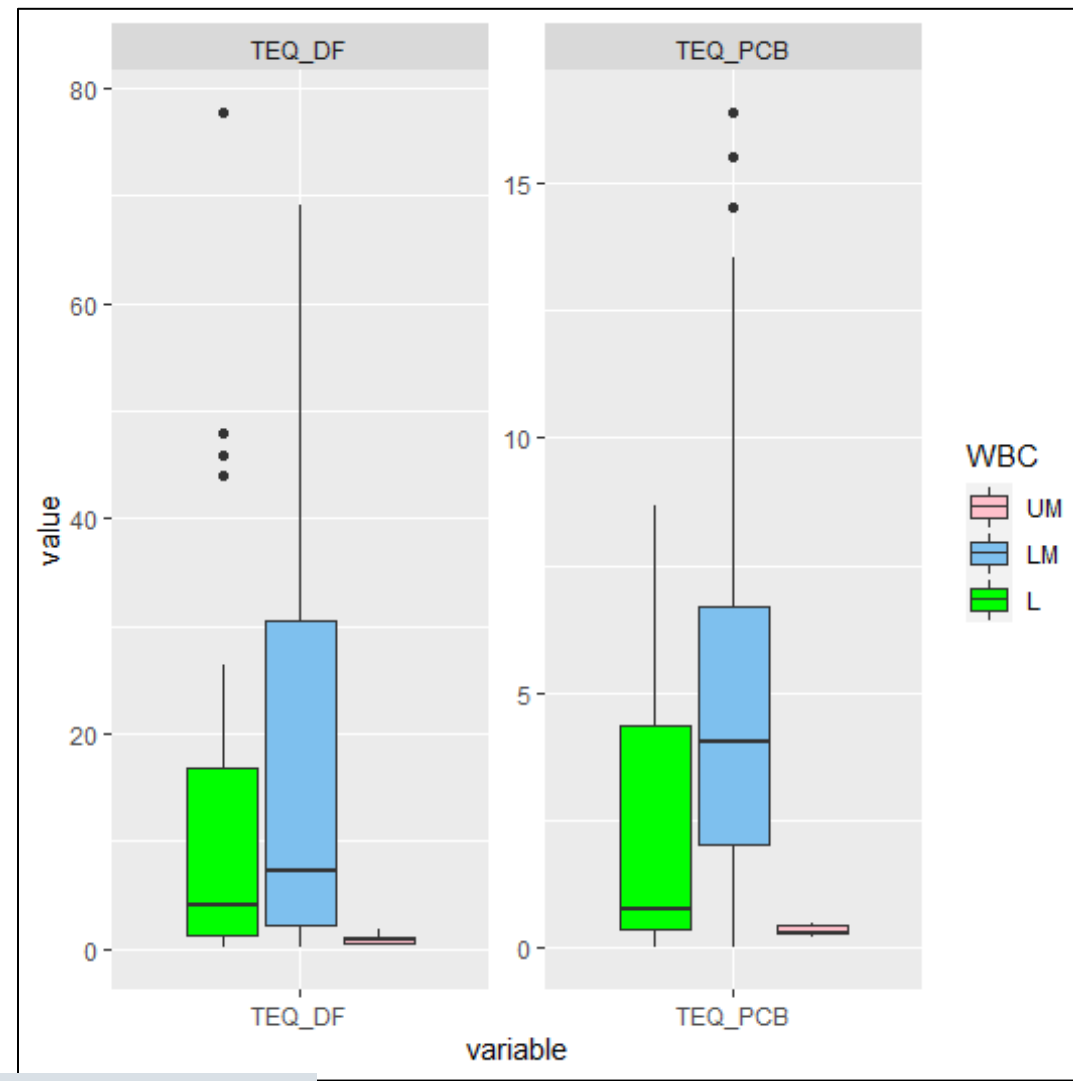
Values in pg TEQ/PUF



# Population density



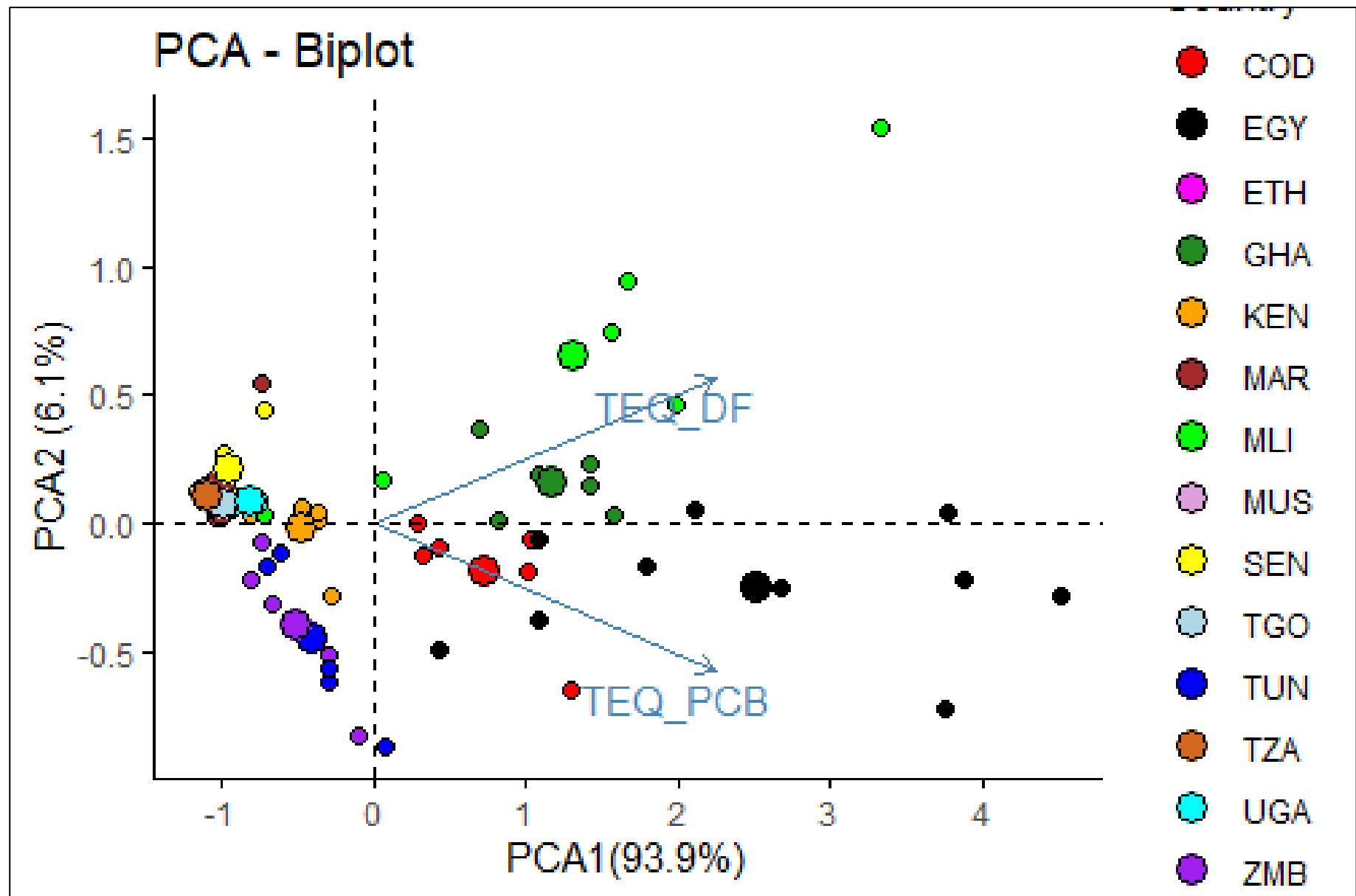
# Income



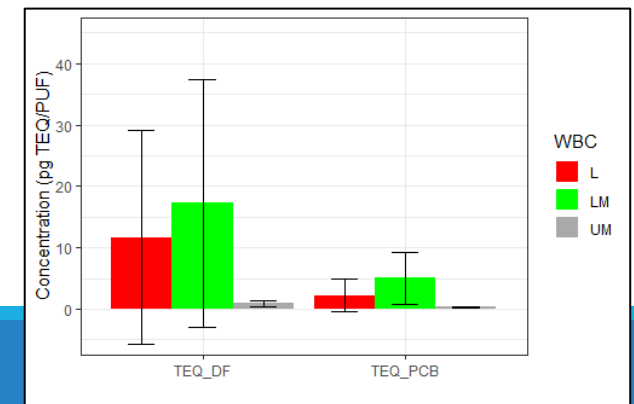
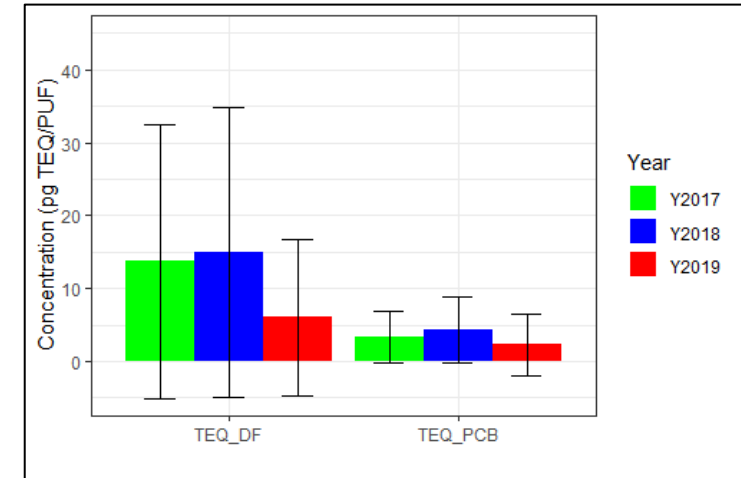
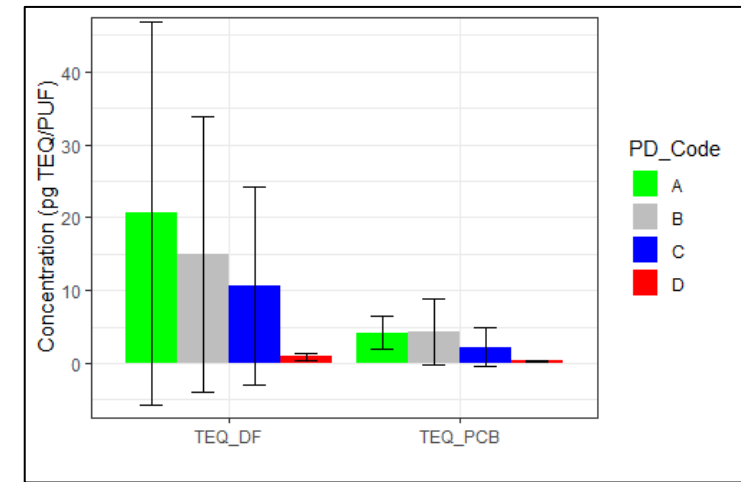
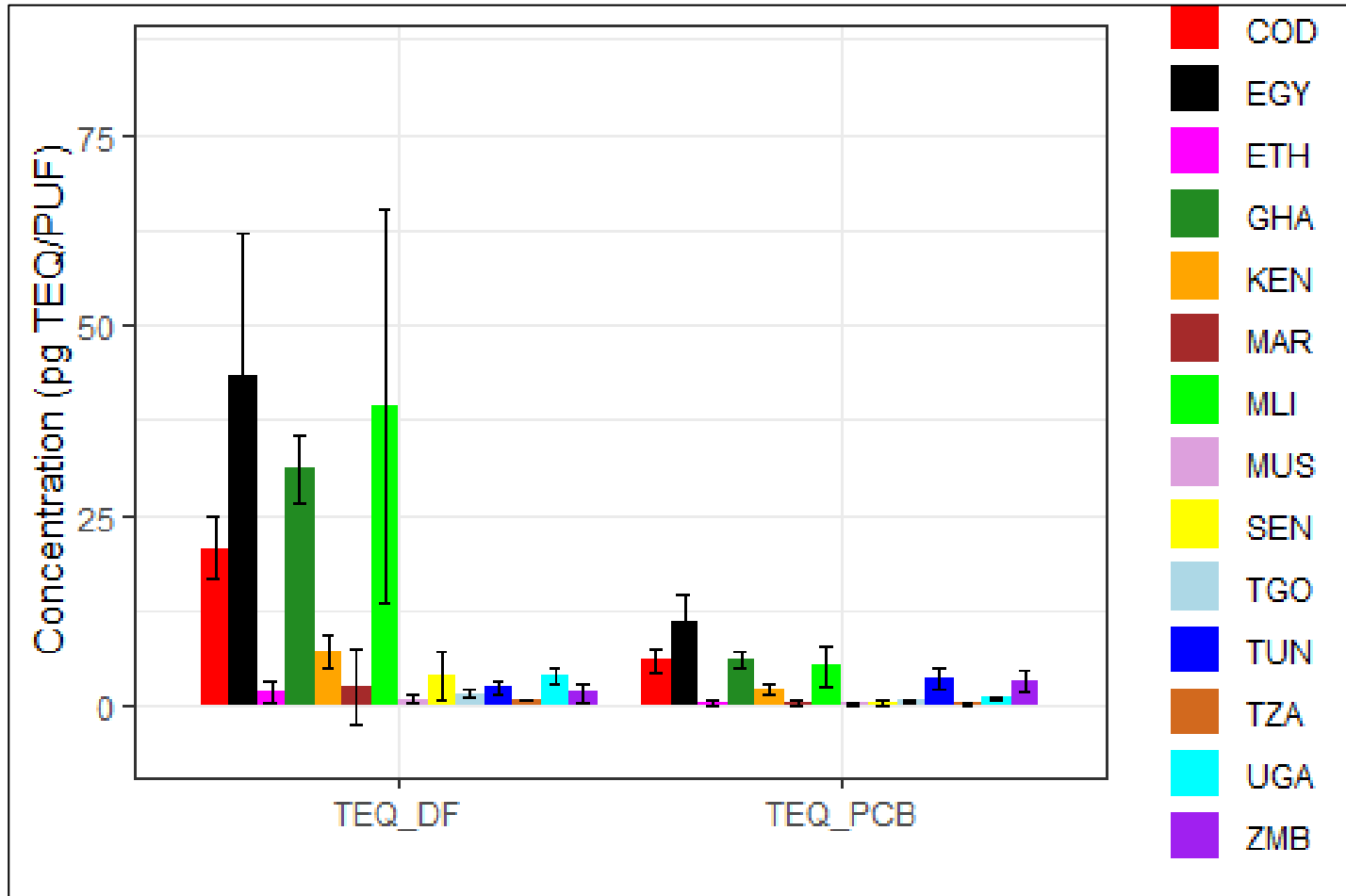
Values in pg TEQ/PUF



# PCA by country



# Mean values and SDs

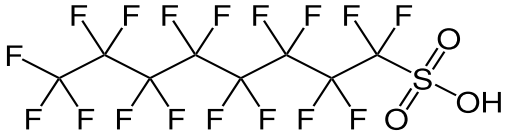

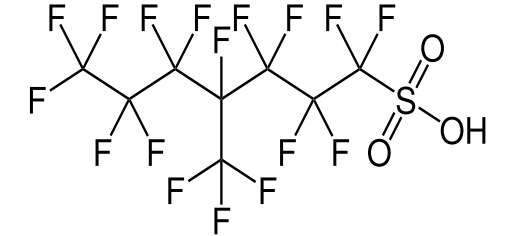
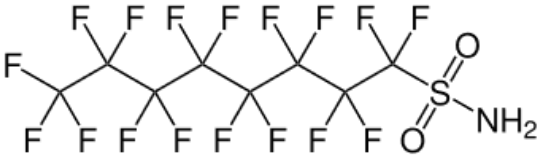


# PAS/PUF Results - PFAS

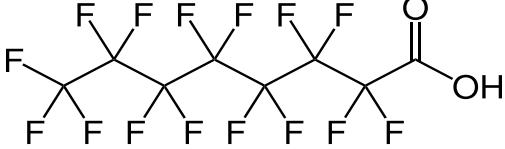
## B. Across All Projects

# Perfluoroalkane substances (PFAS)

## Perfluoroalkylsulfonic acids (PFSA)

	PFOS	PFHxS
L-PFOS		 <p>L-PFHxS</p>
br-PFOS		
FOSA (PFOS pre-cursor)		

## Perfluoroalkylcarboxylic acids (PFCA)

	PFOA
L-PFOA	

# Number/classification of samples GMP2 PFAS

	Africa (N=127)	Asia (N=46)	GRULAC (N=101)	PAC (N=43)	Overall (N=317)
<b>Region</b>					
Africa	127 (100%)	0 (0%)	0 (0%)	0 (0%)	127 (40.1%)
Asia	0 (0%)	46 (100%)	0 (0%)	0 (0%)	46 (14.5%)
GRULAC	0 (0%)	0 (0%)	101 (100%)	0 (0%)	101 (31.9%)
PAC	0 (0%)	0 (0%)	0 (0%)	43 (100%)	43 (13.6%)
<b>WBC</b>					
L	52 (40.9%)	0 (0%)	0 (0%)	0 (0%)	52 (16.4%)
LM	65 (51.2%)	40 (87.0%)	0 (0%)	20 (46.5%)	125 (39.4%)
UM	10 (7.9%)	6 (13.0%)	58 (57.4%)	15 (34.9%)	89 (28.1%)
H	0 (0%)	0 (0%)	43 (42.6%)	8 (18.6%)	51 (16.1%)
<b>PD_Code</b>					
A	19 (15.0%)	9 (19.6%)	34 (33.7%)	18 (41.9%)	80 (25.2%)
B	55 (43.3%)	14 (30.4%)	38 (37.6%)	13 (30.2%)	120 (37.9%)
C	43 (33.9%)	23 (50.0%)	19 (18.8%)	12 (27.9%)	97 (30.6%)
D	10 (7.9%)	0 (0%)	10 (9.9%)	0 (0%)	20 (6.3%)

Quantifiable,  
includes ZMB

# Number/classification of samples GMP2 PFAS

Without outliers

	Africa (N=119)	Asia (N=46)	GRULAC (N=101)	PAC (N=43)	Overall (N=309)
<b>Region</b>					
Africa	119 (100%)	0 (0%)	0 (0%)	0 (0%)	119 (38.5%)
Asia	0 (0%)	46 (100%)	0 (0%)	0 (0%)	46 (14.9%)
GRULAC	0 (0%)	0 (0%)	101 (100%)	0 (0%)	101 (32.7%)
PAC	0 (0%)	0 (0%)	0 (0%)	43 (100%)	43 (13.9%)
<b>WBC</b>					
L	52 (43.7%)	0 (0%)	0 (0%)	0 (0%)	52 (16.8%)
LM	57 (47.9%)	40 (87.0%)	0 (0%)	20 (46.5%)	117 (37.9%)
UM	10 (8.4%)	6 (13.0%)	58 (57.4%)	15 (34.9%)	89 (28.8%)
H	0 (0%)	0 (0%)	43 (42.6%)	8 (18.6%)	51 (16.5%)
<b>PD_Code</b>					
A	11 (9.2%)	9 (19.6%)	34 (33.7%)	18 (41.9%)	72 (23.3%)
B	55 (46.2%)	14 (30.4%)	38 (37.6%)	13 (30.2%)	120 (38.8%)
C	43 (36.1%)	23 (50.0%)	19 (18.8%)	12 (27.9%)	97 (31.4%)
D	10 (8.4%)	0 (0%)	10 (9.9%)	0 (0%)	20 (6.5%)
<b>YYYY</b>					
Y2017	54 (45.4%)	9 (19.6%)	47 (46.5%)	15 (34.9%)	125 (40.5%)
Y2018	58 (48.7%)	29 (63.0%)	54 (53.5%)	26 (60.5%)	167 (54.0%)
Y2019	7 (5.9%)	8 (17.4%)	0 (0%)	2 (4.7%)	17 (5.5%)
<b>Sample</b>					
a	24 (20.2%)	8 (17.4%)	21 (20.8%)	9 (20.9%)	62 (20.1%)
q	95 (79.8%)	38 (82.6%)	80 (79.2%)	34 (79.1%)	247 (79.9%)

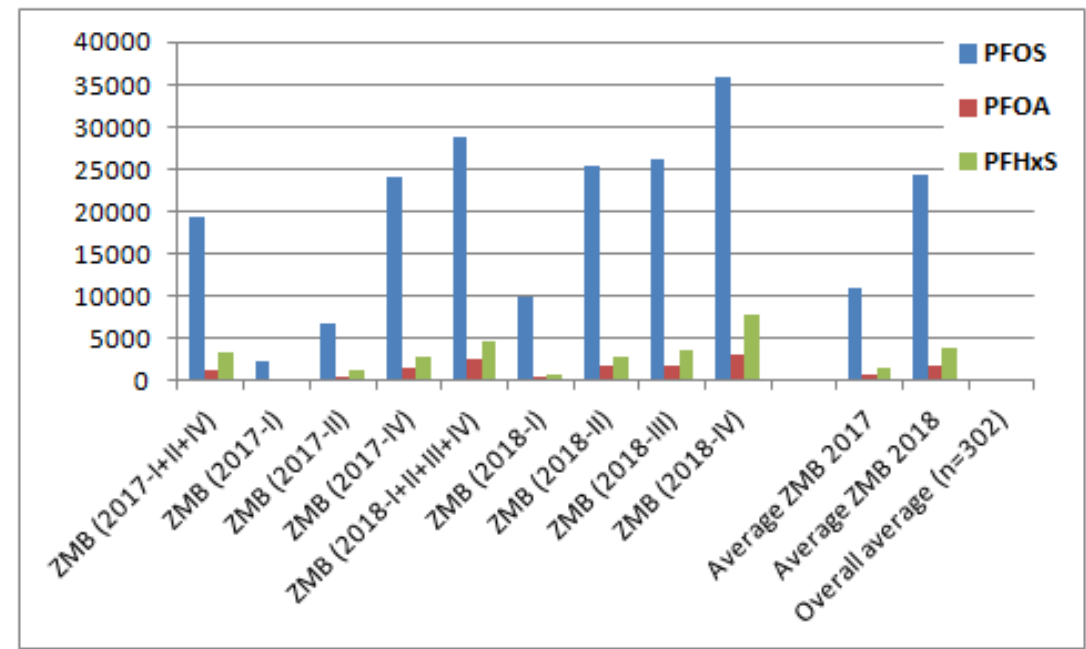


# Summary results PAS/PUFs for PFAS (without outliers)

	Africa (N=119)	Asia (N=46)	GRULAC (N=101)	PAC (N=43)	Overall (N=309)
<b>PFOS (pg/PUF)</b>					
Mean (SD)	203 (346)	139 (122)	376 (497)	297 (219)	261 (375)
Median [Min, Max]	98.1 [0, 2480]	101 [27.3, 634]	192 [0, 2260]	266 [0, 827]	128 [0, 2480]
Missing	5 (4.2%)	1 (2.2%)	10 (9.9%)	3 (7.0%)	19 (6.1%)
<b>PFOA (pg/PUF)</b>					
Mean (SD)	206 (177)	271 (194)	257 (125)	181 (86.5)	230 (157)
Median [Min, Max]	149 [0, 1190]	183 [83.1, 965]	233 [58.9, 655]	165 [0, 417]	187 [0, 1190]
Missing	10 (8.4%)	2 (4.3%)	5 (5.0%)	5 (11.6%)	22 (7.1%)
<b>PFHxS (pg/PUF)</b>					
Mean (SD)	8.96 (24.8)	13.4 (20.7)	9.72 (18.6)	41.6 (48.5)	14.5 (29.3)
Median [Min, Max]	0 [0, 237]	0 [0, 96.1]	0 [0, 101]	34.7 [0, 206]	0 [0, 237]
Missing	2 (1.7%)	2 (4.3%)	1 (1.0%)	0 (0%)	5 (1.6%)
<b>FOSA (pg/PUF)</b>					
Mean (SD)	16.5 (40.6)	24.6 (81.8)	138 (260)	68.5 (155)	64.3 (171)
Median [Min, Max]	0 [0, 251]	0 [0, 327]	34.9 [0, 964]	0 [0, 669]	0 [0, 964]
Missing	61 (51.3%)	30 (65.2%)	56 (55.4%)	20 (46.5%)	167 (54.0%)

# PFAS in Zambia PAS/PUFs

All concentrations in pg/PUF  
(and 3 months)

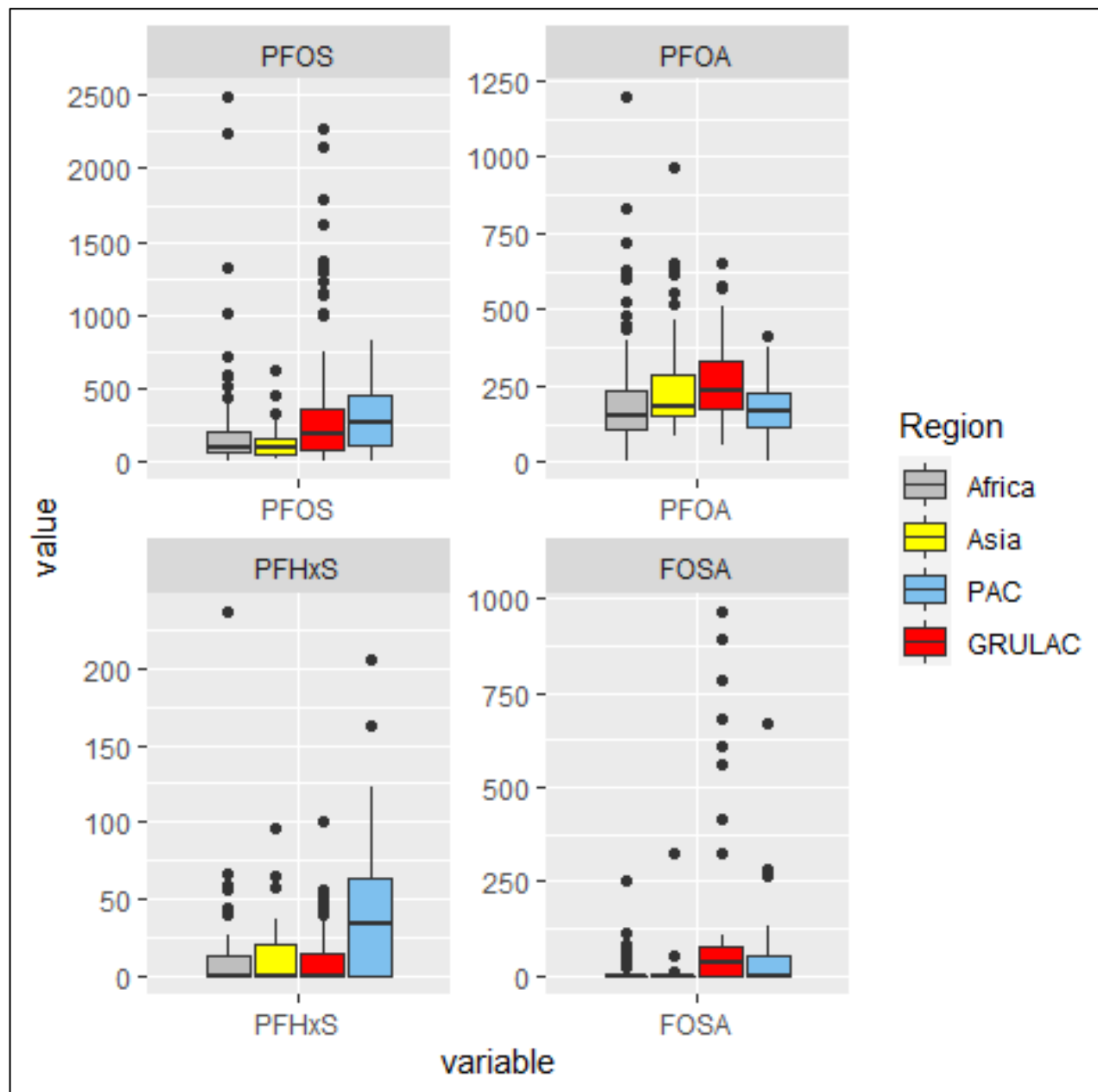


Sampling_Year	Season_Code	Sample_ID	L-PFOS	br-PFOS	S_PFOA	PFOA	PFHxS	FOSA	NMeFOA	NETFOA	NMeFOSE	NETFOSE
2017	I+II+IV	ZMB (2017-I+II+IV)	14003	5439	19442	1337	3203	1378	NR	NR	NR	NR
2017	I	ZMB (2017-I)	1695	544	2239	169	237	<25	NR	NR	NR	NR
2017	II	ZMB (2017-II)	5149	1541	6689	545	1198	<25	NR	NR	NR	NR
2017	IV	ZMB (2017-IV)	17573	6608	24181	1596	2750	NR	NR	NR	NR	NR
2018	I+II+III+IV	ZMB (2018-I+II+III+IV)	22931	5914	28845	2622	4759	NR	NR	<200	<200	NR
2018	I	ZMB (2018-I)	8091	1933	10024	430	782	992	NR	NR	NR	NR
2018	II	ZMB (2018-II)	20128	5350	25479	1712	2893	1872	NR	NR	NR	NR
2018	III	ZMB (2018-III)	20475	5784	26259	1760	3521	1894	NR	NR	NR	NR
2018	IV	ZMB (2018-IV)	27582	8385	35966	3182	7879	1344	<200	<200	<200	<200
		Average ZMB 2017	8139	2898	11037	770	1395	<25	NR	NR	NR	NR
		Average ZMB 2018	19069	5363	24432	1771	3769	1526	NR	NR	NR	NR
		Overall average (n=302)			256	230	44	67				

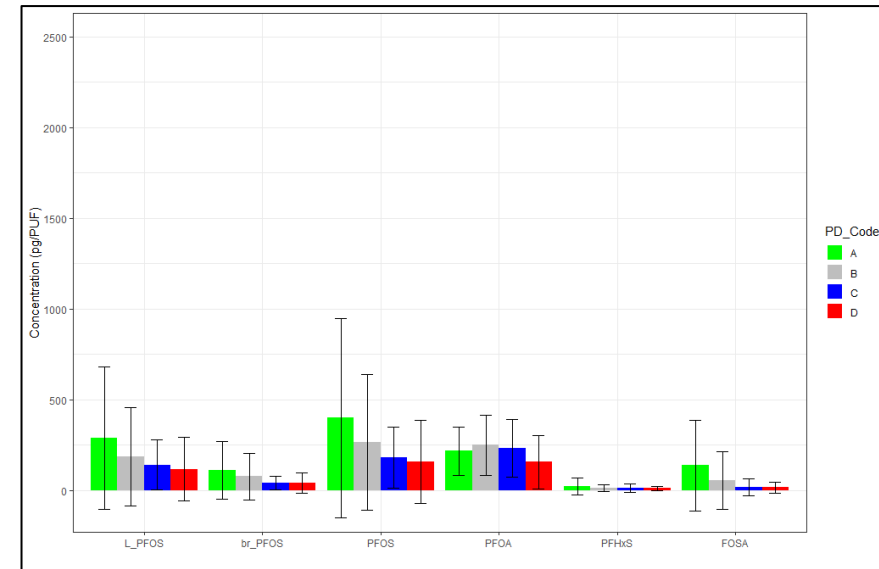
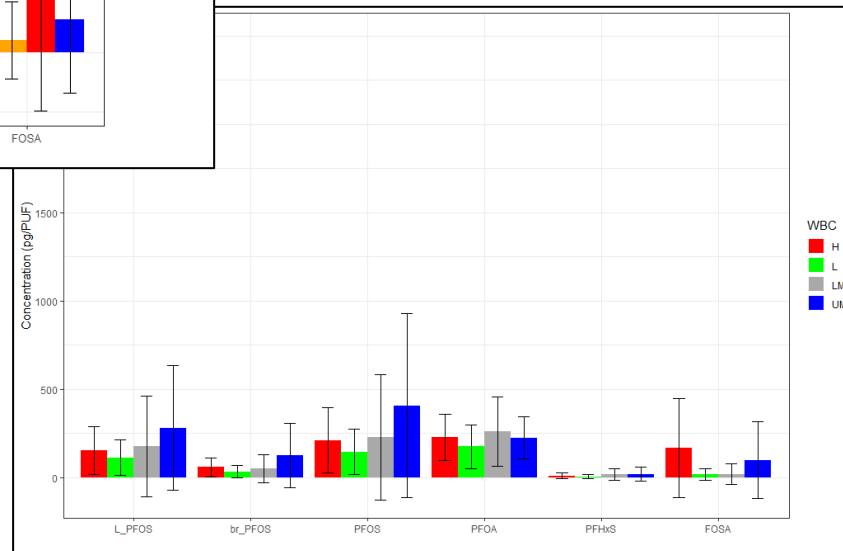
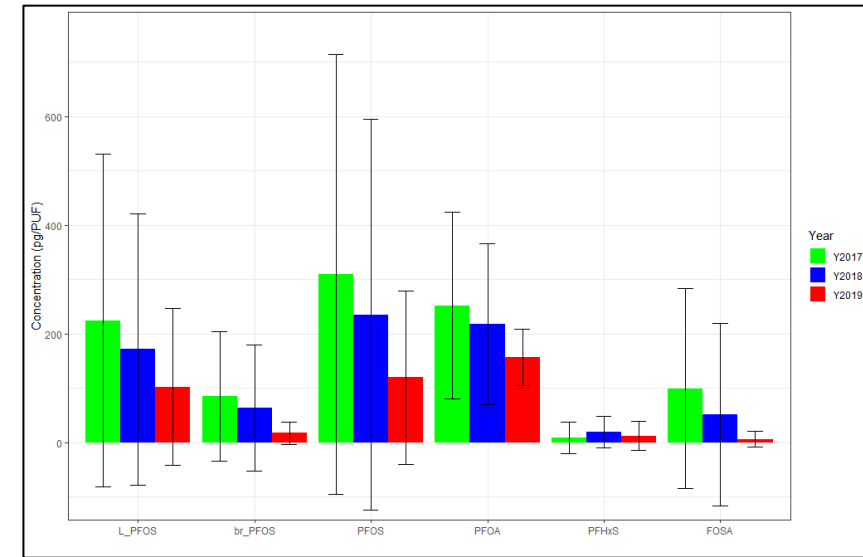
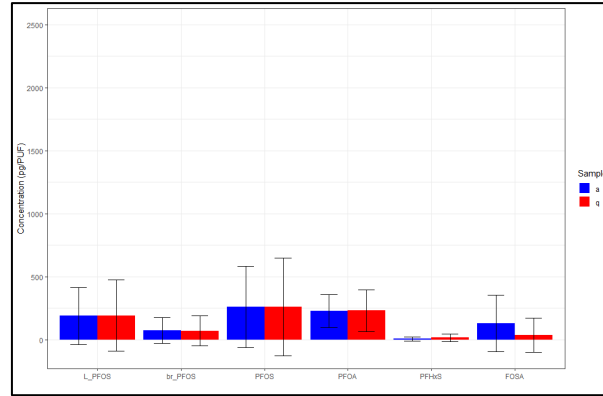
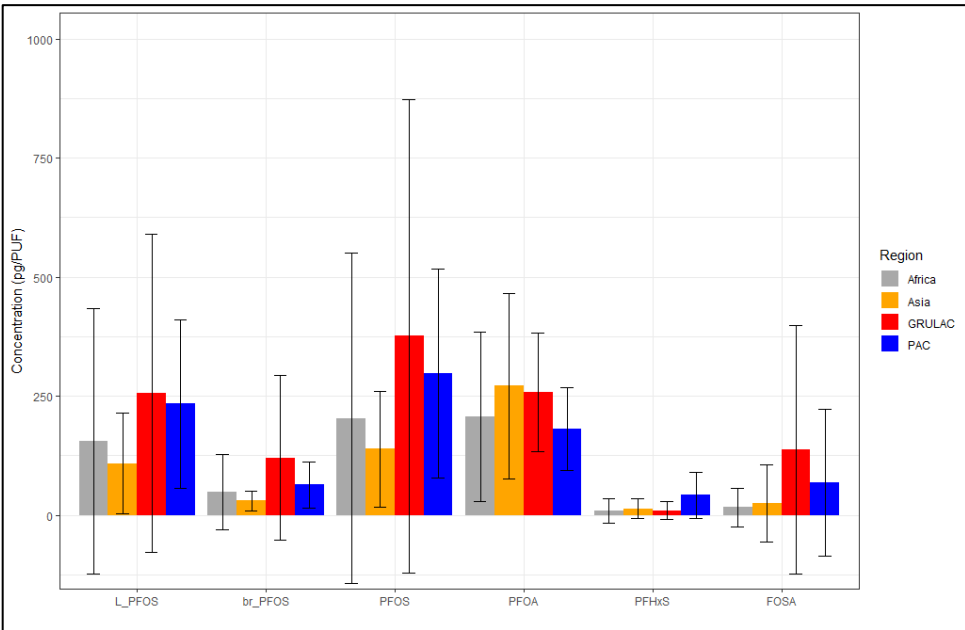
# PAS/PUFs

## Air (n=309)

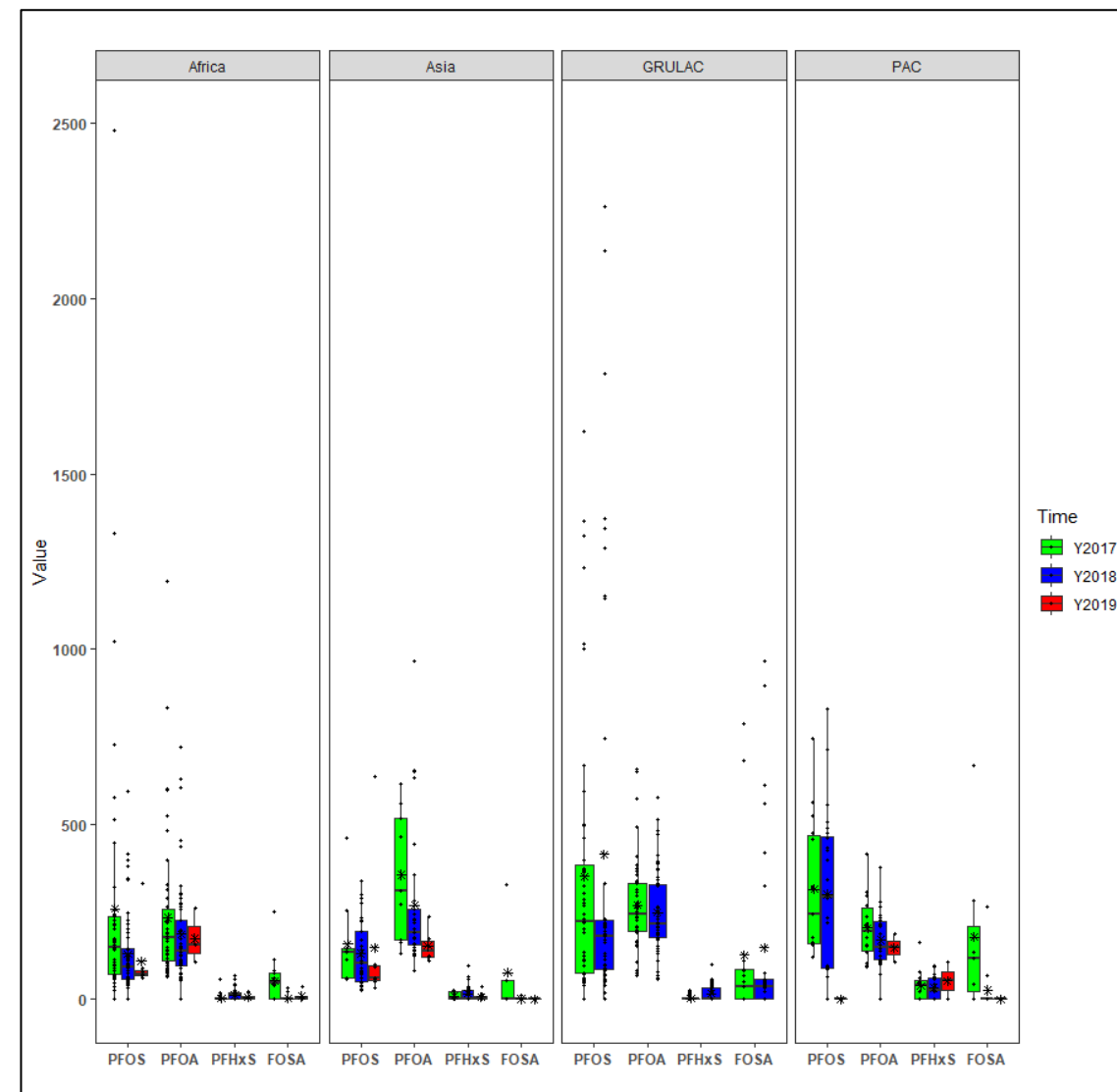
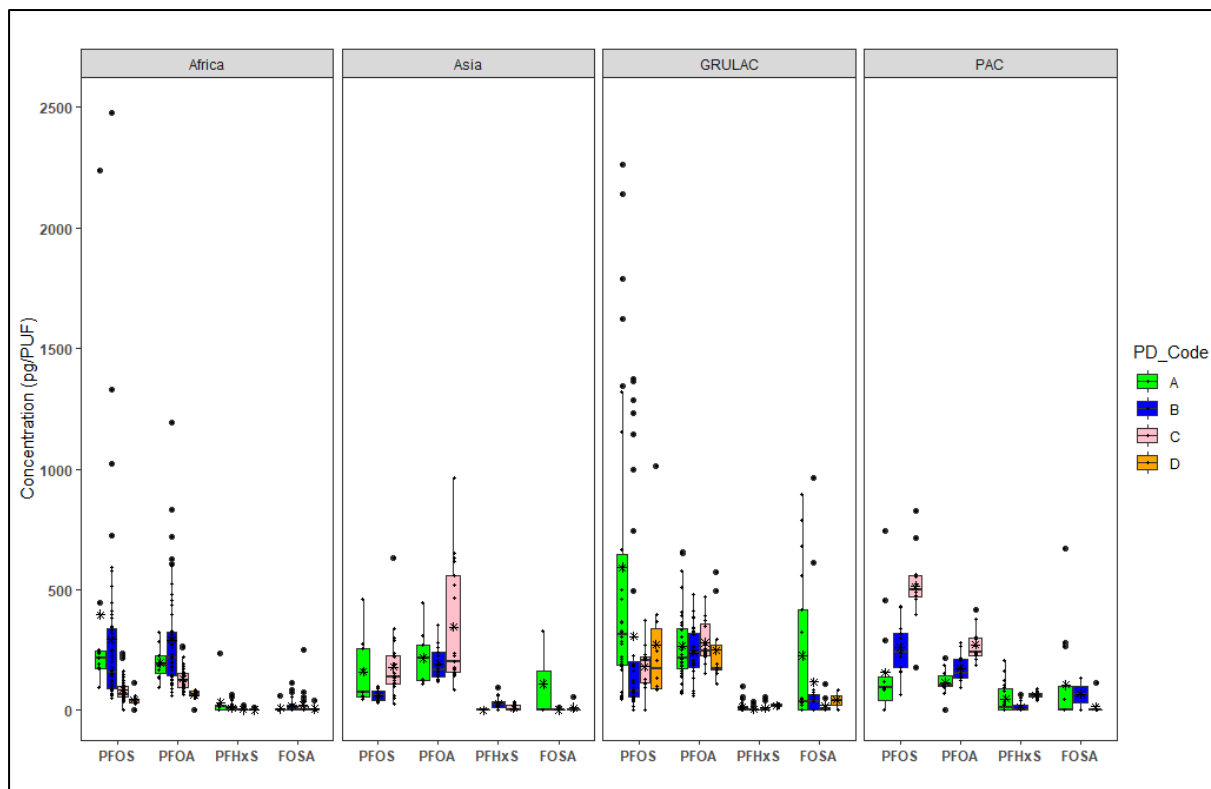
Values in pg/PUF and  
3 months exposure



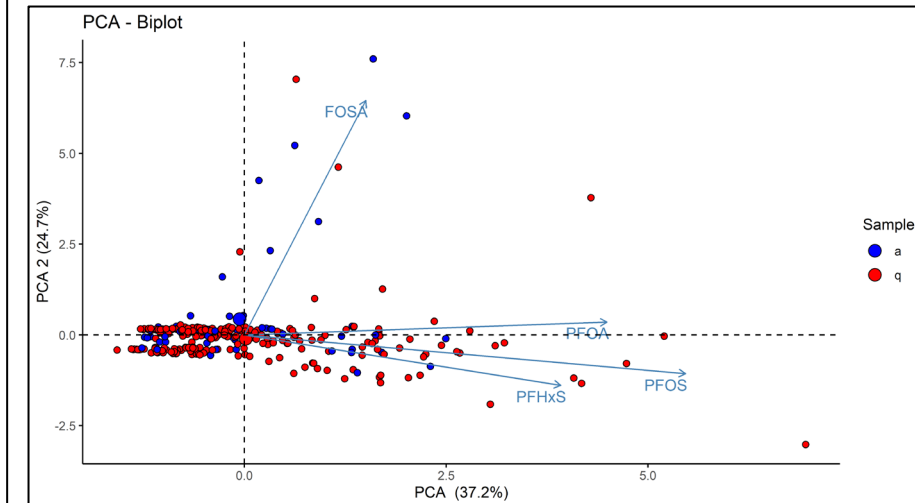
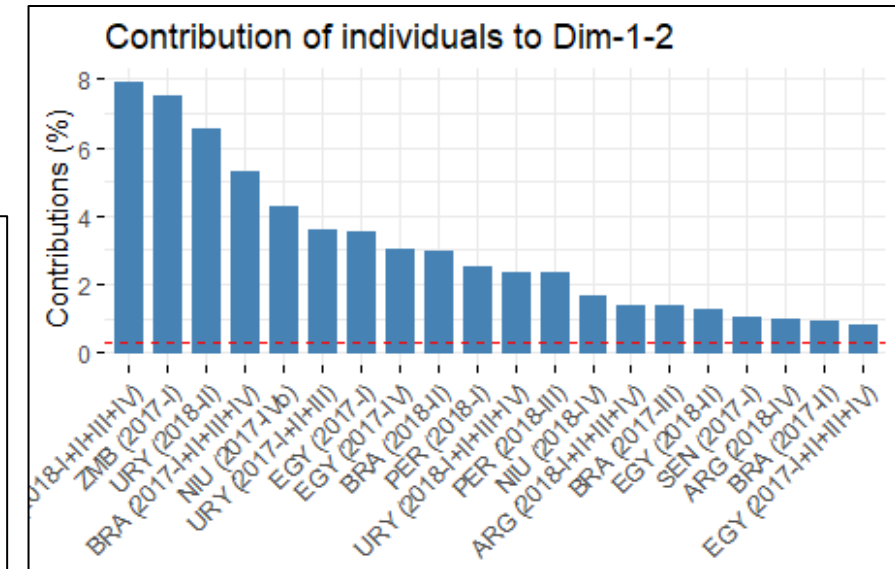
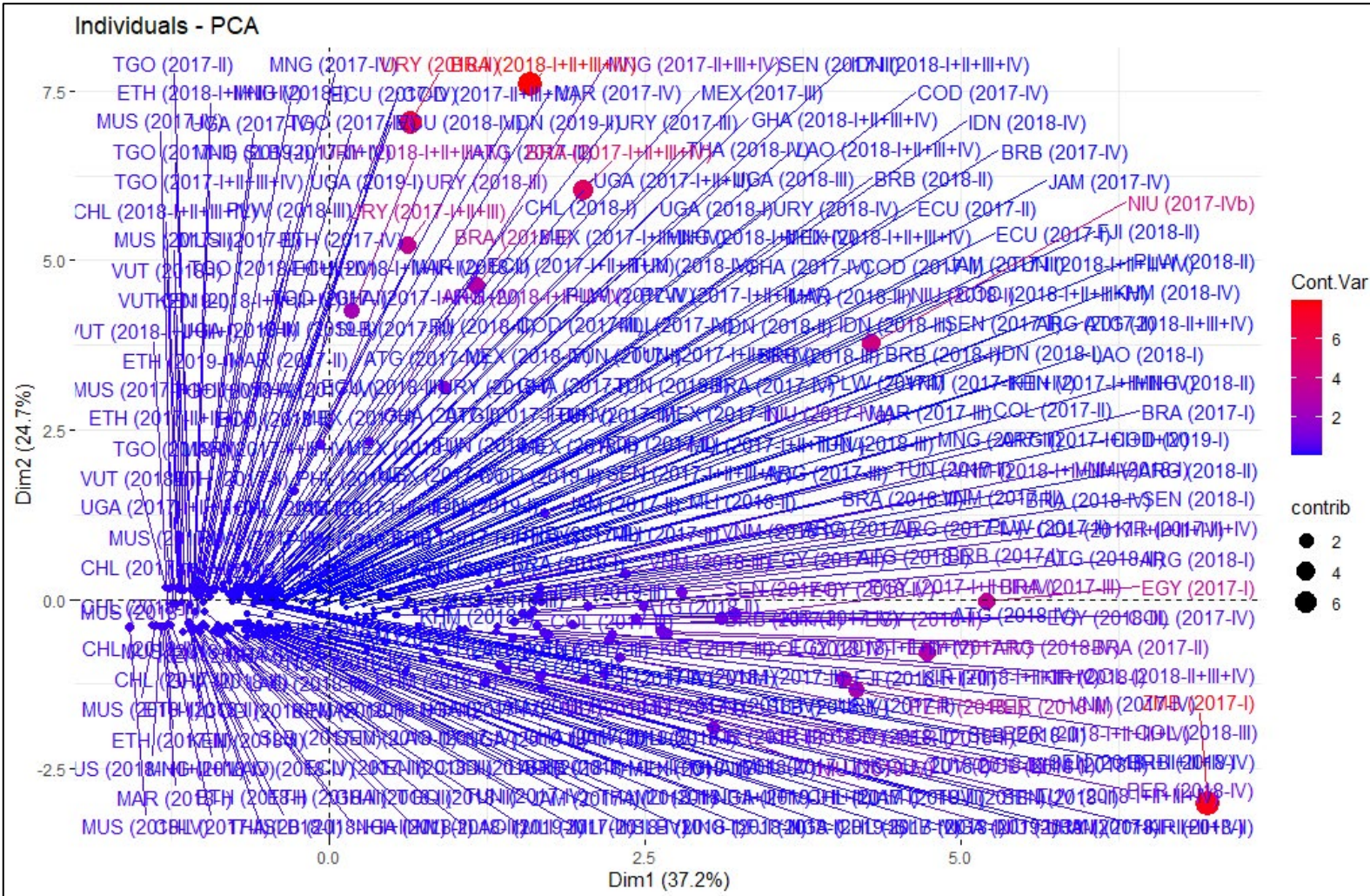
# Mean values with SD (n=309)



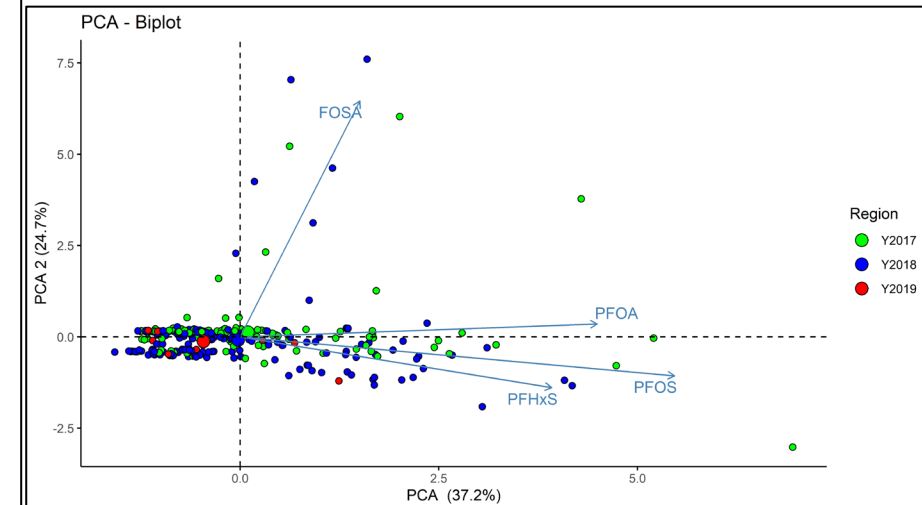
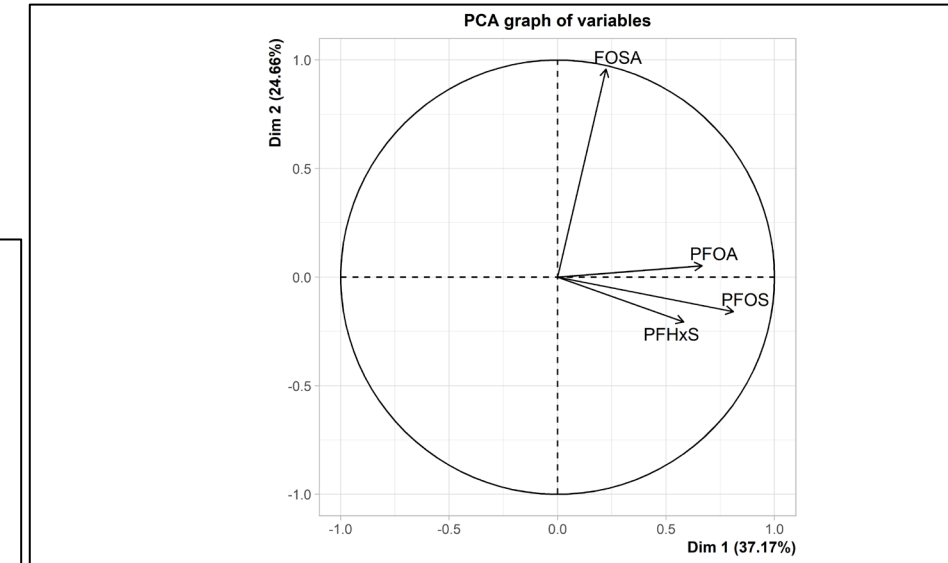
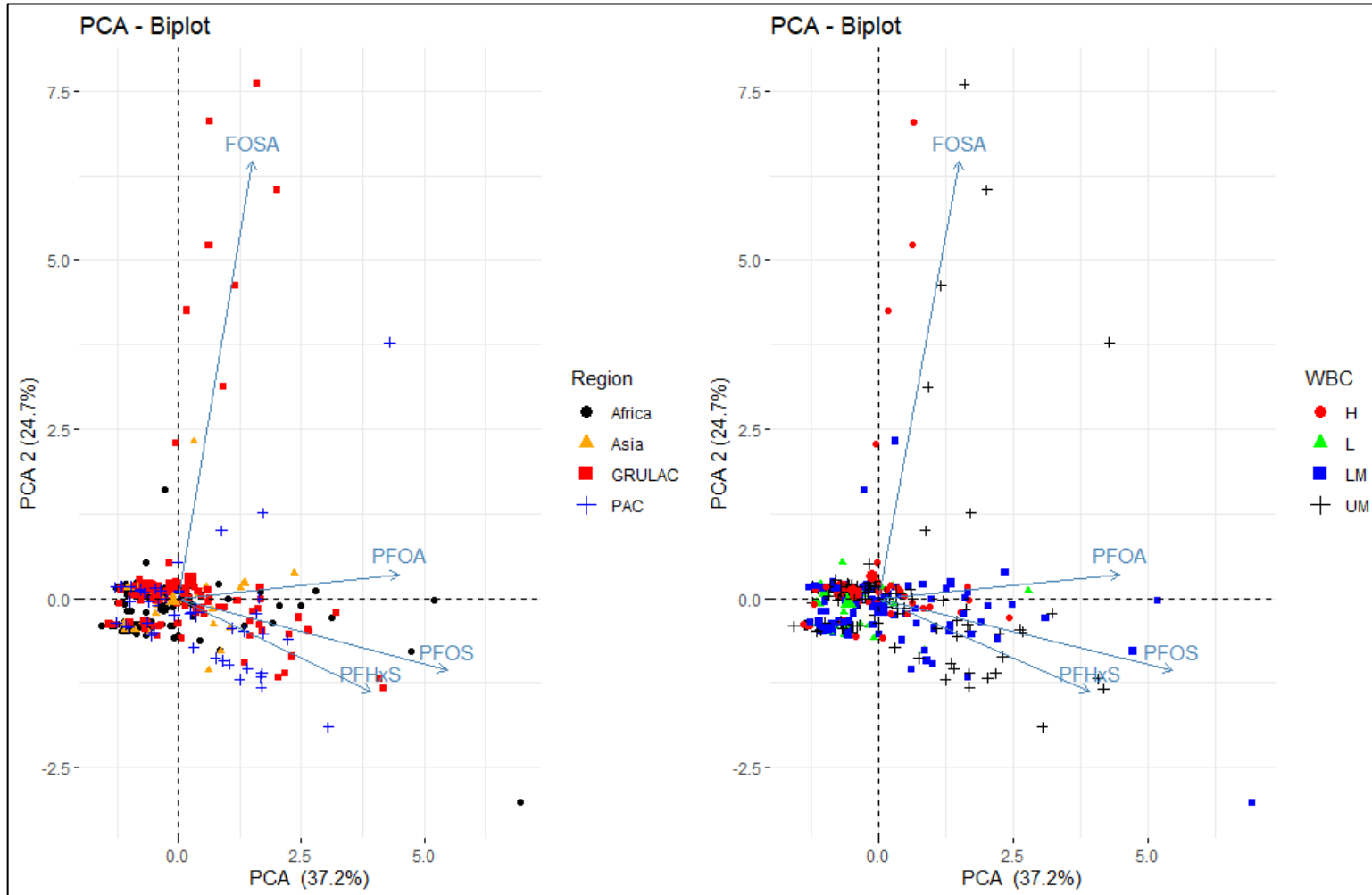
# Overview PFAS by year and PD (n=309)



# PCA biplot for region (n=309)



# PCA biplots



# PFAS Results

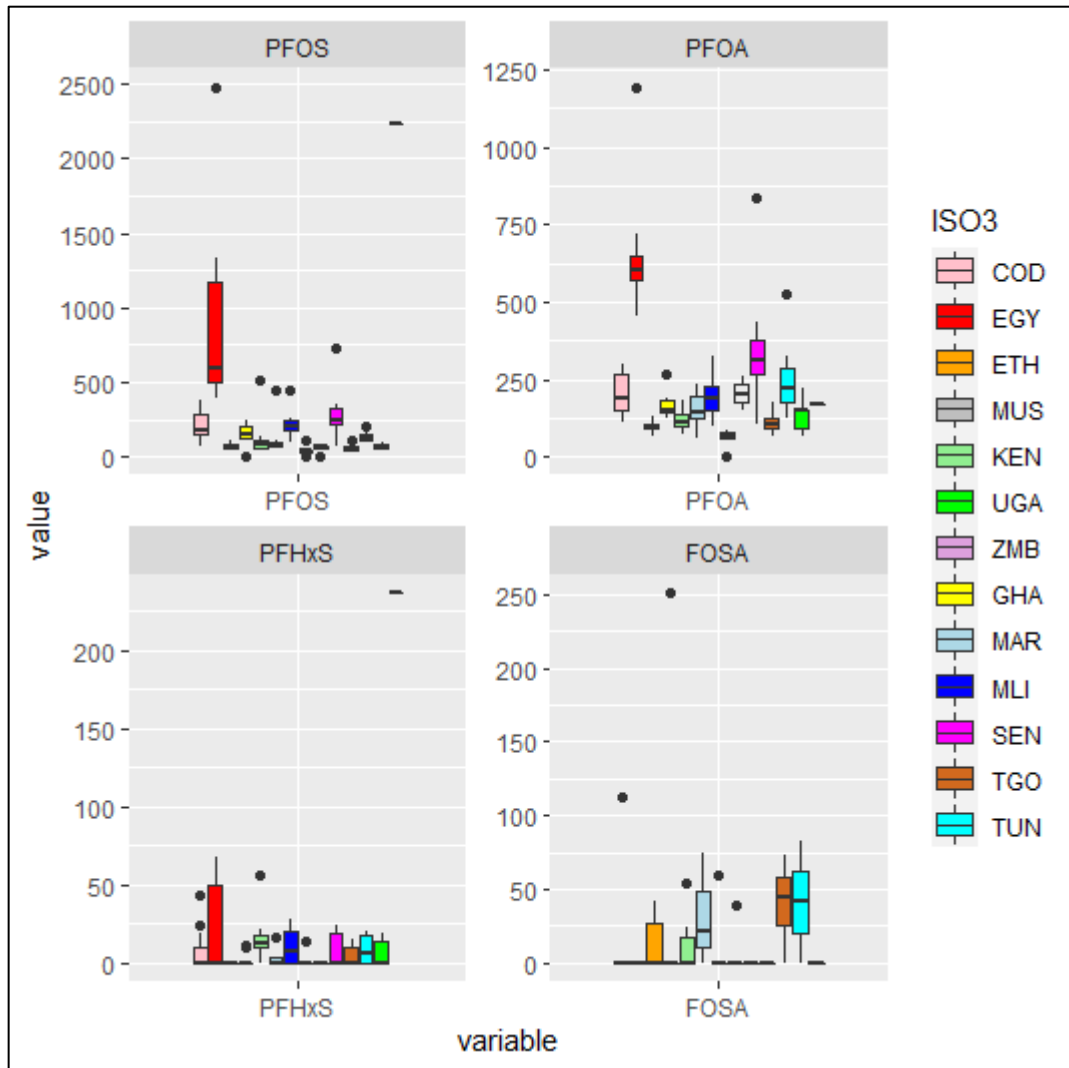
## B.2 Africa Region

Country name	ISO-3	Project Region	WBC 2017	WBC 2018	PD 2017	PD 2018
Congo DR	COD	Africa	L	L	B	B
Egypt	EGY	Africa	LM	LM	B	B
Ethiopia	ETH	Africa	L	L	C	C
Ghana	GHA	Africa	LM	LM	C	C
Kenya	KEN	Africa	LM	LM	B	B
Mali	MLI	Africa	L	L	A	A
Mauritius	MUS	Africa	UM	UM	D	D
Morocco	MAR	Africa	LM	LM	B	B
Nigeria	NGA	Africa	LM	LM	C	C
Senegal	SEN	Africa	L	LM	B	B
Tanzania	TZA	Africa	L	L	B	B
Togo	TGO	Africa	L	L	C	C
Tunisia	TUN	Africa	LM	LM	B	B
Uganda	UGA	Africa	L	L	C	C
Zambia	ZMB	Africa	LM	LM	A	A

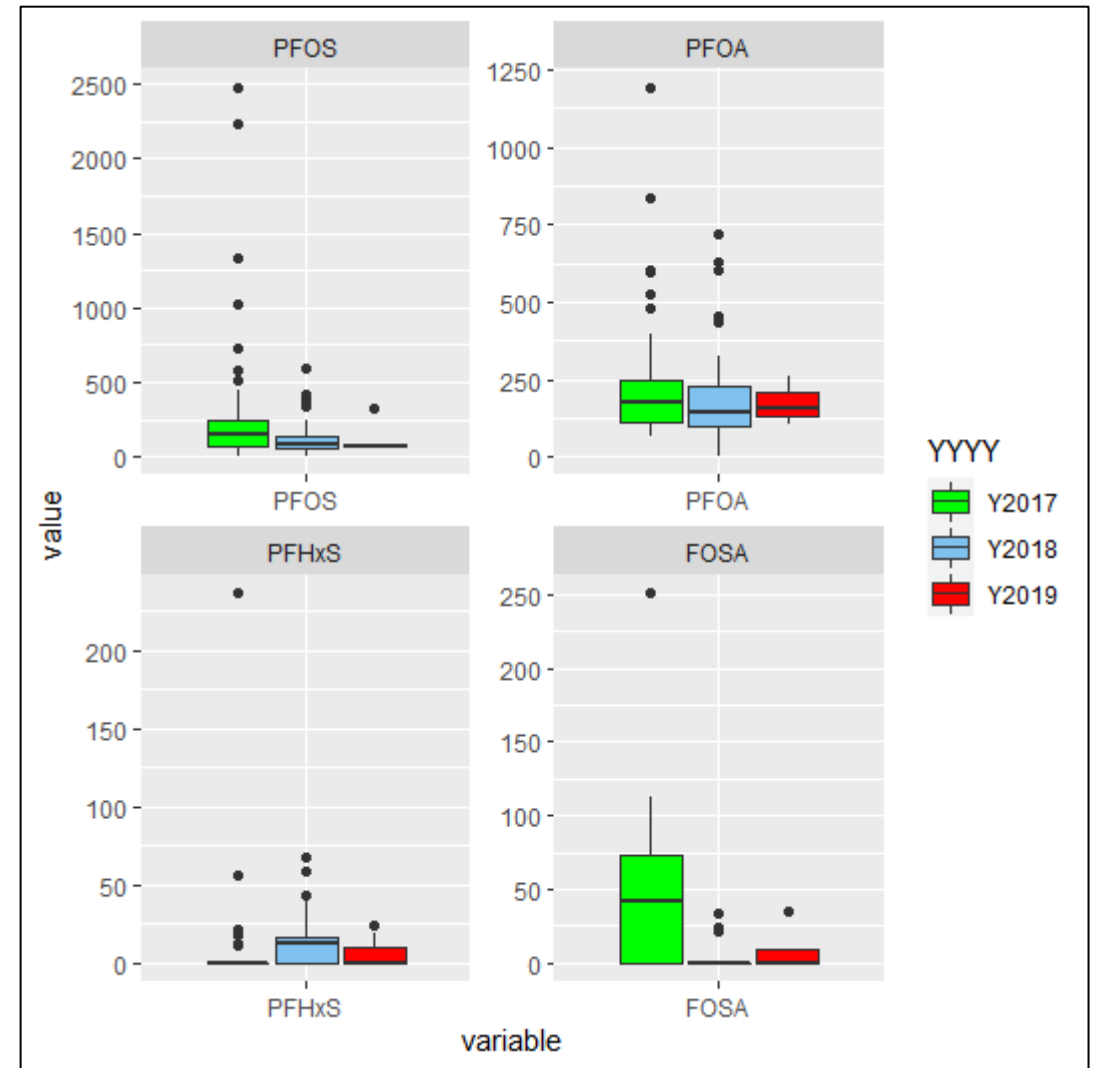


# Country

Values in pg/PUF



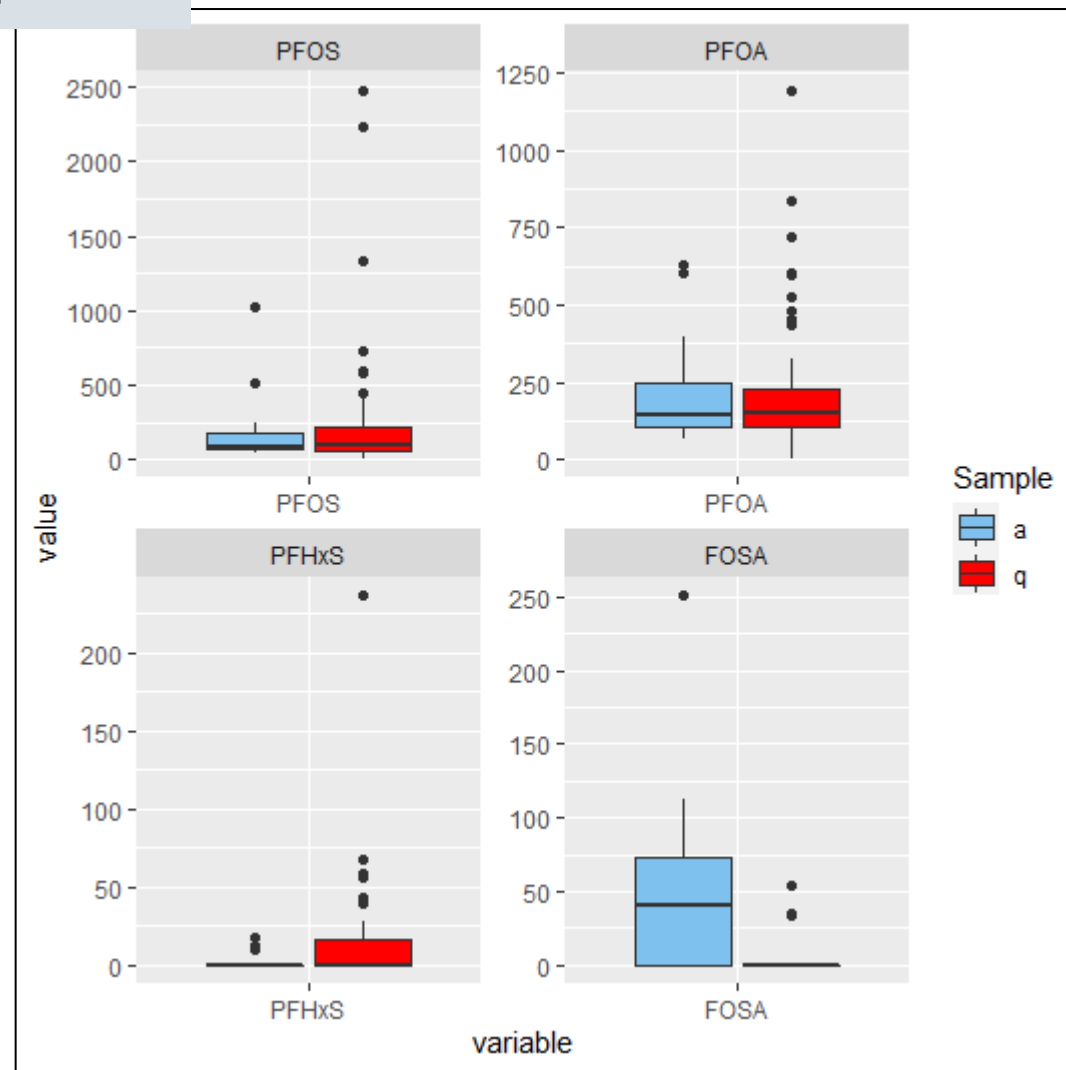
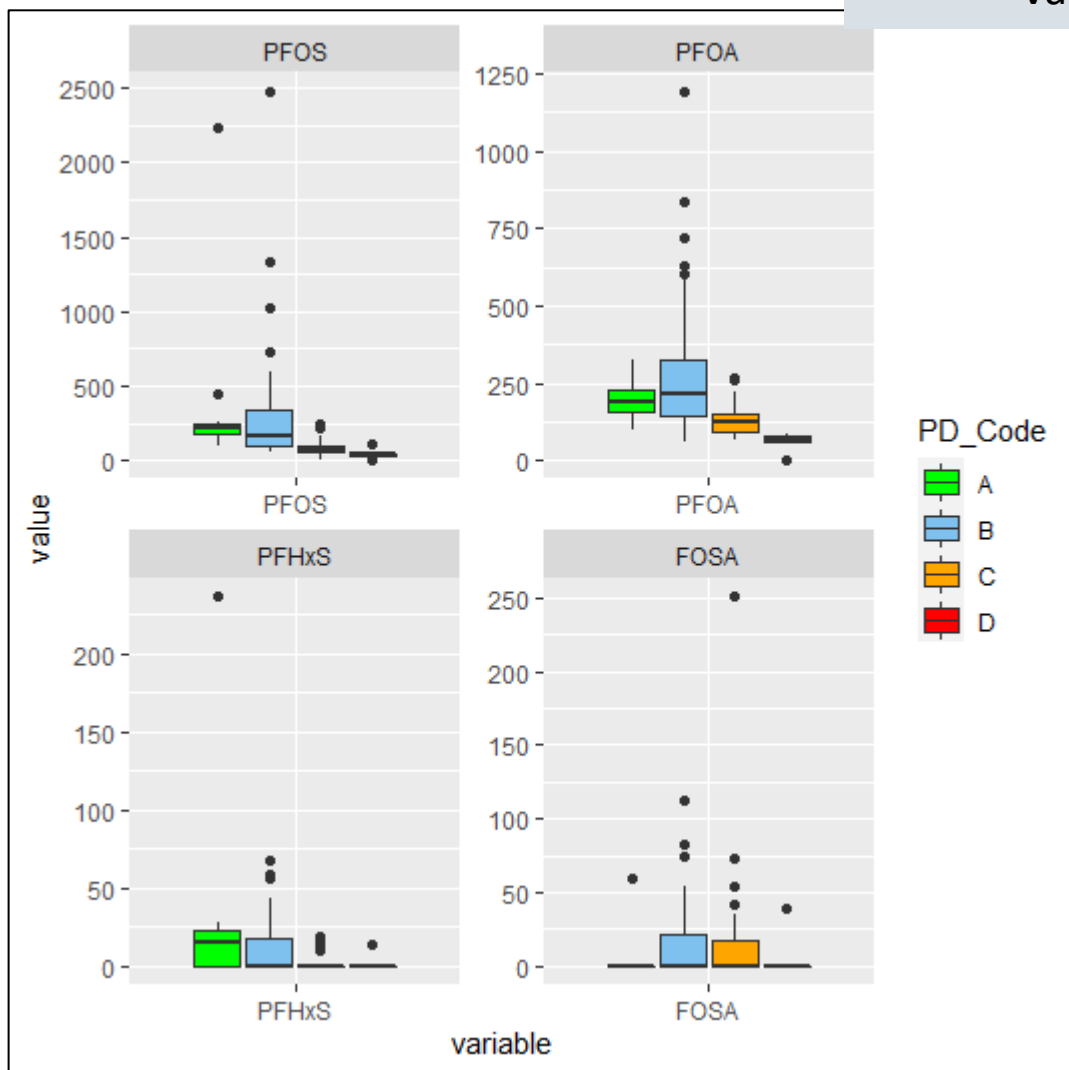
# Sampling year



# Population density

# Sampling time

Values in pg/PUF



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- Thanks to Dr. Leo W.Y. Yeung for PFASs QA/QC, Siamak Sobhanei, Mohammad Sadia, and Abeer Baabish for PFAS lab work at MTM Research Centre, Örebro University;
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# Thank you !