



ANNEX A

MEMBERS OF THE WORKING GROUP

Name	Institution
Jerzy Bartnicki	Norwegian Meteorological Institute (DNMI, for European Environment Agency)
Klaus Berger	ergo Forschungsgesellschaft, Hamburg (Germany)
Annette Borowiak	IRC (Ispra), European Reference Laboratory of Air Pollution
Peter Bruckmann	Landesumweltamt, Essen (Germany, chair)
Norbert Englert	Umweltbundesamt, Berlin (Germany)
Andrea Gärtner	Landesumweltamt, Essen (Germany)
Jean-Claude Galloo	Ecole des Mines de Douai (France)
Saul Garcia Dos Santos-Alves	Instituto de Salud Carlos III, Madrid (Spain)
Sergey Dutchak	MSC-East, Moscow (Guest)
Lynne Edwards	European Commission, DG Environment
Duncan Johnstone	European Commission, DG Environment
Georg Krause	Landesumweltamt, Essen (Germany)
Norbert Kurzeja	Universität Bochum (for European Environmental Bureau, EEB)
Rolaf van Leeuwen	World Health Organisation, Europe
Bob Maynard	Expert on Risk Assessment (Guest)
Phillipe Panier	ERAMET (France, for UNICE)
Bernhard Prinz	Landesumweltamt, Essen (Germany)
Edward Roekens	Flemish Environmental Agency, Antwerp (Belgium)
Bernd Seifert	Umweltbundesamt, Berlin (Germany, chair)

Acknowledgement

The Working Group thanks Angelika Wiefers for typing and formatting the text and making it readable.

ANNEX B

Table 1: Annual emissions of heavy metals in the 15 Member States per source category in 1990 (t/a)

Branch	SNAP 90	As	Cd	Ni
<i>Total</i>	<i>0</i>	<i>575</i>	<i>203</i>	<i>4860</i>
Stationary combustion	01+02+03	492	58.3	2860
Publ. power, cogeneration & district heating	10000	277	19.4	1760
Public power etc. brown coal	01bc	20.2	3.42	24
Public power etc. hard coal	01hc	130	4.42	94.4
Public power etc. fuel oils	01fo	117	10.2	1560
Public power etc other fuels	01of	9.73	1.06	3.05
Comm. instit. & residential combustion	20000	37.8	10.1	130
Commercial etc. brown coal	02bc	2.0	0.483	15.5
Commercial etc. hard coal	02hc	23.4	1.39	38.4
Commercial etc. fuel oils	02fo	9.46	2.35	73
Commercial etc. other fuels	02of	2.82	5.91	1.94
Industrial combustion	30000	177	28.7	973
Industrial combustion brown coal	03bc	65.6	8.95	80.7
Industrial combustion hard coal	03hc	52.3	1.58	69.7
Industrial combustion fuel oils	03fo	50.6	12	805
Industrial combustion other fuels	03of	8.72	6.07	14.8
Production processes	40000	77.3	78.4	202
Petroleum industries	40100	-	-	1.0
Iron & steel industry	40200	35.1	39.5	143
Coke production	40201	1.68	2.89	3.79
Blast furnace	40202	16.4	1.13	18.5
Pig iron	40203	0.17	0.512	0.283
Open hearth furnace	40205	-	2	-
Basic oxygen furnace	40206	1.64	2.18	5.33
Electric arc furnace	40207	10.9	25.9	87.5
Rolling	40208	-	-	-
Sinter plants	40209	4.01	4.66	26.8
Foundries	0402xx	0.28	0.18	0.51

Table 1 (cont.): Annual emissions of heavy metals in the 15 Member States per source category in 1990 (t/a)

Branch	SNAP 90	As	Cd	Ni
Non-ferrous metal industry	40300	31.5	34.2	13.3
Al industry	40301	0.303	0.412	12.5
Cu industry	0403cu	6.85	1.77	0.122
Ni industry	0403ni	-	-	-
Other non-ferrous industry	0403ot	-	-	-
Pb industry	0403pb	9.34	7.55	-
Zn industry	0403zn	-	19.1	-
NPK fertilizers	40407		0.738	0.066
Chloro-alkali industry	40413	-	-	-
Organic chemical industry	40500	-	-	-
Halogenated HC production	40524	-	-	-
Pesticide production	40525	-	-	-
Paper pulp (Kraft process)	40602	-	-	-
Paper and pulp industry	04060x	-	-	-
Road paving with asphalt	40611	-	-	-
Cement industry	40612	3.83	1.79	19.9
Glass industry	40613	6.96	0.548	10.4
Battery manufacturing	40615		0.001	
Synthetic grit blasting	0406xx	-	-	-
Extraction & distribution of fossil fuels	50000	0.541	0.012	0.734
Solvent use	60000	-	0.332	-
Paint use	60100	-	-	-
Industrial degreasing	60201	-	-	-
Dry cleaning	60202	-	-	-
Other solvent use	0603&4	-	0.332	-
Wood preservation	60406	-	-	-
Road transport	70000	-	36.6	285
Road transport combustion	0701-5	-	33.6	270
Road transport non-combustion	0706/7	-	2.75	9.06
Other mobile sources & machinery	80000	1.653	7.9	1480
Other transport combustion	08comb	1.65	7.9	1480
Other transport non-combustion	0802nc	-	-	-

Table 1 (cont.): Annual emissions of heavy metals in the 15 Member States per source category in 1990 (t/a)

Branch	SNAP 90	As	Cd	Ni
Waste treatment & disposal	90000	2.56	16.1	27.3
Waste incineration	90200	2.56	16.1	27.3
Landfill	90400	-	-	-
Cremation	90900	-	0.01	-
Hg thermometers and vapour lamps	09xxxx	-	-	-
Agriculture	10000	0.05	5.21	-
Pesticide use	10600	-	-	-
Nature	11000	-	-	-
Electrical equipment	eel	-	-	-

Table 2: Cd emissions in Europe according to UN/ECE report [t/a]

Country	UN/ECE reported official emission data (April 1999)							
	1990	1991	1992	1993	1994	1995	1996	1997off
Austria	3.09					1.79		
Belgium	9.52	3	4	1	4.4	6.38	4.62	5.62
Denmark					1.16	1.12	1.09	0.87
Finland	6.1	2.5	2.2	3.0	2.7	2.5	1	0.6
France	15.4	15.8	15.2	14.7	14.3	13.3	13.1	
Germany	30					11		
Greece							3	
Ireland								0.9*
Italy	53.79				29.90			
Luxembourg					0.532	0.382	0.368	
Netherlands	2.38	2.33	2.33	1.84	1.68	1.51	1.83	1.82
Portugal								2.4
Spain	36.7							
Sweden	2		1.3		0.7	0.8		
United Kingdom	25.4	24.9	25.7	25.5	24.2	15	14.5	15.1

* Expert estimates of J. Pacyna (see MSC-E report, [62, chapter 1])

Table 3: Annual emissions of Cd in Austria [t/a]

Sector	Cd [t/a]
Combustion in energy and transformation industries	0.39
Non-industrial combustion plants	0.76
Combustion in manufacturing industry	0.25
Production processes	0.22
Road transport	0.08
Other mobile sources and machinery	< 0.01
Waste treatment and disposal	0.04
Agriculture	0.05
Other sources and sinks	< 0.01
Total	1.79

Table 4: Annual emissions of heavy metals in Denmark in 1997 [t/a]
(According to SNAP 97)

Source Sectors	As	Cd	Ni
Combustion in energy and transformation industry	0.435	0.316	8.782
Non-industrial combustion plants	0.127	0.229	2.685
Combustion in manufacturing industry	0.267	0.215	9.397
Production processes	0	0.060	0.228
Road transport	0	0.033	0.235
Other mobile sources and machinery	0.032	0.012	0.965
Total	0.861	0.866	22.29

Table 5: Annual emissions of heavy metals in Finland in 1997 [t/a]

Branch	As	Cd	Ni
Energy production	0.911	0.349	9.391
Industry (fuels)	1.604	0.423	9.918
Industry (processes)	9.750	0.337	8.795
Mobile sources	n.a.	n.a.	n.a.
Waste management	0.002	0.002	0.001
Total	12.27	1.11	28.11

Table 6: Annual emissions of heavy metals in Flanders in 1997 [t/a]

Branch	As	Cd	Ni
Electricity production	0.172	0.007	0.303
Steel	0	0.285	1.583
Non-ferro	1.291	1.658	0.321
Production of glass material	0	0.317	0.051
Refinery	0.016	0	26.168
Incineration industrial waste	0.013	0.003	0
Incineration waste	0	0	0.014
Chemical industry	0	0	1.106
Traffic	0	0.052	0.365
Machinery; electrotechn. industry	0	0	0.119
Total	1.492	2.322	30.03

Table 7: Annual emissions of heavy metals in France in 1996 [t/a]

Branch	As	Cd	Ni
Combustion in energy and transformation industries	1.5	0.2	107.9
Non-industrial combustion plants	0.1	2	11.2
Combustion in manufacturing industry	16.3	3.7	97
Production processes	1.3	2.1	9.4
Road transport	0	0.4	2.7
Other mobile sources and machinery	0	0	0.8
Waste treatment and disposal	0.5	4.7	2.9
Total	19.7	13.1	231.9

Table 8: Annual emissions of heavy metals in Germany per source category in 1995 (t/a)

Branch	SNAP 90	As	Cd	Ni
<i>Total</i>	<i>0</i>	<i>33</i>	<i>11</i>	<i>159</i>
Stationary combustion	01+02+03	21.0	3.0	139.5
Publ. power, cogeneration & district heating	10000	10.4	1.72	46.6
Public power etc. brown coal	01bc	6.3	0.99	7.7
Public power etc. hard coal	01hc	3.7	0.4	3.4
Public power etc. fuel oils	01fo	0.4	0.03	34.7
Public power etc. other fuels	01of	0.1	0.3	0.8
Comm. instit. & residential combustion	20000	2.4	0.5	14.0
Commercial etc. brown coal	02bc	1.1		8.2
Commercial etc. hard coal	02hc	1.3		2.4
Commercial etc. fuel oils	02fo	-		3.4
Commercial etc. other fuels	02of	-		-
Industrial combustion	30000	8.2	0.78	78.9
Industrial combustion brown coal	03bc	5.1	0.71	6.2
Industrial combustion hard coal	03hc	2.3	-	3.2
Industrial combustion fuel oils	03fo	0.8	0.07	69.5
Industrial combustion other fuels	03of	-	-	-
Production processes	40000	12.6	7.754	20.2
Petroleum industries	40100	-	-	-
Iron & steel industry	40200	2.9	5.11	15.3
Coke production	40201	0.1	0.26	0.35
Blast furnace	40202	1.7	0.14	4.2
Pig iron	40203	-	-	-
Open hearth furnace	40205	-	-	-
Basic oxygen furnace	40206	0.07	0.56	1.5
Electric arc furnace	40207	0.35	2.93	3.8
Rolling	40208	-	-	-
Sinter plants	40209	0.6	1.1	5.3
Foundries	0402xx	0.08	0.12	0.15

Table 8 (cont.): Annual emissions of heavy metals in Germany per source category in 1995 (t/a)

Branch	SNAP 90	As	Cd	Ni
Non-ferrous metal industry	40300	5	2.3	-
Al industry	40301			-
Cu industry	0403cu			-
Ni industry	0403ni			-
Other non-ferrous industry	0403ot			-
Pb industry	0403pb			-
Zn industry	0403zn			-
NPK fertilisers	40407	-	-	-
Chloro-alkali industry	40413	-	-	-
Organic chemical industry	40500	-	-	-
Halogenated HC production	40524	-	-	-
Pesticide production	40525	-	-	-
Paper pulp (Kraft process)	40602	-	-	-
Paper and pulp industry	04060x	-	-	-
Road paving with asphalt	40611	-	-	-
Cement industry	40612	0.3	0.164	2.5
Glass industry	40613	4.4	0.18	2.4
Battery manufacturing	40615		-	
Synthetic grit blasting	0406xx	-	-	-
Extraction & distribution of fossil fuels	50000	-	-	-
Solvent use	60000	-	-	-
Paint use	60100	-	-	-
Industrial degreasing	60201	-	-	-
Dry cleaning	60202	-	-	-
Other solvent use	0603&4	-	-	-
Wood preservation	60406	-	-	-
Road transport	70000	-	n. a.	n. a.
Road transport combustion	0701-5	-	-	n. a.
Road transport non-combustion	0706/7	-	n. a.	n. a.
Other mobile sources & machinery	80000	n. a.	n. a.	n. a.
Other transport combustion	08comb	n. a.	n. a.	n. a.
Other transport non-combustion	0802nc	-	-	-

Table 8 (cont.): Annual emissions of heavy metals in Germany per source category in 1995 (t/a)

Branch	SNAP 90	As	Cd	Ni
Waste treatment & disposal	90000	-	n. a.	-
Waste incineration	90200	-		-
Landfill	90400	-	-	-
Cremation	90900	-	n. a.	-
Hg thermometers and vapour lamps	09xxxx	-	-	-
Agriculture	10000	n. a.	-	-
Pesticide use	10600	-	-	-
Nature	11000	-	-	-
Electrical equipment	eel	-	-	-

Table 9: Annual emissions of heavy metals in Italy in 1994 [t/a]

Branch	As	Cd	Ni
Combustion in energy and transformation industries	2.9	2.7	304.4
Non-industrial combustion plants	0.5	1	25.6
Combustion in manufacturing industry	32.6	22.1	129.2
Production processes	1	2.7	2.4
Road transport	0	0.3	2.2
Other mobil sources and machinery	1	0.4	67.8
Waste treatment and disposal	0.2	0.7	8.4
Total	38.1	29.9	540

Table 10: Annual emissions of heavy metals in Luxemburg in 1997 [t/a]

Branch	As	Cd	Ni
Public power, cogeneration & district heating	0	0.004	0.005
Comm. instit. & residential combustion plants	0.016	0.023	0.238
Industrial combustion plants and processes with combustion	0.897	0.248	1.133
Non combustion processes	0.066	0.022	0.144
Road transport	0	0.004	0.028
Other transport	0.007	0	0.003
Waste treatment & disposal	0.004	0	0
Total	0.99	0.301	1.551

Table 11: Annual emissions of heavy metals in The Netherlands in 1997 by source category according to the CORINAIR-97 definitions [t/a]

Source Category	As	Cd	Ni
Combustion in energy and transformation industries			
Public power	0.00873	0.00303	0.503
Petroleum refining plants	0.131	0.128	72.6
Coal mining, oil/gas extraction, pipeline compressors	0.0000067	0.0000067	0.00374
Non-industrial combustion plants			
Commercial and institutional plants (1)	0.00246	0.00211	1.17
Residential plants	0.015	0.001	0.362
Plants in agriculture, forestry and aquaculture	0.00424	0.000807	0.403
Combustion in manufacturing industry			
Comb. in boilers, gas turbines and stationary engines	0.0153	0.00532	3.41
Processes with contact	0.0205	0.0465	0.0071
Production processes			
Processes in iron and steel industries and collieries	0.551	1.04	1.21
Processes in non-ferrous metal industries	0.239	0.195	0.444
Processes in inorganic chemical industries	0	0.232	0.205
Processes in organic chemical industr. (bulk production)	0	0.00199	0.000944
Processes in wood, paper pulp, food, drink and other industries	0.000764	0.000185	0.216
Extraction and distribution of fossil fuels and geothermal energy			
Liquid fuel distribution (except gasoline distribution)	0.0000017	0.0000018	0.000976
Solvent and other product use			
Chemical products manufacturing or processing	0	0.0109	0.0074

Table 11 (cont.): Annual emissions of heavy metals in The Netherlands in 1997 by source category according to the CORINAIR-97 definitions [t/a]

Source Category	As	Cd	Ni
Road transport			
Passenger cars (r)	0.0971	0.0154	0.0782
Light duty vehicles < 3,5 t (r)	0.0114	0.00181	0.0108
Heavy duty vehicles > 3,5 t and buses (r)	0.00878	0.00138	0.0264
Mopeds and motorcycles < 50 cm ³	0.000436	0.0000693	0.00036
Motorcycles > 50 cm ³	0.000821	0.000131	0.00092
Automobile type and brake water	0.0186	0.0307	1.22
Other mobile sources and machinery			
Railways	0	0	0.000296
Inland waterways	0	0	0.0111
Maritime activities	0.0107	0.00431	8.24
Agriculture	0	0	0.00382
Other off-road	0	0	0.00263
Waste treatment and disposal			
Waste incineration	0.0659	0.106	0.0719
Other waste treatment	0.0000292	0.0000775	0.0164

Table 12: Annual emissions of heavy metals in Sweden in 1995 [t/a]

Branch	As	Cd	Ni
Mining	0.09	0.02	0.45
Glass industry	0.02	0.01	0
Cement industry	0	0.001	0
Refineries	0	0.03	0.82
Iron and steel	0	0.13	8.00
Non-ferrous metals	0.78	0.17	0.01
Casting	0	0	0.11
Engineering industry	0	0.005	0.02
Waste incineration	0	0.008	0
District heating	0.19	0.06	6.60
Combustion of that industry	0.13	0.15	13.00
Dwellings	0.09	0.18	3.30
Total	1.30	0.76	32.31

Table 13: Annual Emissions of heavy metals in the United Kingdom in 1996

	As	Cd	Ni
Comb in Energy Prod & Trans	7	4.7	128
Comb in Comm/Inst/Res/Agri			
Domestic	12	0.4	16
Other	2.7	0.1	35
Combustion in Industry			
Treated Wood	9	-	-
Iron & Steel	0.7	0.5	7
Other Combustion in Industry	13	0.4	92
Non-Ferrous Metals	3.2	7.0	0
Cement	0.1	0.2	1
Glass Production	0.8	0.3	5
Production Processes			
Processes in Industry	0.0	0.3	2
Iron & Steel	1.8	1.9	4
Extr./Distrib. of Fossil Fuels	0.0	0.0	0
Road Transport	0.0	0.5	0
Other Transp. & Mach.	0.0	0.0	0
Waste Treatment & Disp.	0.3	2.6	1
Total	50.5	18.9	291

ANNEX C

Table 14: Monitoring sites included in the EMEP data base on Cd for 1996, 1997

Country	Station Codes	Station name	Location		Height above sea level (m)
			Lat.	Long.	
Czech Rep.	CS1	Svratouch	40°44'N	16°02'E	737
	CS3	Kosetice	49°35'N	15°05'E	633
Denmark	DK31	Ulborg	56°17'N	8°26'E	10
Estonia	EE9	Lahemaa	59°3'N	25°54'E	32
	EE11	Vilsandi	58°23'N	21°49'E	6
Finland	FI9	Uto	59°47'N	21°23'E	7
	FI17	Virolahti II	60°31'N	27°41'E	4
	FI53	Hailuoto	65°00'N	24°41'E	4
	FI92	Hietajarvi	63°10'N	30°43'E	173
	FI93	Kotinen	61°14'N	25°04'E	158
	FI94	Pesosjarvi	66°18'N	29°30'E	257
	FI95	Yuoskojarvi	69°44'N	26°57'E	147
	FI96	Pallas	67°58'N	24°7'E	566
Germany	DE1	Westerland	54°55'N	8°18'E	12
	DE2	Langenbrugge	52°48'N	10°45'E	74
	DE3	Schauinsland	47°55'N	7°54'E	1205
	DE4	Deuselbach	49°46'N	7°03'E	480
	DE5	Brotjacklriegel	48°49'N	13°13'E	1016
	DE7	Neuglobsow	53°09'N	13°02'E	62
	DE8	Schmucke	50°39'N	10°46'E	937
	DE9	Zingst	54°26'N	12°44'E	1
Iceland	IS2	Irafoss	64°05'N	21°01'W	61
	IS90	Reykjavik	64°08'N	21°54'W	61
	IS91	Sturhofdi	63°24'N	20°17'W	118
Ireland	IE1	Valentia Observatory	51°56'N	10°15'W	9
	IE2	Turlough Hill	53°02'N	6°24'W	420
Latvia	LV10	Rucava	56°13'N	21°13'E	18
	LV16	Zoseni	57°08'N	25°55'E	183
Lithuania	LT15	Preila	55°21'N	21°04'E	5

Table 14 (cont.): Monitoring sites included in the EMEP data base on Cd for 1996, 1997

Country	Station Codes	Station name	Location		Height above sea level (m)
			Lat.	Long.	
Norway	NO1	Birkenes	58°23'N	8°15'E	190
	NO30	Jergul	69°24'N	24°36'E	255
	NO39	KÍrvatn	62°47'N	8°53'E	210
	NO41	Osen	61°15'N	11°47'E	440
	NO42	Zeppelinfjell	78°54'N	11°53'E	474
	NO44	Nordmoen	60°16'N	11°06'E	440
	NO47	Svanvik	69°27'N	30°02'E	474
	NO92	Overbygd	69°03'N	19°22'E	90
	NO93	Valdalen	62°05'N	12°10'E	800
	NO94	Mosvatn	59°50'N	8°20'E	940
Norway	NO95	Ualand	58°31'N	6°23'E	220
	NO96	Namsvatn	64°59'N	13°35'E	500
	NO97	Solhomfjell	58°56'N	8°48'E	260
	NO99	Lista	58°06'N	6°34'E	13
Poland	PL4	Leba	54°45'N	17°32'E	157
	PL5	Diabla Gora	54°09'N	22°04'E	157
Portugal	PT1	Braganca	41°49'N	6°46'W	691
	PT3	V. d. Castelo	40°25'N	7°33'W	16
Slovakia	SK2	Chopok	48°56'N	19°35'E	2008
	SK4	Stara Lesna	49°09'N	20°17'E	808
	SK5	Liesek	49°22'N	19°41'E	892
	SK6	Starina	49°03'N	22°16'E	345
	SE5	Bredkalen	63°51'N	15°20'E	404
	SE11	Vavihill	56°01'N	13°09'E	172
	SE12	Aspvreten	58°48'N	17°23'E	20
	SE51	Arup	55°45'N	13°40'E	157
	SE97	GÍrdsjon	58°03'N	12°01'E	113
Turkey	TR1	Cubuk II	40°30'N	33°00'E	1169
United Kingdom	GB14	High Muffles	54°20'N	0°48'W	260
	GB90	East Ruston	52°48'N	1°28'E	5
	GB91	Banchory	57°05'N	2°32'E	120
Yugoslavia	YU5	Kamenicki vis	43°24'N	21°57'E	813
	YU8	Zabljak	43°09'N	19°08'E	1450

The sites codes used are the new EMEP codes introduced in 1992. Stations without standard EMEP codes have been coded with country ISO code and number from 90 and higher. Most of the presented stations carry out measurements of As and Ni as well.

ANNEX D

Resampling of mean values and calculation of variation coefficients of mean values from 30 time series of some member states.

(For the definition of units and symbols compare text of chapter 3.2.3.)

Pollutant:	Arsenic	vpred =	0,05	0,10	0,15
Site	type	year	N (days)	N (days)	N (days)
Hoboken (B)	I	1996	240	119	64
Hoboken (B)	I	1997	164	62	30
Essen (D)	I	1996	180	71	35
Essen (D)	I	1997	171	66	33
average:	I		189	80	41
Biest (NL)	U	1998	143	51	24
Bilthoven (NL)	U	1998	143	50	24
Vlaardingen (NL)	U	1998	182	73	36
Wolfsburg (D)	U	1996	302	198	126
Wolfsburg (D)	U	1997	288	177	108
average:	U		212	110	64
Kollumerwaard (NL)	R	1998	207	90	46

Pollutant:	Cadmium	vpred =	0,05	0,10	0,15
Site	type	year	N (days)	N (days)	N (days)
Hoboken (B)	I	1996	289	178	108
Hoboken (B)	I	1997	170	65	32
Essen (D)	I	1996	310	214	141
Essen (D)	I	1997	315	223	150
Terni (I)	I	1996	321	235	163
Terni (I)	I	1997	136	47	23
average:	I		257	160	103
Biest (NL)	U	1998	144	51	25
Bilthoven (NL)	U	1998	143	51	24
Vlaardingen (NL)	U	1998	185	75	37
Wolfsburg (D)	U	1996	196	82	42
Wolfsburg (D)	U	1997	198	84	43
average:	U		173	69	34
Kollumerwaard (NL)	R	1998	222	102	54

Pollutant:	Nickel	vpred =	0,05	0,10	0,15
Site	type	year	N (days)	N (days)	N (days)
Hoboken (B)	I	1996	116	38	18
Hoboken (B)	I	1997	39	11	5
Essen (D)	I	1996	130	44	21
Essen (D)	I	1997	132	45	22
Terni (I)	I	1996	180	71	36
Terni (I)	I	1997	147	53	25
average:	I		124	44	21
Wolfsburg (D)	U	1996	114	37	17
Wolfsburg (D)	U	1997	173	67	33
average:	U		144	52	25

Resampling of mean values

(100 samples of size N without replacement)

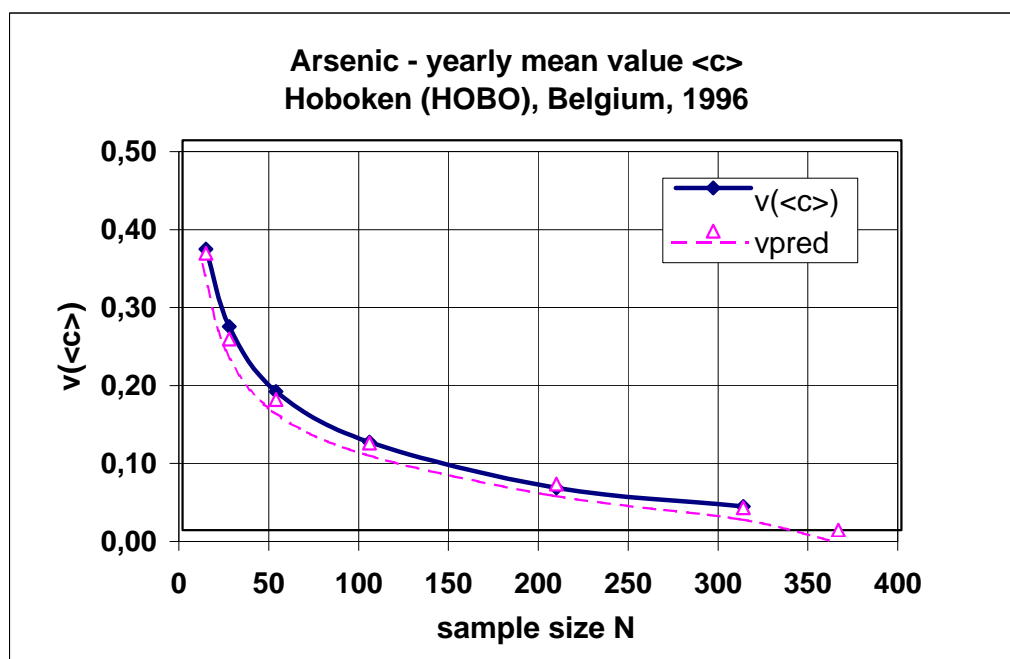
N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Hoboken, Belgium
poll: Arsenic

units: ng/m³
data: 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	1,8	0,66	0,36	0,36
26	1,9	0,48	0,26	0,25
52	1,8	0,33	0,18	0,17
104	1,8	0,20	0,11	0,11
208	1,8	0,10	0,05	0,06
312	1,8	0,06	0,03	0,03
365	1,8			0,00

Nmax: 362 s = 2,4



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	240
0,10	119
0,15	64

Resampling of mean values

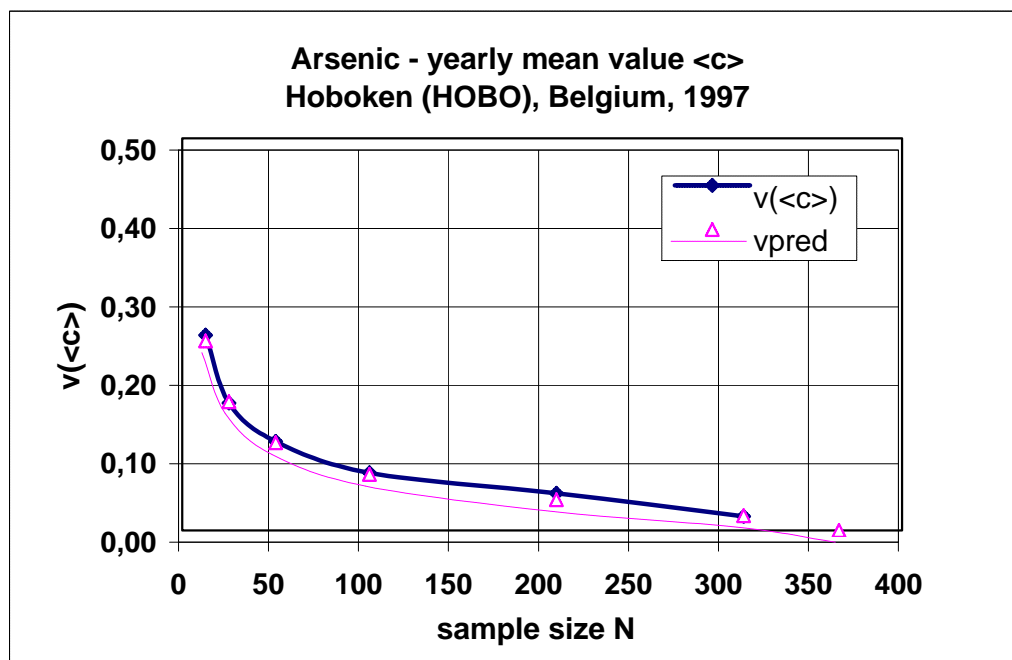
(100 samples of size N without replacement)

N: sample size Nmax: maximum sample size available
 <c>: mean value vpred: $s * \text{SQRT}(1/N - 1/365) / <c>$
 u(<c>): standard deviation of the mean value <c>
 v(<c>): $u(<c>) / <c>$

site: Hoboken, Belgium units: ng/m³
 poll: Arsenic data: 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	3,8	0,95	0,25	0,24
26	3,9	0,64	0,16	0,16
52	3,9	0,44	0,11	0,11
104	4,0	0,29	0,07	0,07
208	3,9	0,19	0,05	0,04
312	3,9	0,07	0,02	0,02
365	3,9			0,00

Nmax: 365 s = 3,4



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	240
0,10	119
0,15	64

Resampling of mean values

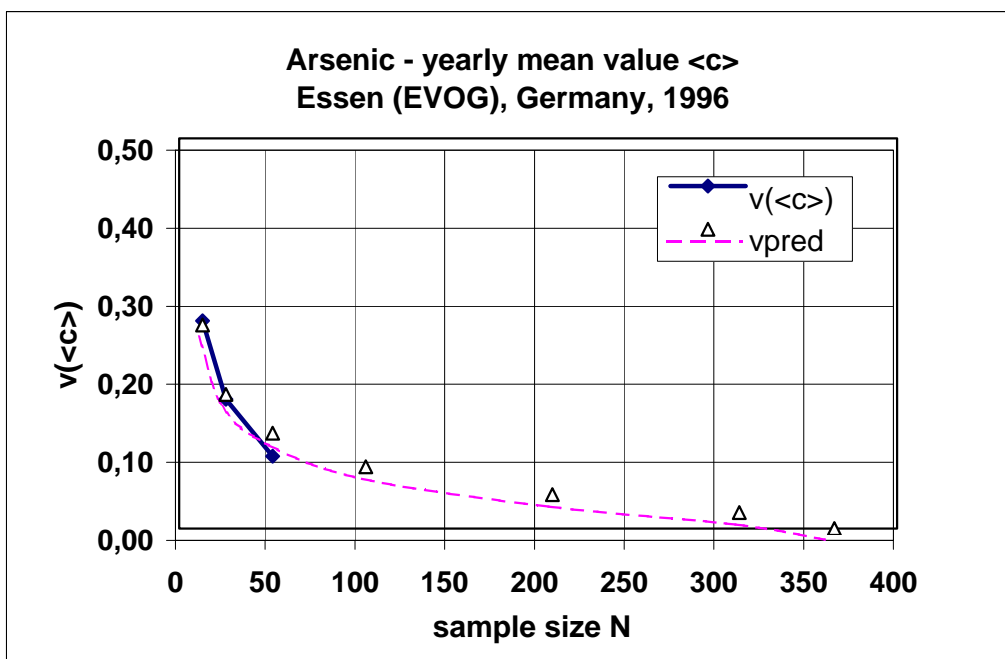
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Essen, Vogelheim, Germany **units:** ng/m³
poll: Arsenic **data:** 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	3,1	0,83	0,27	0,26
26	3,3	0,55	0,17	0,17
52	3,2	0,29	0,09	0,12
104	3,2			0,08
208	3,2			0,04
312	3,2			0,02
365	3,2			0,00

Nmax: 100 s = 3



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	180
0,10	71
0,15	35

Resampling of mean values

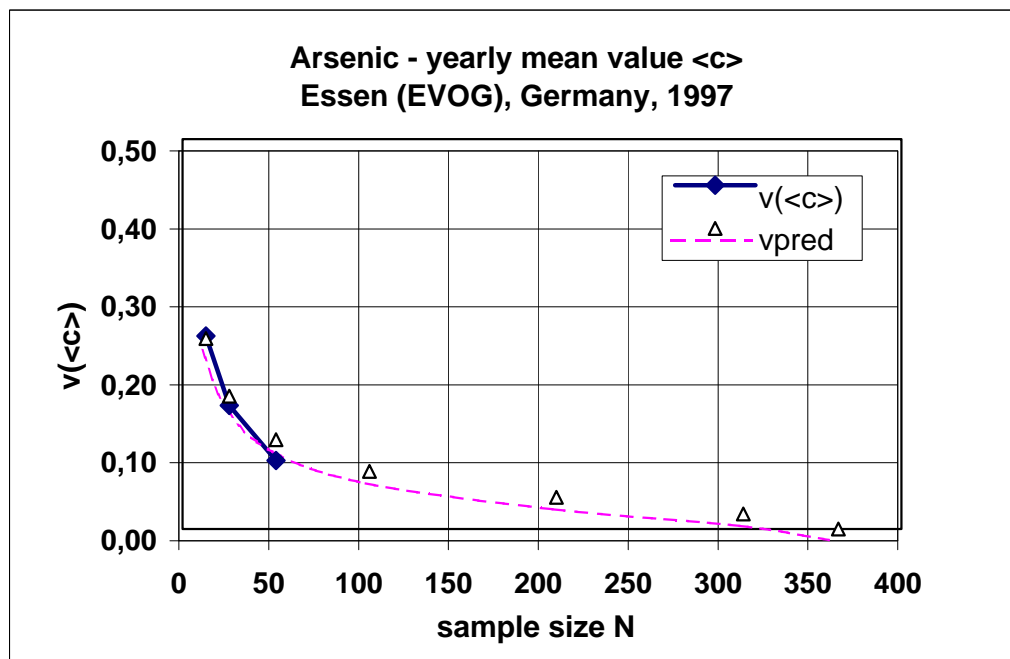
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Essen, Vogelheim, Germany **units:** ng/m³
poll: Arsenic **data:** 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	2,1	0,53	0,25	0,24
26	2,1	0,33	0,16	0,17
52	2,1	0,19	0,09	0,11
104	2,1			0,07
208	2,1			0,04
312	2,1			0,02
365	2,1			0,00

Nmax: 94 s = 1,9



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	171
0,10	66
0,15	33

Resampling of mean values

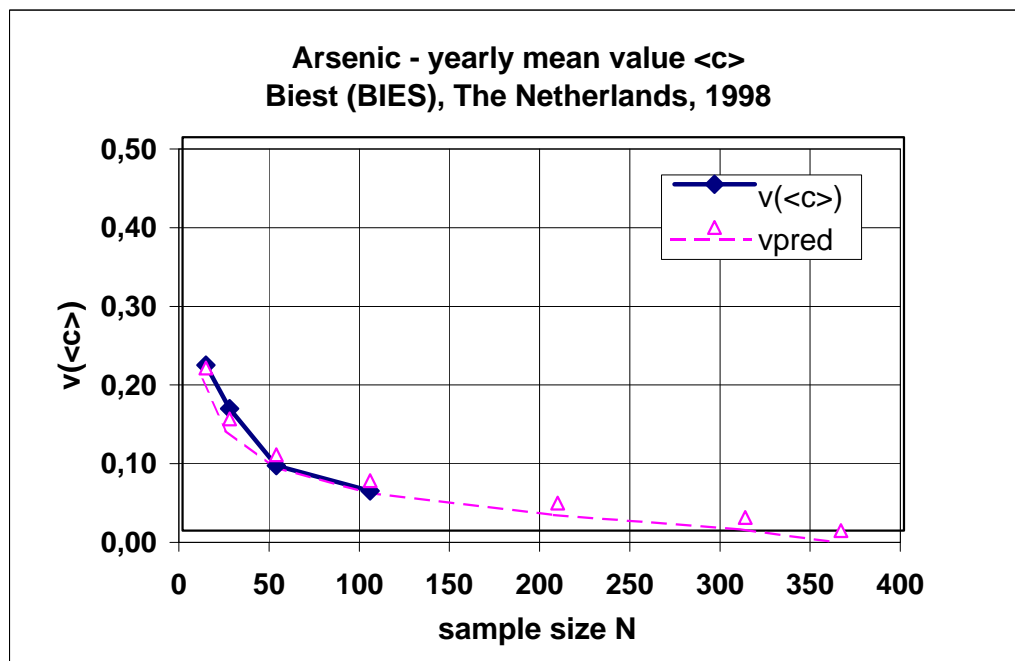
(100 samples of size N without replacement)

N: sample size Nmax: maximum sample size available
 <c>: mean value vpred: $s * \text{SQRT}(1/N - 1/365) / <c>$
 u(<c>): standard deviation of the mean value <c>
 v(<c>): $u(<c>) / <c>$

site: Biest, The Netherlands units: ng/m³
 poll: Arsenic data: 1998

N	<c>	u(<c>)	v(<c>)	vpred
13	1,1	0,23	0,21	0,21
26	1,1	0,17	0,16	0,14
52	1,1	0,09	0,08	0,10
104	1,1	0,05	0,05	0,06
208	1,1			0,03
312	1,1			0,02
365	1,1			0,00

Nmax: 163 s = 0,82



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	143
0,10	51
0,15	24

Resampling of mean values

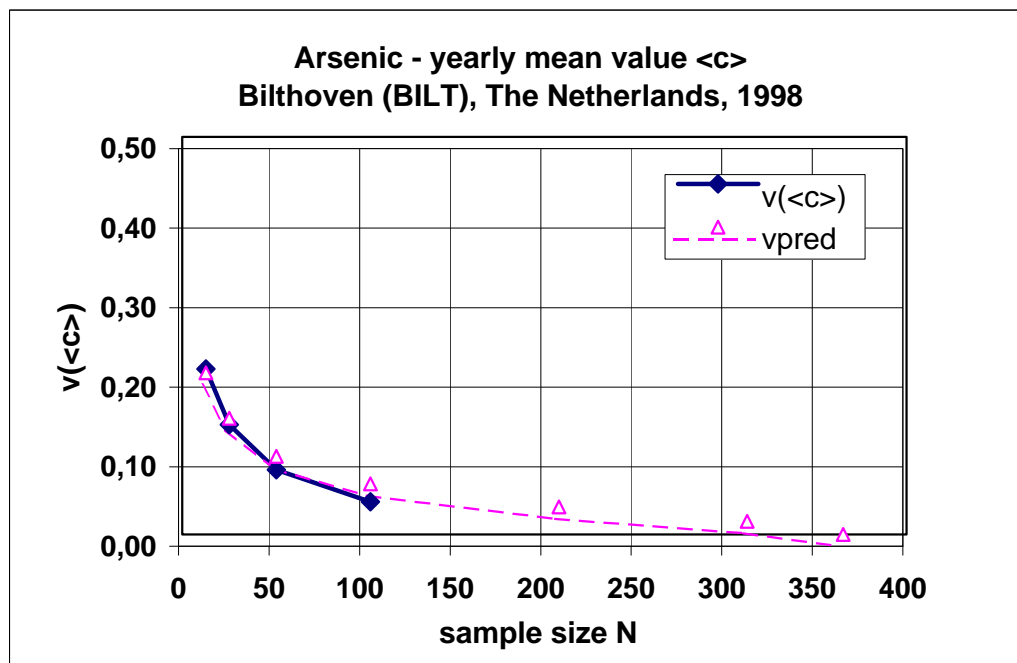
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Bilthoven, The Netherlands **units:** ng/m³
poll: Arsenic **data:** 1998

N	<c>	u(<c>)	v(<c>)	vpred
13	0,9	0,18	0,21	0,20
26	0,8	0,12	0,14	0,15
52	0,9	0,07	0,08	0,10
104	0,9	0,04	0,04	0,06
208	0,9			0,03
312	0,9			0,02
365	0,9			0,00

Nmax: 159 s = 0,65



$N = 1 / [(vpred * <c> / s)^2 + 1/365]$

vpred	N
0,05	143
0,10	50
0,15	24

Resampling of mean values

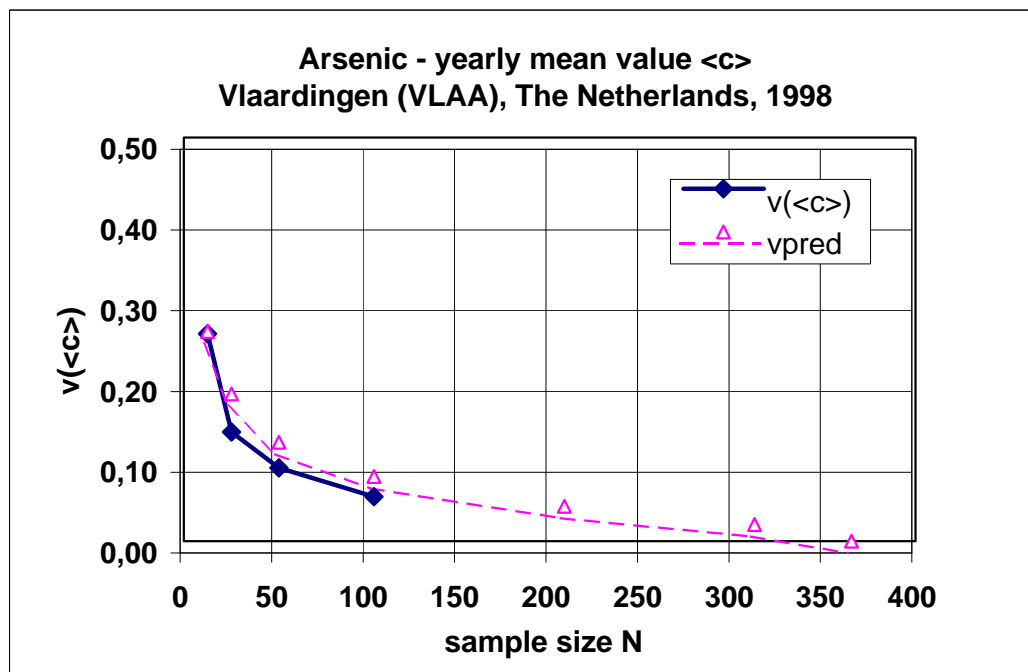
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Vlaardingen, The Netherlands **units:** ng/m³
poll: Arsenic **data:** 1998

N	<c>	u(<c>)	v(<c>)	vpred
13	0,9	0,22	0,26	0,26
26	0,9	0,12	0,14	0,18
52	0,9	0,08	0,09	0,12
104	0,9	0,05	0,06	0,08
208	0,9	0,00		0,04
312	0,9			0,02
365	0,9			0,00

Nmax: 161 s = 0,82



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	182
0,10	73
0,15	36

Resampling of mean values

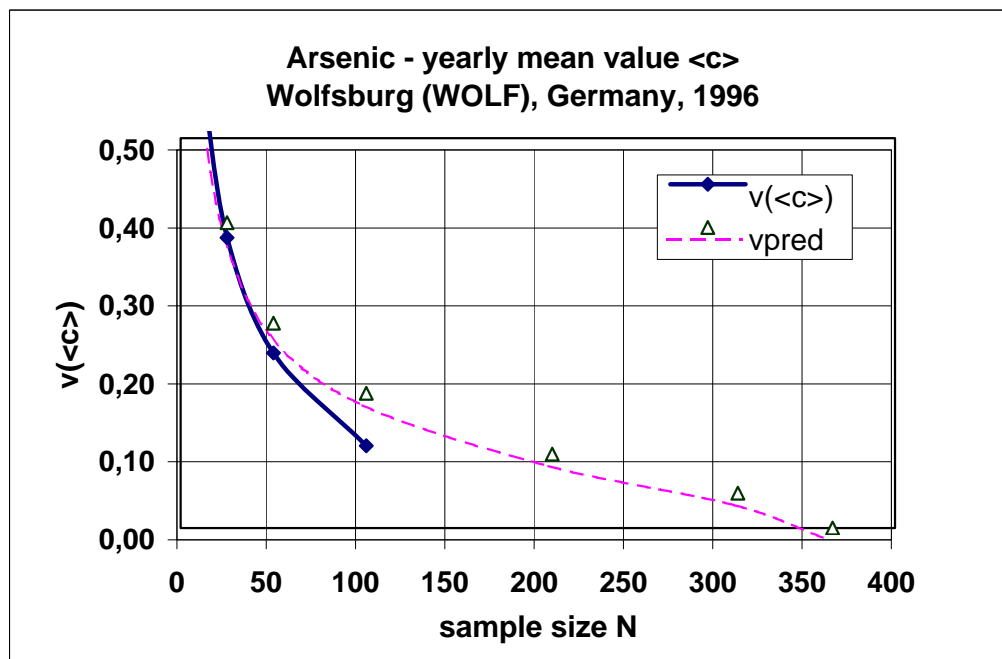
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size
<c>: mean value **vpred:** $s \cdot \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>) = $u(<c>)/<c>$

site: Wolfsburg, Germany **units:** ng/m³
poll: Arsenic **data:** 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	1,7	0,96	0,56	0,56
26	1,7	0,63	0,37	0,39
52	1,7	0,38	0,22	0,26
104	1,7	0,18	0,11	0,17
208	1,7			0,09
312	1,7			0,04
365	1,7			0,00

Nmax: 150 s = 3,5



$$N = 1 / [(vpred \cdot <c> / s)^2 + 1/365]$$

vpred	N
0,05	302
0,10	198
0,15	126

Resampling of mean values

(100 samples of size N without replacement)

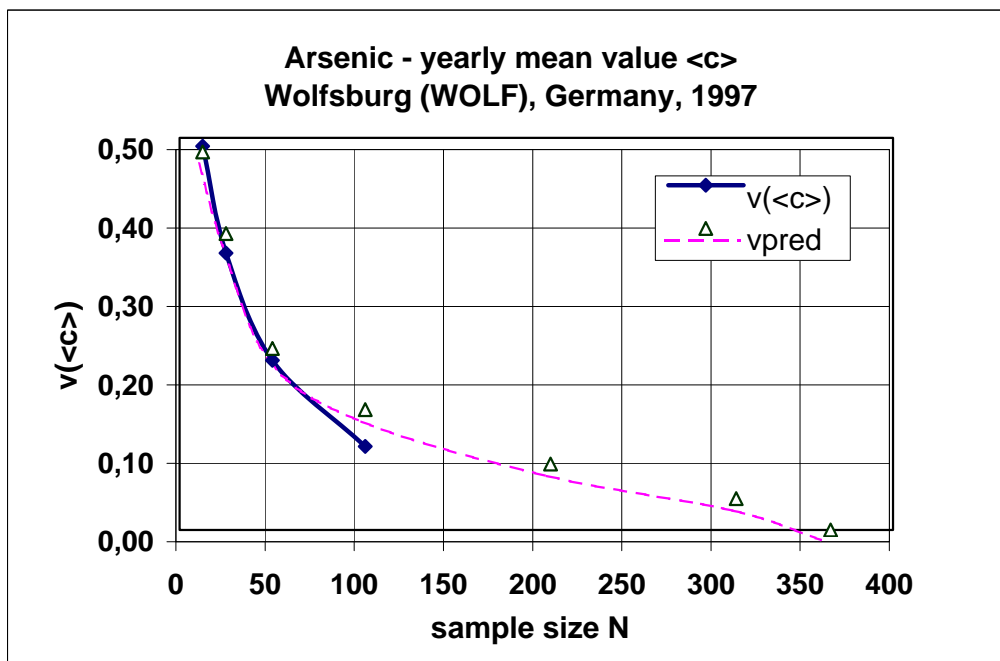
N: sample size **Nmax:** maximum sample size
<c>: mean value **vpred:** $s \cdot \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>) = $u(<c>)/<c>$

site: Wolfsburg, Germany
poll: Arsenic

units: ng/m³
data: 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	1,1	0,55	0,49	0,48
26	1,0	0,35	0,35	0,38
52	1,1	0,24	0,22	0,23
104	1,1	0,12	0,11	0,15
208	1,1			0,08
312	1,1			0,04
365	1,1			0,00

Nmax: 166 s = 2



$N = 1 / [(vpred \cdot <c> / s)^2 + 1/365]$

vpred	N
0,05	288
0,10	177
0,15	108

Resampling of mean values

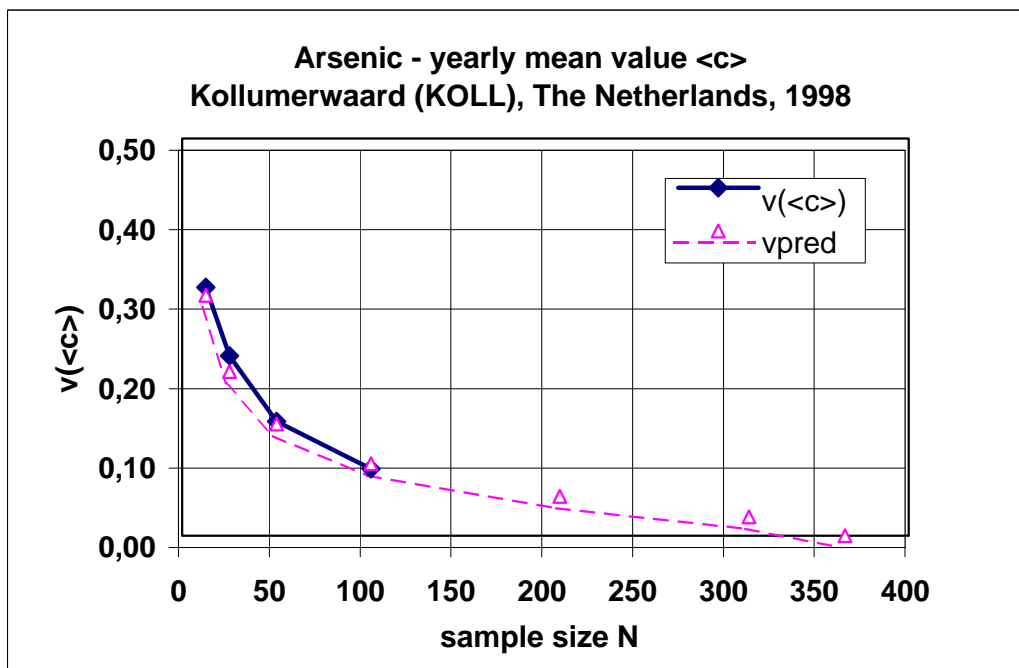
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Kollumerwaard, The Netherlands **units:** ng/m³
poll: Arsenic **data:** 1998

N	<c>	u(<c>)	v(<c>)	vpred
13	0,6	0,20	0,31	0,30
26	0,6	0,15	0,23	0,21
52	0,6	0,09	0,14	0,14
104	0,6	0,05	0,08	0,09
208	0,6			0,05
312	0,6			0,02
365	0,6			0,00

Nmax: 182 s = 0,7



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	207
0,10	90
0,15	46

Resampling of mean values

(100 samples of size N without replacement)

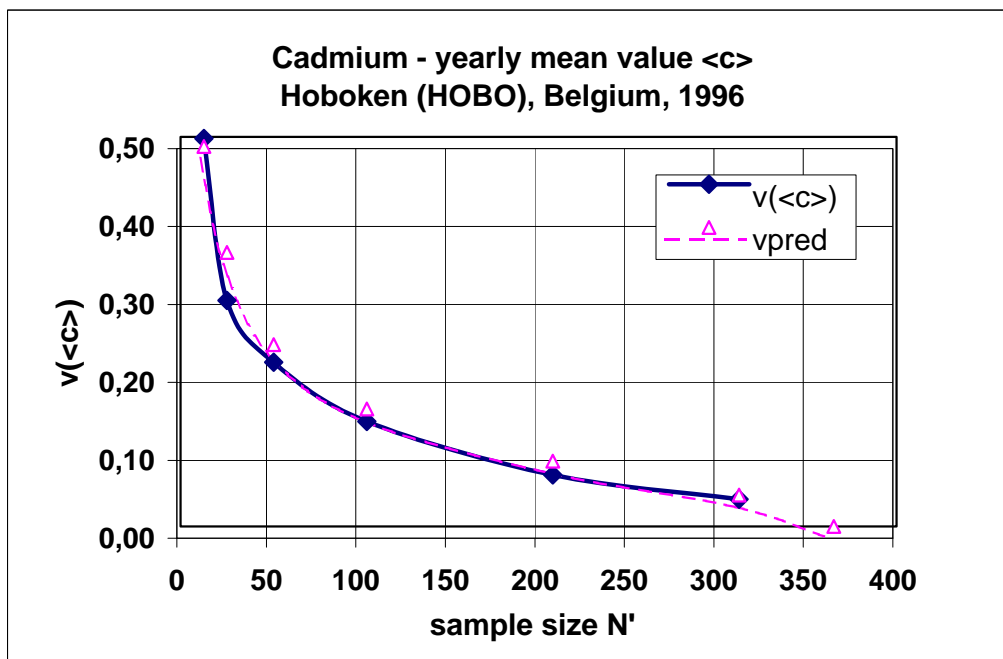
N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Hoboken, Belgium
poll: Cadmium

units: ng/m³
data: 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	1,3	0,67	0,50	0,49
26	1,3	0,37	0,29	0,35
52	1,3	0,28	0,21	0,23
104	1,3	0,18	0,13	0,15
208	1,3	0,09	0,07	0,08
312	1,3	0,05	0,03	0,04
365	1,3			0,00

Nmax: 362 s = 2,4



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	289
0,10	178
0,15	108

Resampling of mean values

(100 samples of size N without replacement)

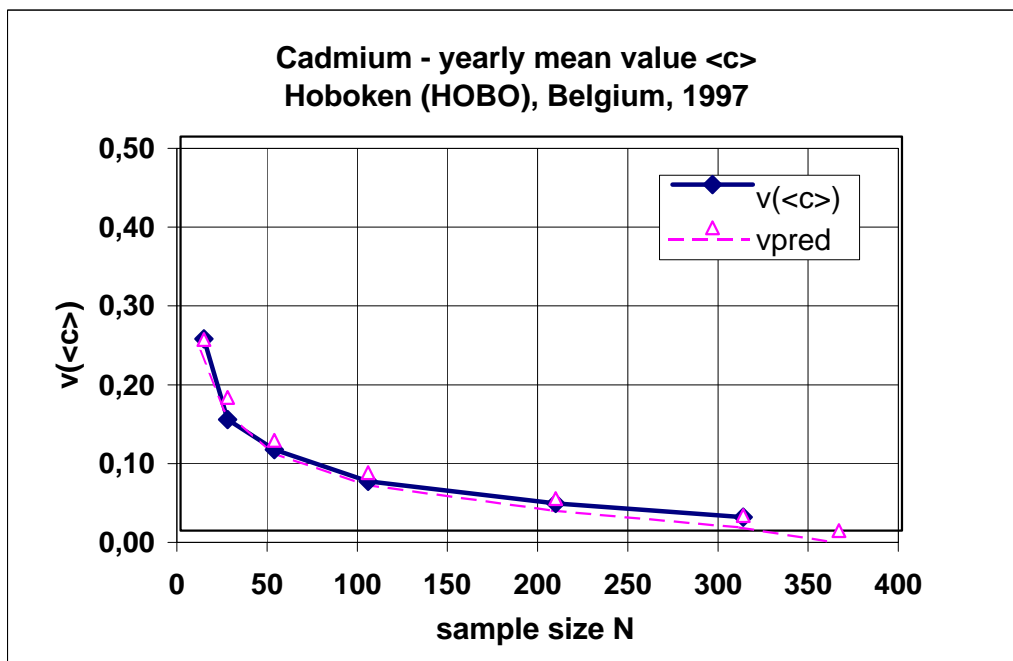
N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Hoboken, Belgium
poll: Cadmium

units: ng/m³
data: 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	2,5	0,60	0,24	0,24
26	2,5	0,35	0,14	0,17
52	2,5	0,25	0,10	0,11
104	2,5	0,16	0,06	0,07
208	2,5	0,09	0,03	0,04
312	2,5	0,04	0,02	0,02
365	2,5			0,00

Nmax: 365 s = 2,2



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	170
0,10	65
0,15	32

Resampling of mean values

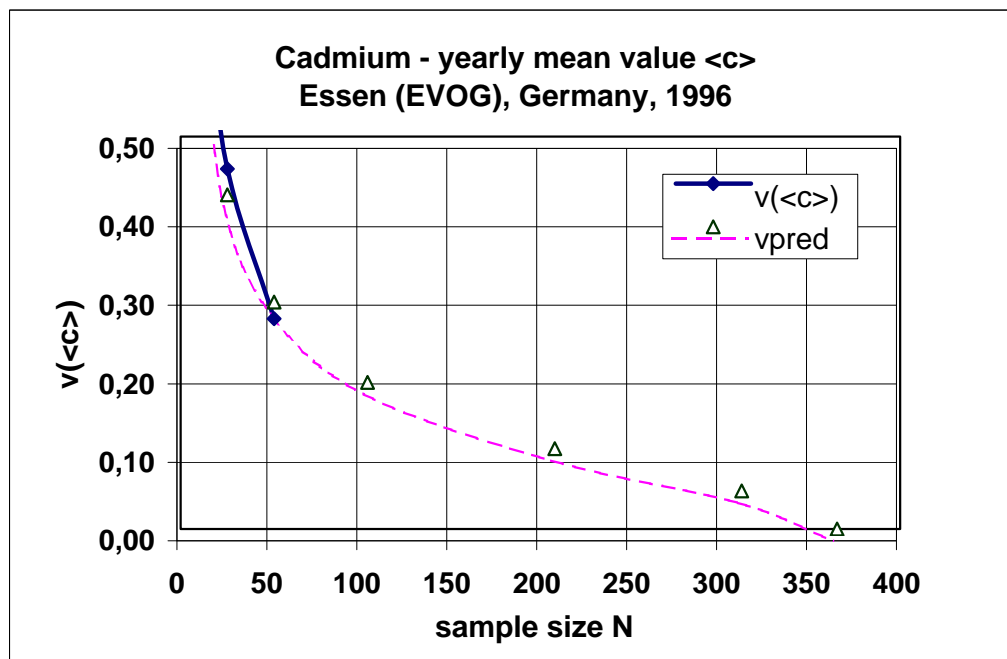
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Essen, Vogelheim, Germany **units:** ng/m³
poll: Cadmium **data:** 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	2,3	1,58	0,68	0,67
26	2,5	1,16	0,46	0,43
52	2,5	0,68	0,27	0,29
104	2,5			0,19
208	2,5			0,10
312	2,5			0,05
365	2,5			0,00

Nmax: 100 s = 5,7



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	310
0,10	214
0,15	141

Resampling of mean values

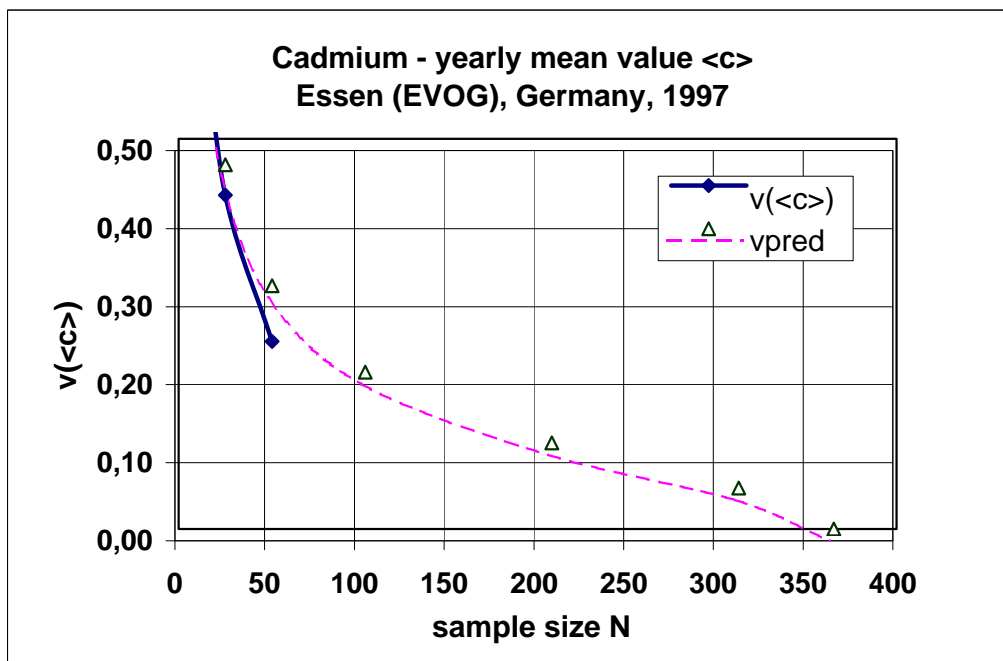
(100 samples of size N without replacement)

N: sample size Nmax: maximum sample size available
 <c>: mean value vpred: $s * \text{SQRT}(1/N - 1/365) / <c>$
 u(<c>): standard deviation of the mean value <c>
 v(<c>): $u(<c>) / <c>$

site: Essen, Vogelheim, Germany units: ng/m³
 poll: Cadmium data: 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	1,7	1,12	0,67	0,67
26	1,7	0,71	0,43	0,47
52	1,7	0,41	0,24	0,31
104	1,7			0,20
208	1,7			0,11
312	1,7			0,05
365	1,7			0,00

Nmax: 94 s = 4,1



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	315
0,10	223
0,15	150

Resampling of mean values

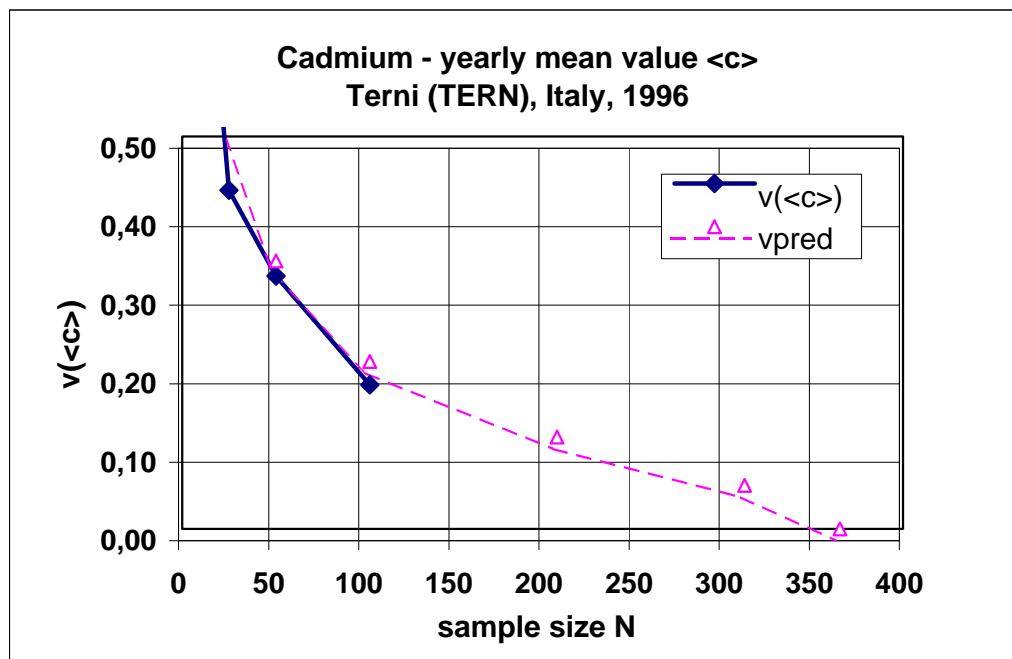
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Terni, Italy **units:** ng/m³
poll: Cadmium **data:** 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	5,1	3,99	0,78	0,76
26	5,3	2,29	0,43	0,51
52	5,4	1,75	0,32	0,34
104	5,6	1,03	0,18	0,21
208	5,6			0,12
312	5,6			0,06
365	5,6			0,00

Nmax: 195 s = 14,4



$N = 1 / [(vpred * <c> / s)^2 + 1/365]$

vpred	N
0,05	321
0,10	235
0,15	163

Resampling of mean values

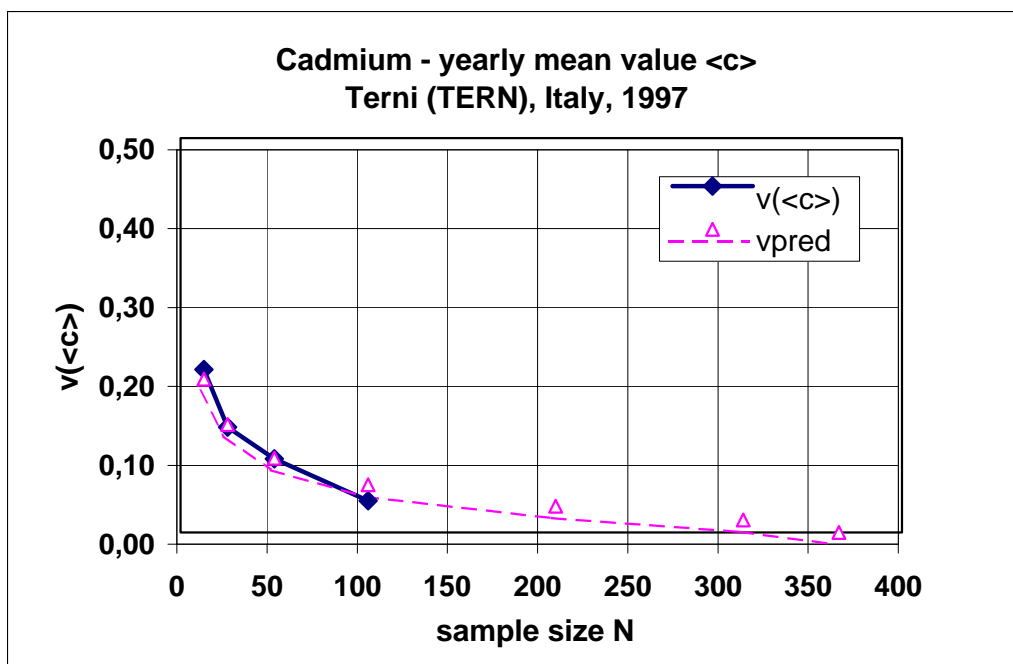
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Terni, Italy **units:** ng/m³
poll: Cadmium **data:** 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	2,1	0,43	0,21	0,19
26	2,1	0,28	0,13	0,14
52	2,1	0,19	0,09	0,09
104	2,1	0,08	0,04	0,06
208	2,1			0,03
312	2,1			0,02
365	2,0			0,00

Nmax: 151 s = 1,5



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	136
0,10	47
0,15	23

Resampling of mean values

(100 samples of size N without replacement)

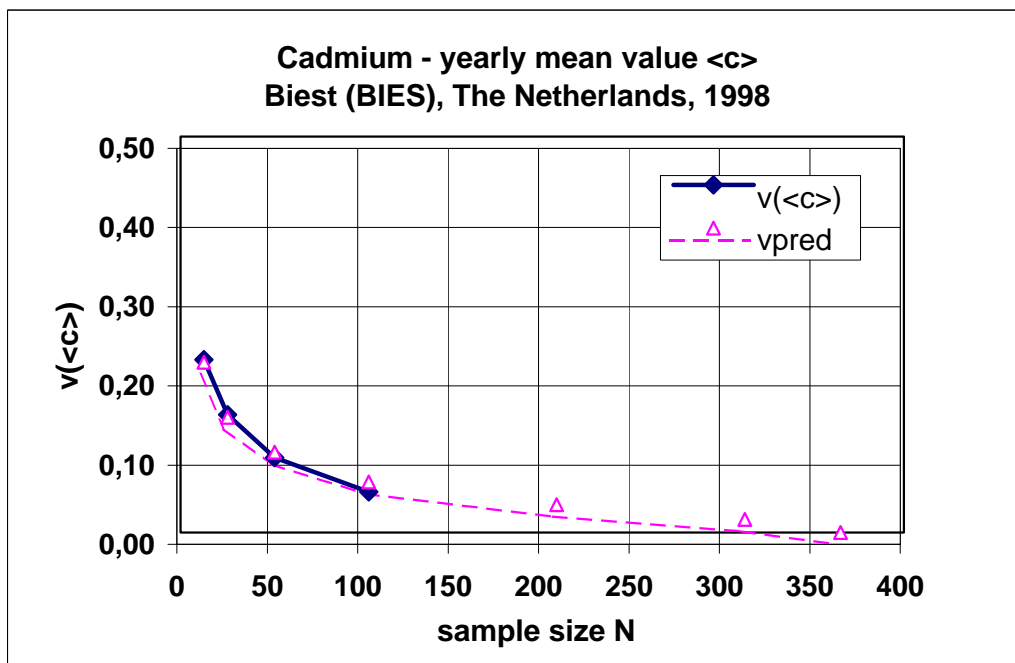
N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Biest, The Netherlands
poll: Cadmium

units: ng/m³
data: 1998

N	<c>	u(<c>)	v(<c>)	vpred
13	0,4	0,08	0,22	0,22
26	0,4	0,06	0,15	0,15
52	0,4	0,04	0,09	0,10
104	0,4	0,02	0,05	0,06
208	0,4	0,00		0,03
312	0,4			0,02
365	0,4			0,00

Nmax: 163 s = 0,3



$N = 1 / [(vpred * <c> / s)^2 + 1/365]$

vpred	N
0,05	144
0,10	51
0,15	25

Resampling of mean values

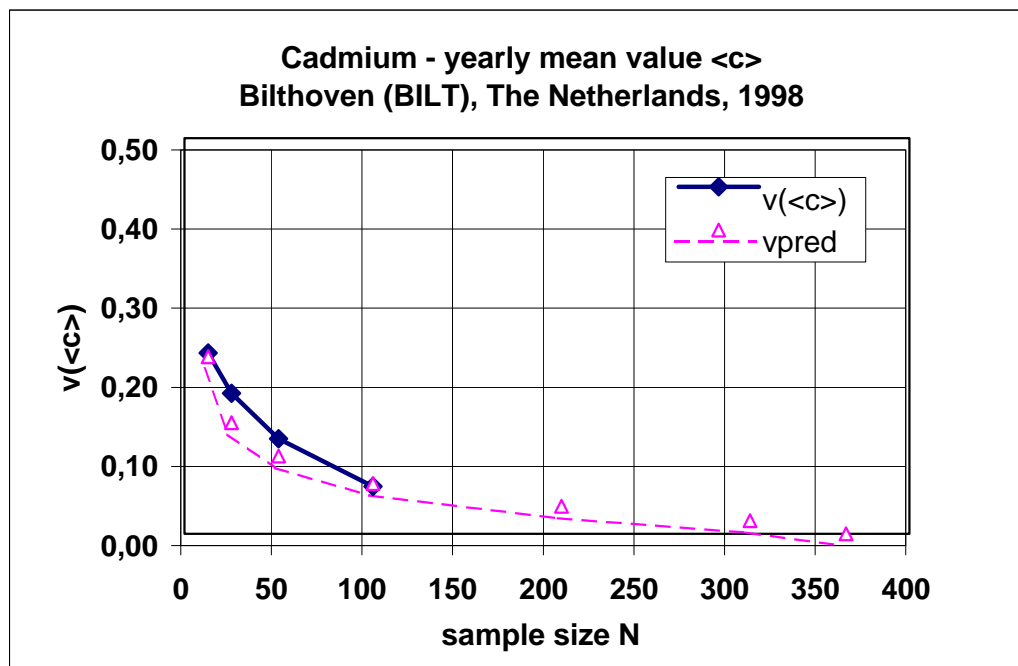
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Bilthoven, The Netherlands **units:** ng/m³
poll: Cadmium **data:** 1998

N	<c>	u(<c>)	v(<c>)	vpred
13	0,3	0,06	0,23	0,22
26	0,3	0,06	0,18	0,14
52	0,3	0,04	0,12	0,10
104	0,3	0,02	0,06	0,06
208	0,3	0,00		0,03
312	0,3			0,02
365	0,3			0,00

Nmax: 159 s = 0,23



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	143
0,10	51
0,15	24

Resampling of mean values

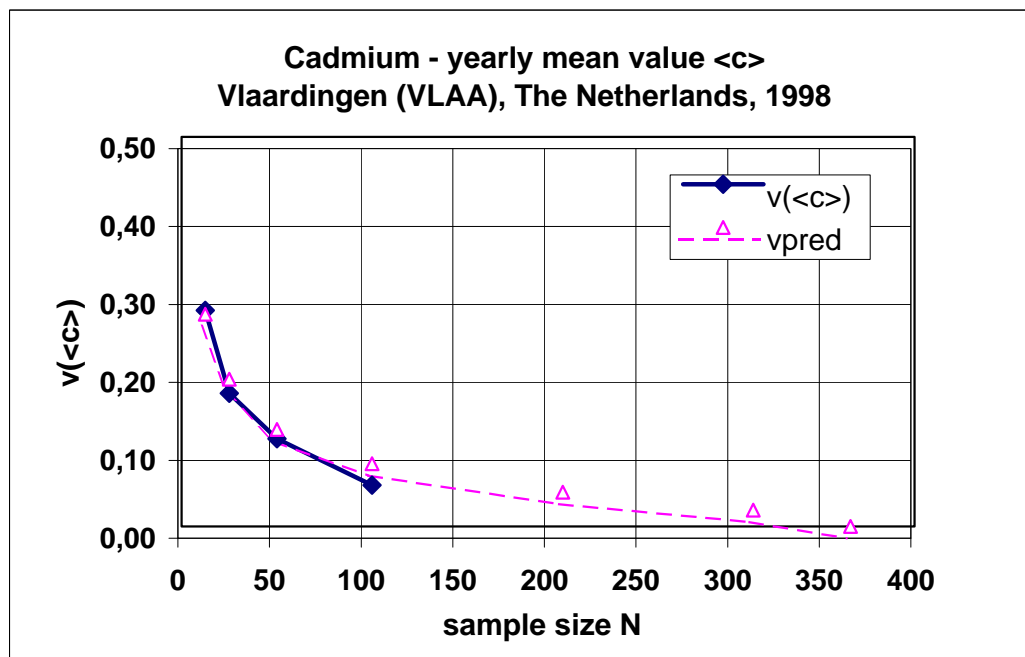
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Vlaardingen, The Netherlands **units:** ng/m³
poll: Cadmium **data:** 1998

N	<c>	u(<c>)	v(<c>)	vpred
13	0,3	0,09	0,28	0,27
26	0,3	0,05	0,17	0,19
52	0,3	0,04	0,11	0,12
104	0,3	0,02	0,05	0,08
208	0,3			0,04
312	0,3			0,02
365	0,3			0,00

Nmax: 161 s = 0,31



$N = 1 / [(vpred * <c> / s)^2 + 1/365]$

vpred	N
0,05	185
0,10	75
0,15	37

Resampling of mean values

(100 samples of size N without replacement)

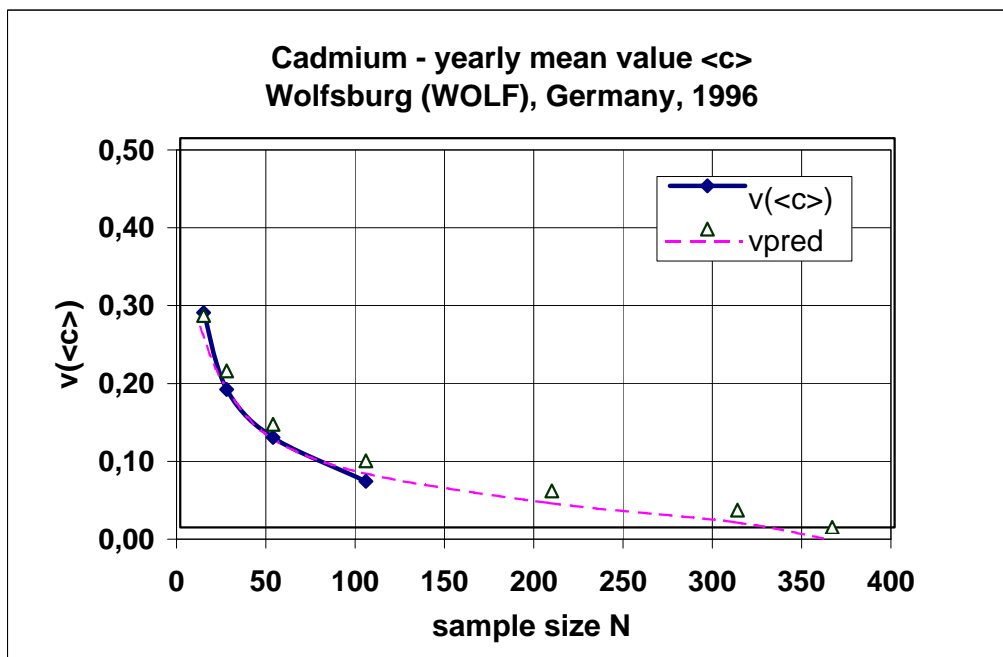
N: sample size **Nmax:** maximum sample size
<c>: mean value **vpred:** $s \cdot \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>) = $u(<c>)/<c>$

site: Wolfsburg, Germany
poll: Cadmium

units: ng/m³
data: 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	0,33	0,091	0,28	0,27
26	0,31	0,055	0,18	0,20
52	0,32	0,037	0,12	0,13
104	0,32	0,019	0,06	0,09
208	0,32			0,05
312	0,32			0,02
365	0,32			0,00

Nmax: 150 s = 0,33



$$N = 1 / [(vpred \cdot <c>/s)^2 + 1/365]$$

vpred	N
0,05	196
0,10	82
0,15	42

Resampling of mean values

(100 samples of size N without replacement)

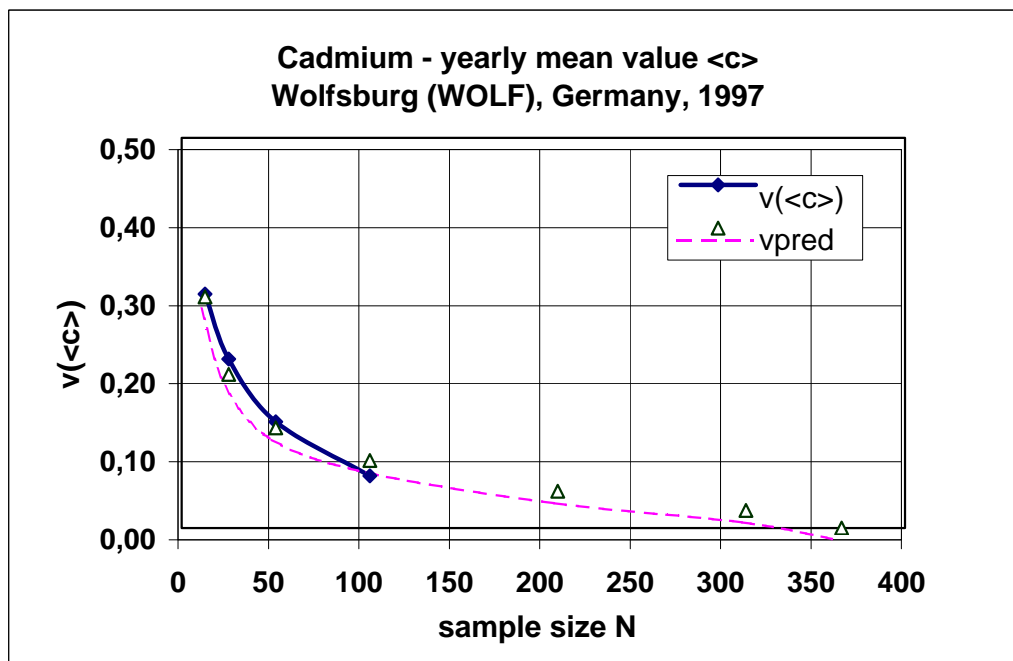
N: sample size **Nmax:** maximum sample size
<c>: mean value **vpred:** $s \cdot \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>) = $u(<c>)/<c>$

site: Wolfsburg, Germany
poll: Cadmium

units: ng/m³
data: 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	0,2	0,07	0,30	0,30
26	0,2	0,05	0,22	0,20
52	0,3	0,03	0,14	0,13
104	0,2	0,02	0,07	0,09
208	0,2			0,05
312	0,2			0,02
365	0,2			0,00

Nmax: 169 s = 0,25



$$N = 1 / [(vpred \cdot <c> / s)^2 + 1/365]$$

vpred	N
0,05	198
0,10	84
0,15	43

Resampling of mean values

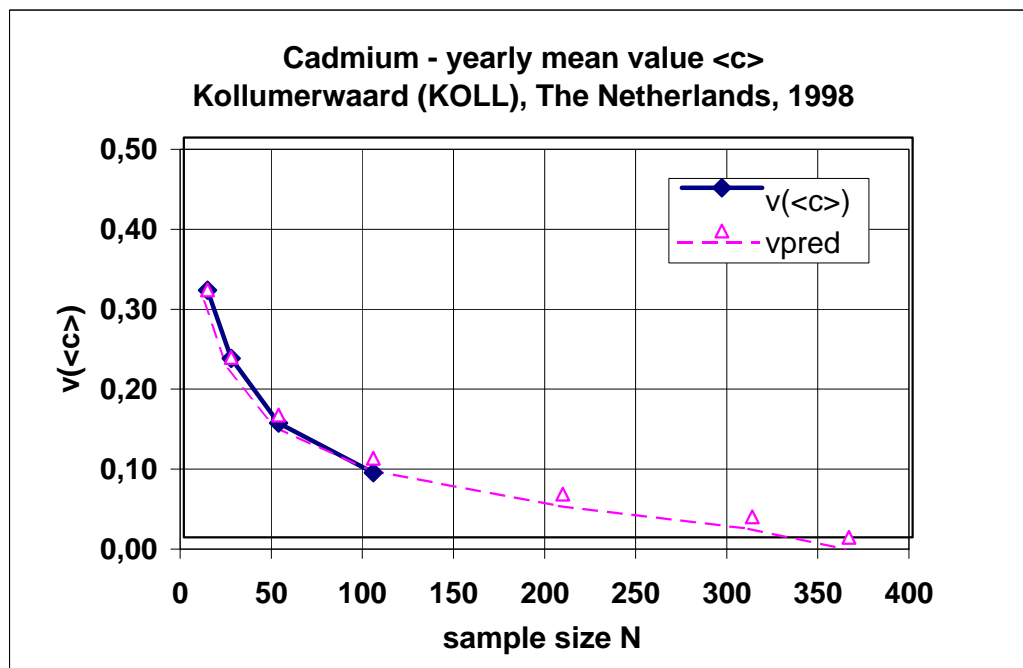
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

Site: Kollumerwaard, The Netherlands **units:** ng/m³
Poll: Cadmium **data:** 1998

N	<c>	u(<c>)	v(<c>)	vpred
13	0,2	0,07	0,31	0,31
26	0,2	0,05	0,22	0,23
52	0,2	0,03	0,14	0,15
104	0,2	0,02	0,08	0,10
208	0,2			0,05
312	0,2			0,03
365	0,2			0,00

Nmax: 182 s = 0,25



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	222
0,10	102
0,15	54

Resampling of mean values

(100 samples of size N without replacement)

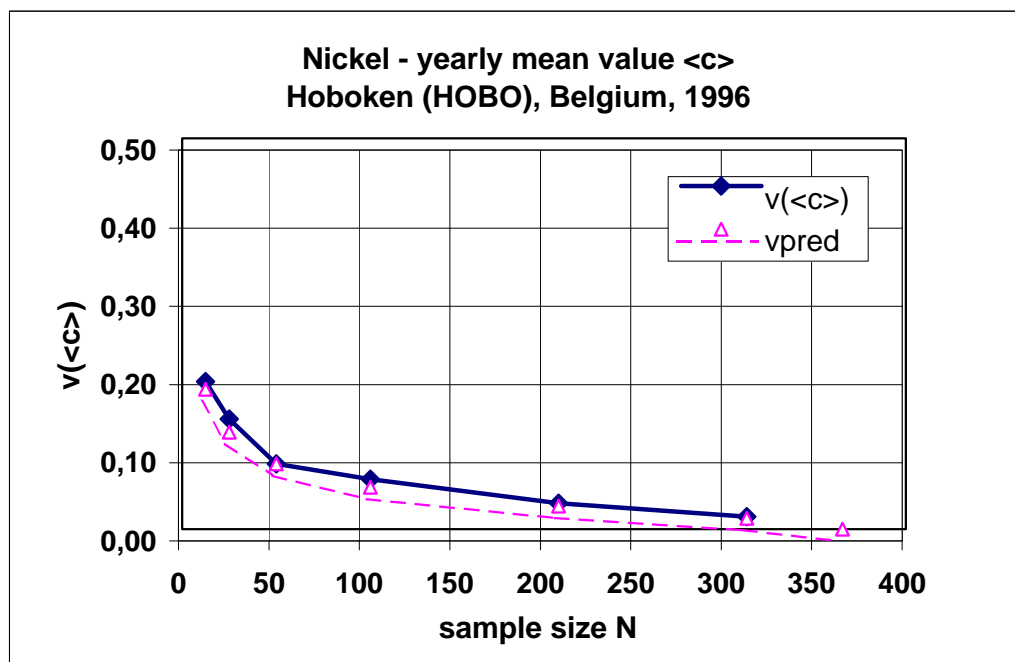
N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Hoboken, Belgium
poll: Nickel

units: ng/m³
data: 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	2,1	0,40	0,19	0,18
26	2,1	0,30	0,14	0,12
52	2,2	0,18	0,08	0,08
104	2,2	0,14	0,06	0,05
208	2,2	0,07	0,03	0,03
312	2,2	0,03	0,02	0,01
365	2,2			0,00

Nmax: 362 s = 1,4



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	116
0,10	38
0,15	18

Resampling of mean values

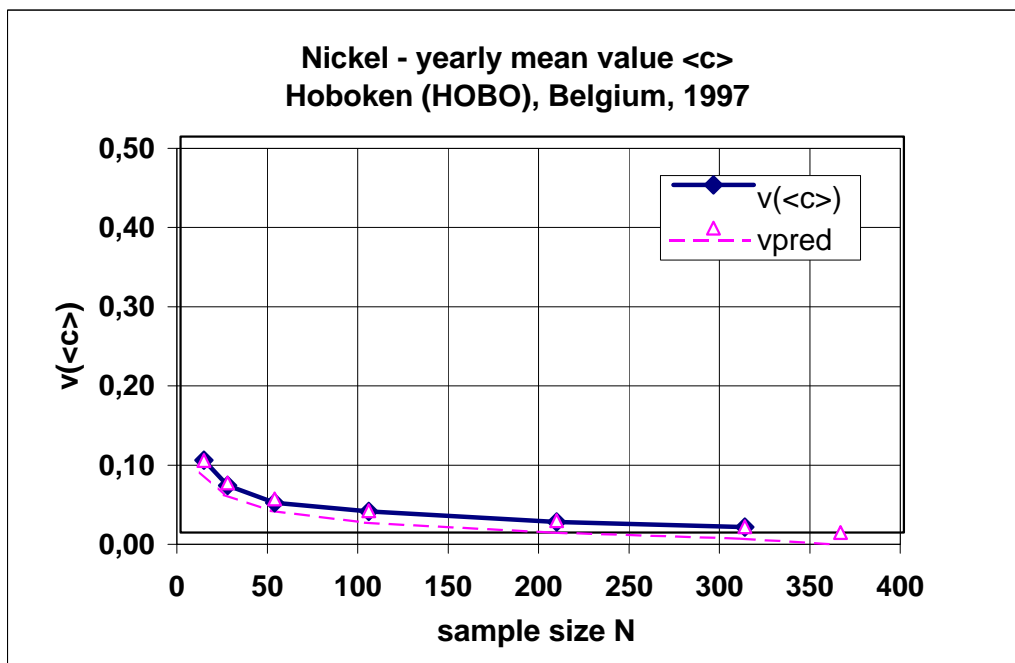
(100 samples of size N without replacement)

N: sample size Nmax: maximum sample size available
 <c>: mean value vpred: $s * \text{SQRT}(1/N - 1/365) / <c>$
 u(<c>): standard deviation of the mean value <c>
 v(<c>): $u(<c>) / <c>$

site: Hoboken, Belgium units: ng/m³
 poll: Nickel data: 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	5,4	0,49	0,09	0,09
26	5,4	0,32	0,06	0,06
52	5,4	0,20	0,04	0,04
104	5,4	0,14	0,03	0,03
208	5,4	0,07	0,01	0,02
312	5,4	0,04	0,01	0,01
365	5,4			0,00

Nmax: 365 s = 1,8



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	39
0,10	11
0,15	5

Resampling of mean values

(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

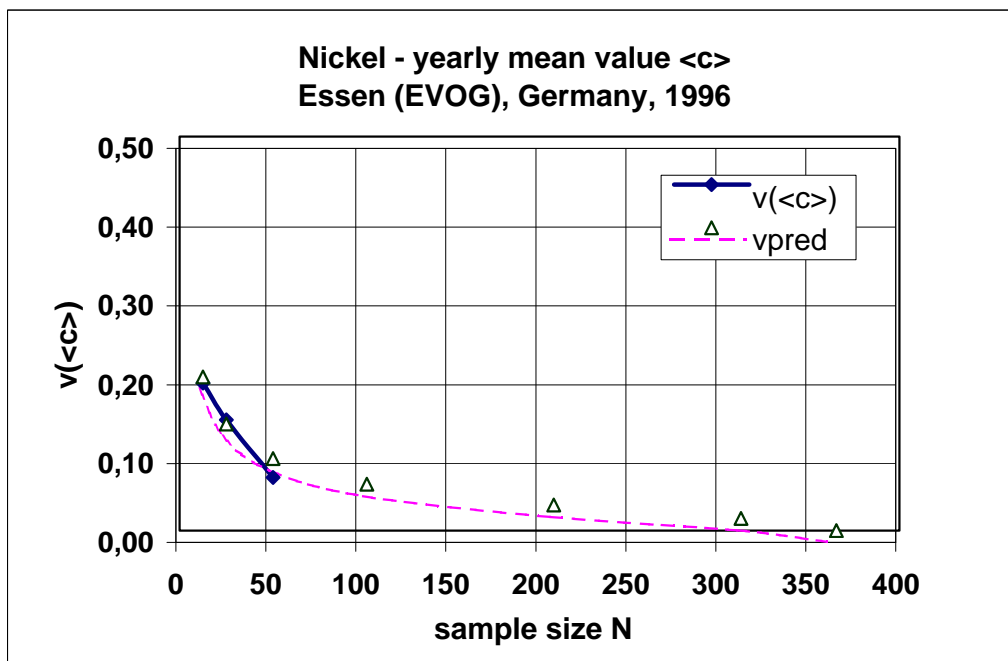
site: Essen, Vogelheim, Germany
poll: Nickel

units: ng/m³
data: 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	7,0	1,31	0,19	0,20
26	7,0	0,98	0,14	0,14
52	7,0	0,47	0,07	0,09
104	7,0			0,06
208	7,0			0,03
312	7,0			0,02
365	7,1			0,00

Nmax: 100

s = 5



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	130
0,10	44
0,15	21

Resampling of mean values

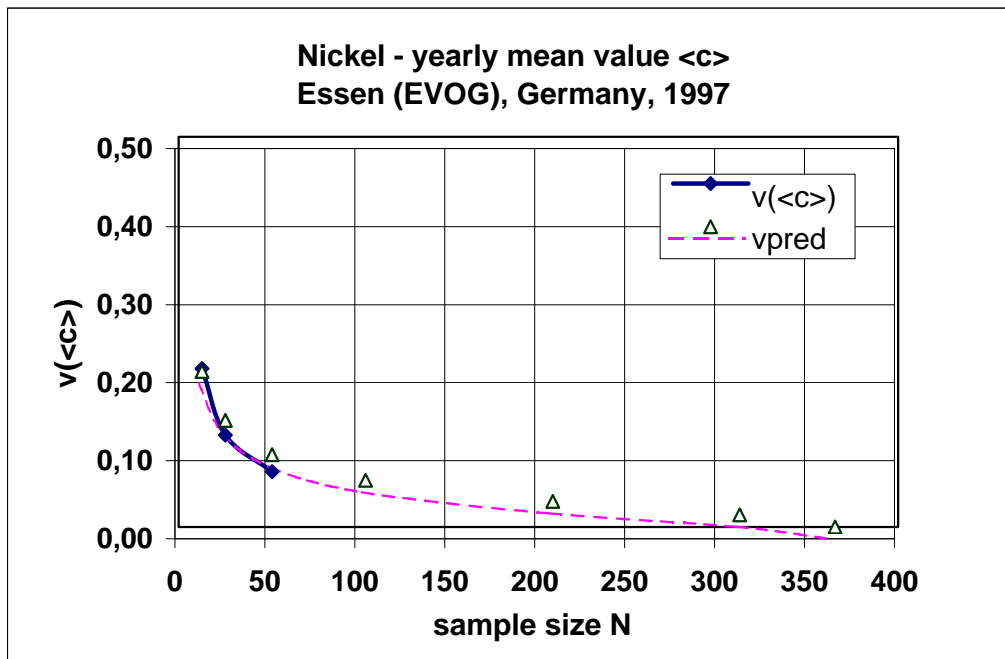
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Essen, Vogelheim, Germany **units:** ng/m³
poll: Nickel **data:** 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	7,1	1,44	0,20	0,20
26	7,2	0,85	0,12	0,14
52	7,2	0,51	0,07	0,09
104	7,2			0,06
208	7,2			0,03
312	7,2			0,02
365	7,2			0,00

Nmax: 92 s = 5,2



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	132
0,10	45
0,15	22

Resampling of mean values

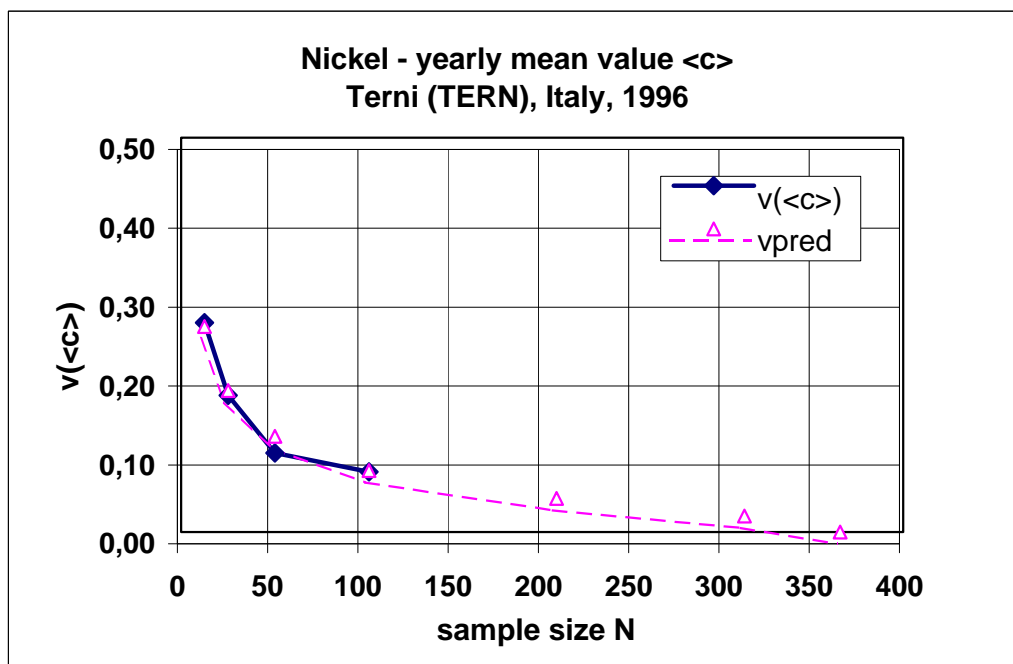
(100 samples of size N without replacement)

N: sample size **Nmax:** maximum sample size available
<c>: mean value **vpred:** $s * \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>): $u(<c>) / <c>$

site: Terni, Italy **units:** ng/m³
poll: Nickel **data:** 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	15,4	4,07	0,27	0,26
26	15,5	2,69	0,17	0,18
52	15,5	1,56	0,10	0,12
104	15,6	1,19	0,08	0,08
208	15,7	0,42		0,04
312	15,7			0,02
365	15,6			0,00

Nmax: 260 s = 14,7



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	180
0,10	71
0,15	36

Resampling of mean values

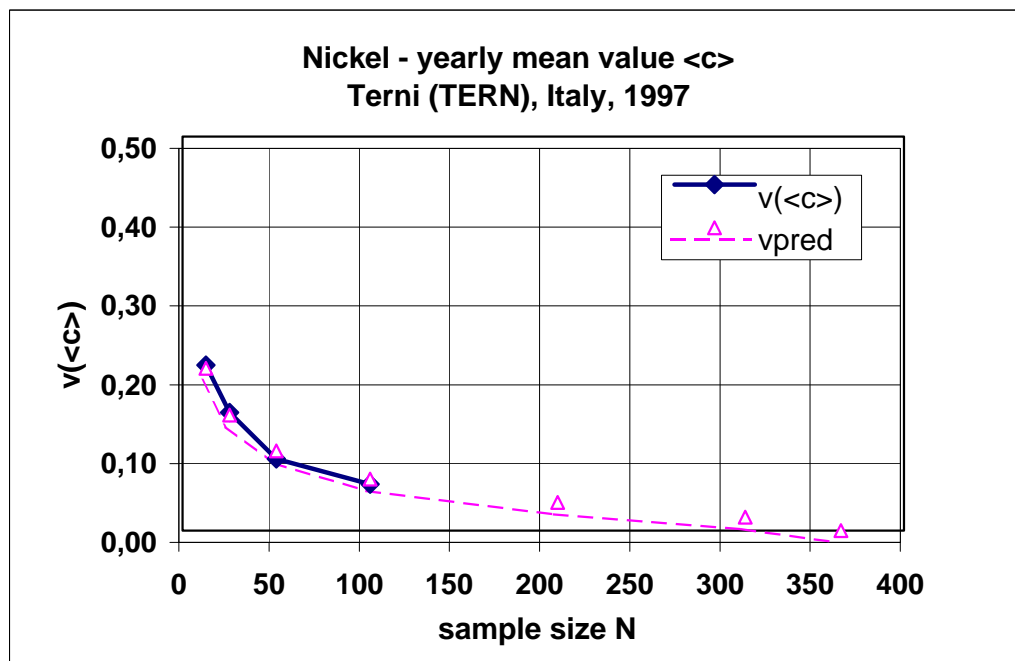
(100 samples of size N without replacement)

N: sample size Nmax: maximum sample size available
 <c>: mean value vpred: $s * \text{SQRT}(1/N - 1/365) / <c>$
 u(<c>): standard deviation of the mean value <c>
 v(<c>): $u(<c>) / <c>$

site: Terni, Italy units: ng/m³
 poll: Nickel data: 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	23,0	4,83	0,21	0,21
26	22,4	3,36	0,15	0,15
52	22,1	2,01	0,09	0,10
104	22,1	1,30	0,06	0,07
208	22,1			0,04
312	22,1			0,02
365	22,2			0,00

Nmax: 207 s = 17,4



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	147
0,10	53
0,15	25

Resampling of mean values

(100 samples of size N without replacement)

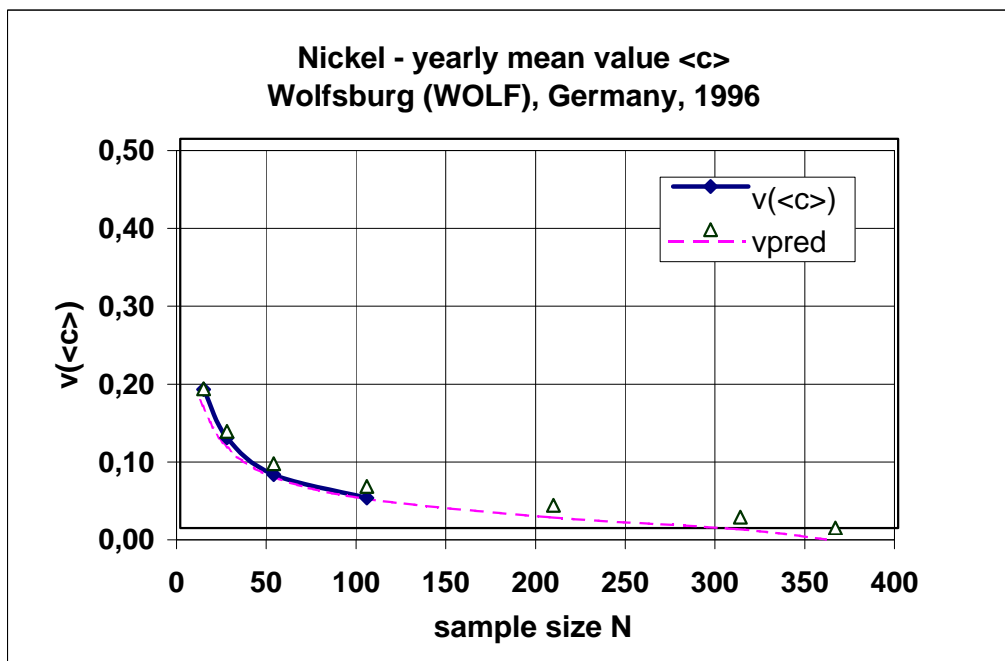
N: sample size **Nmax:** maximum sample size
<c>: mean value **vpred:** $s \cdot \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>) = $u(<c>)/<c>$

site: Wolfsburg, Germany
poll: Nickel

units: ng/m³
data: 1996

N	<c>	u(<c>)	v(<c>)	vpred
13	1,4	0,24	0,18	0,18
26	1,4	0,16	0,12	0,12
52	1,4	0,10	0,07	0,08
104	1,4	0,05	0,04	0,05
208	1,4			0,03
312	1,4			0,01
365	1,4			0,00

Nmax: 150 s = 0,9



$$N = 1 / [(vpred * <c> / s)^2 + 1/365]$$

vpred	N
0,05	114
0,10	37
0,15	17

Resampling of mean values

(100 samples of size N without replacement)

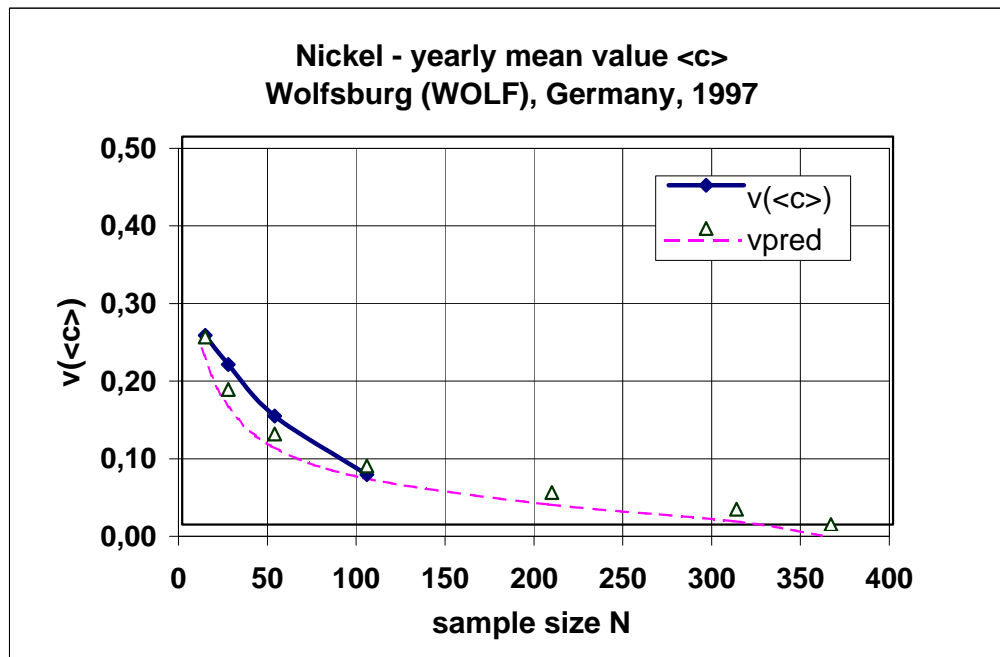
N: sample size **Nmax:** maximum sample size
<c>: mean value **vpred:** $s \cdot \text{SQRT}(1/N - 1/365) / <c>$
u(<c>): standard deviation of the mean value <c>
v(<c>) = $u(<c>)/<c>$

site: Wolfsburg, Germany
poll: Nickel

units: ng/m³
data: 1997

N	<c>	u(<c>)	v(<c>)	vpred
13	1,7	0,41	0,24	0,24
26	1,6	0,34	0,21	0,17
52	1,7	0,23	0,14	0,12
104	1,7	0,11	0,06	0,08
208	1,7			0,04
312	1,7			0,02
365	1,7			0,00

Nmax: 166 s = 1,5



$$N = 1 / [(vpred \cdot <c> / s)^2 + 1/365]$$

vpred	N
0,05	173
0,10	67
0,15	33