



«Tit» «Name» «Fam_Nam»
«Organization»
«Address1»
«Address_2»
«PO_Box» «City». «Country»

Sevilla, January, 2014

Proficiency Test 2013-2

Laboratory Code: «**Lab_code**»

Dear participants,

Enclosed you will find the report of the Proficiency Test 2013-2 on Drugs of Abuse in Hair, organized by the Society of Hair Testing.

Each of the participating laboratories received an identifying code. Your particular code is «**Lab_code**».

Sets of three samples were sent to fifty four participating laboratories. Forty eight of them sent the report forms back.

Sample contents were as follows:

- * Sample A contained opiates (6-MAM and traces of morphine and codeine), cocaine (cocaine, BE and traces of cocaethylene and norcocaine), cannabis (THC, CBD, CBN and THC-COOH). It also contained methadone, tramadol and traces of amphetamine compounds (amphetamine, methamphetamine, MDMA).
- * Sample B was a drug-free hair sample
- * Sample C contained opiates (6-MAM, morphine and codeine), cocaine (cocaine, BE, cocaethylene and norcocaine) and cannabis (low concentrations of THC, CBD, CBN and THC-COOH). It also contained methadone, tramadol, diazepam, noridiazepam and traces of amphetamine compounds (amphetamine, methamphetamine, MDMA).

Z-score

Z-score has been calculated based on robust estimators (median instead of mean and interquartile instead of standard deviation).

Z-score has been calculated as follows:

$$Z\text{-score} = (x - \chi) / IQR$$

Where:

x: Concentration reported by the participant

χ : Median concentration obtained from the participating laboratories

IQR: Interquartile range: It is calculated as: Q3-Q1 (the upper quartile minus the lower quartile)

Q3: Third quartile (percentile 75)

Q1: First quartile (percentile 25)

Decision criteria

The following criteria have been adopted:

Satisfactory results: $Z\text{-score} \leq \pm 2$

Questionable results: $2 < Z\text{-score} \leq 3$

Unsatisfactory results: $Z\text{-score} \geq 3$

Certificate

A certificate will be mailed to the participants.

Yours faithfully,

Carmen Jurado

QUALITATIVE RESULTS

Laboratory Code: **Lab**

Sample A*				Sample B				Sample C*			
Substances	A	T	F	Substances	A	T	F	Substances	A	T	F
MAM		P		Drugs		N		MAM		P	
Cocaine		P						Morphine		P	
BE		P						Codeine		P	
THC		P						Cocaine		P	
								BE		P	

* Sample A contains Morphine. The median concentration is 0.07 ng/mg, which is lower than the cut-off proposed by SoHT (0.2 ng/mg)

** Sample C contains THC. The median concentration is 0.03 ng/mg, which is lower than the cut-off proposed by SoHT (0.05 ng/mg)

A: Your answer
T: True answer
F: False answer

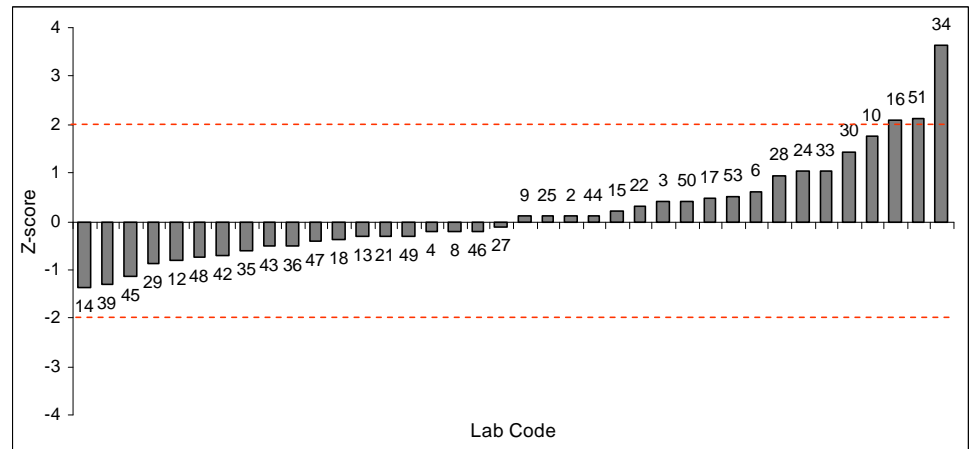
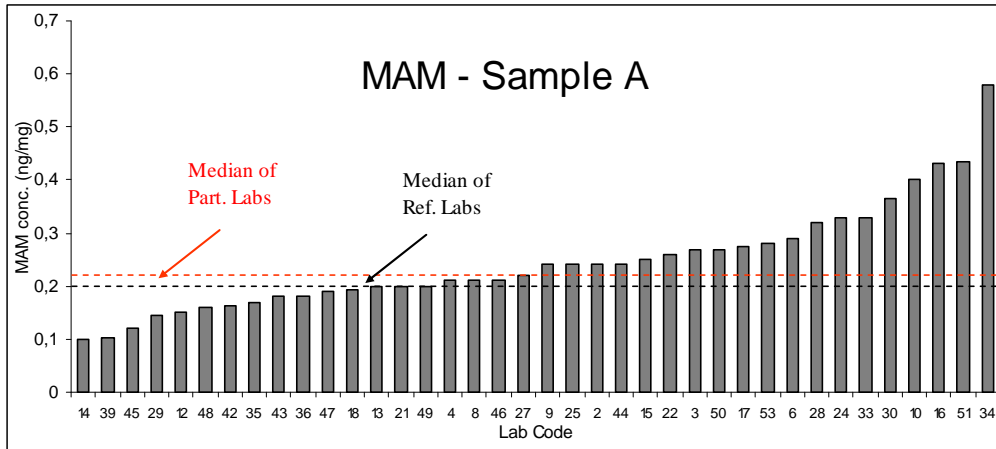
P: Positive
N: Negative

NR: Not reported
NA: Not analyzed

FN: False Negative
FP: False Positive

Comments:

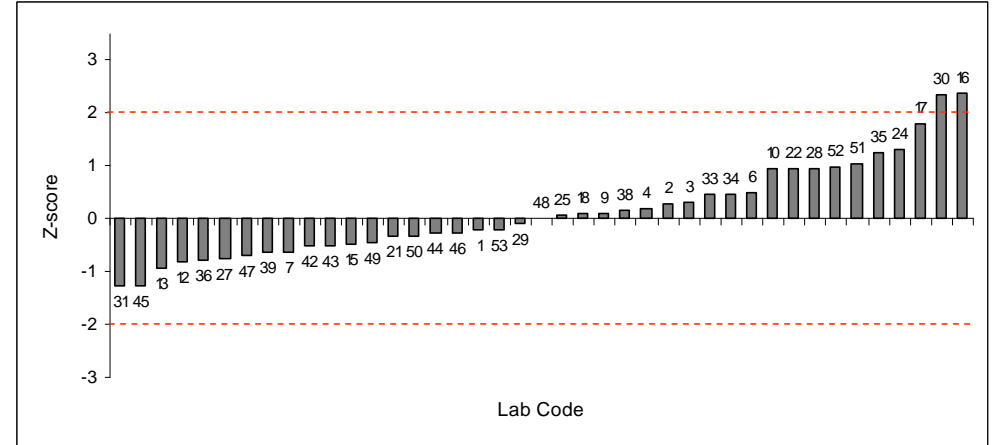
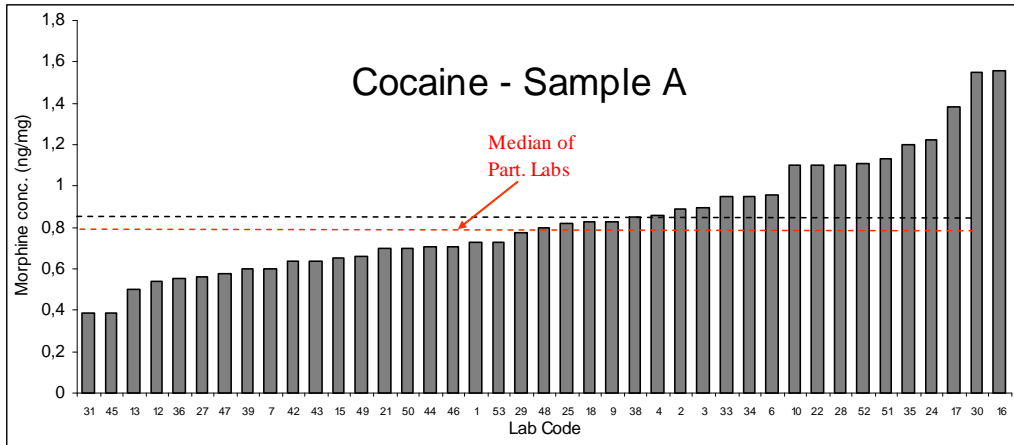
- Sample A contains THC-COOH, methadone, tramadol and traces of morphine, codeine, norcocaine, cocaethylene, amphetamine, methamphetamine and MDMA.
- Sample C contains THC-COOH, norcocaine, cocaethylene, methadone, dihydrocodeine, tramadol, diazepam, nordiazepam and traces of amphetamine, methamphetamine, MDMA



Lab.	MAM (ng/mg)	Z-score	Result
14	0,10	-1,35	Satisfactory
39	0,104	-1,31	Satisfactory
45	0,12	-1,14	Satisfactory
29	0,14	-0,88	Satisfactory
12	0,152	-0,81	Satisfactory
48	0,16	-0,73	Satisfactory
42	0,16	-0,70	Satisfactory
35	0,17	-0,62	Satisfactory
43	0,18	-0,52	Satisfactory
36	0,18	-0,51	Satisfactory
47	0,19	-0,43	Satisfactory
18	0,193	-0,38	Satisfactory
13	0,20	-0,31	Satisfactory
21	0,20	-0,31	Satisfactory
49	0,20	-0,31	Satisfactory
4	0,21	-0,21	Satisfactory
8	0,21	-0,21	Satisfactory
46	0,21	-0,21	Satisfactory
27	0,22	-0,10	Satisfactory
9	0,24	0,10	Satisfactory
25	0,24	0,10	Satisfactory
2	0,24	0,11	Satisfactory
44	0,24	0,11	Satisfactory
15	0,25	0,21	Satisfactory
22	0,26	0,31	Satisfactory
3	0,27	0,41	Satisfactory

Lab.	MAM (ng/mg)	Z-score	Result
50	0,27	0,42	Satisfactory
17	0,276	0,48	Satisfactory
53	0,28	0,52	Satisfactory
6	0,29	0,62	Satisfactory
28	0,321	0,95	Satisfactory
24	0,329	1,03	Satisfactory
33	0,33	1,04	Satisfactory
30	0,366	1,42	Satisfactory
10	0,4	1,77	Satisfactory
16	0,43	2,08	Questionable
51	0,433	2,11	Questionable
34	0,58	3,64	Unsatisfactory
1	N		
7	N		
31	N		
37	N		
52	N		
54	N		

Average	0,25
SD	0,098
CV%	39,84
Median	0,23
Minimum	0,10
Quartile 25	0,183
Quartile 75	0,279
Maximum	0,58
Iqr	0,096

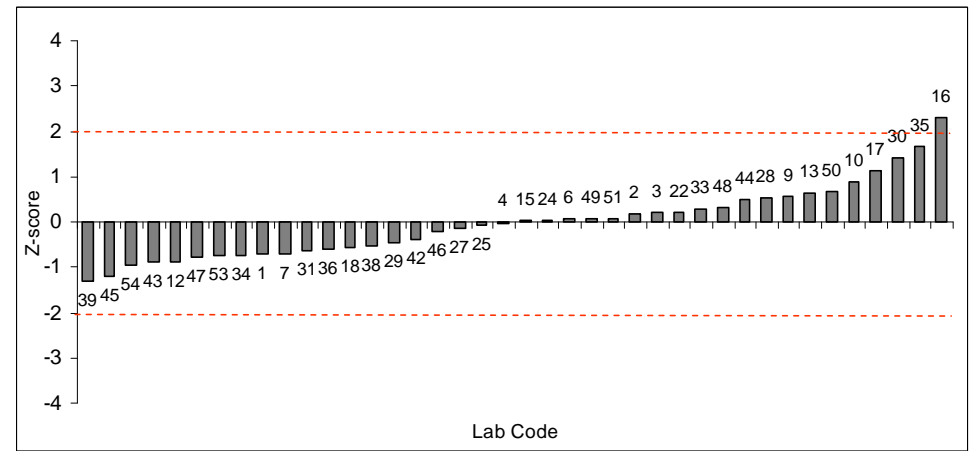
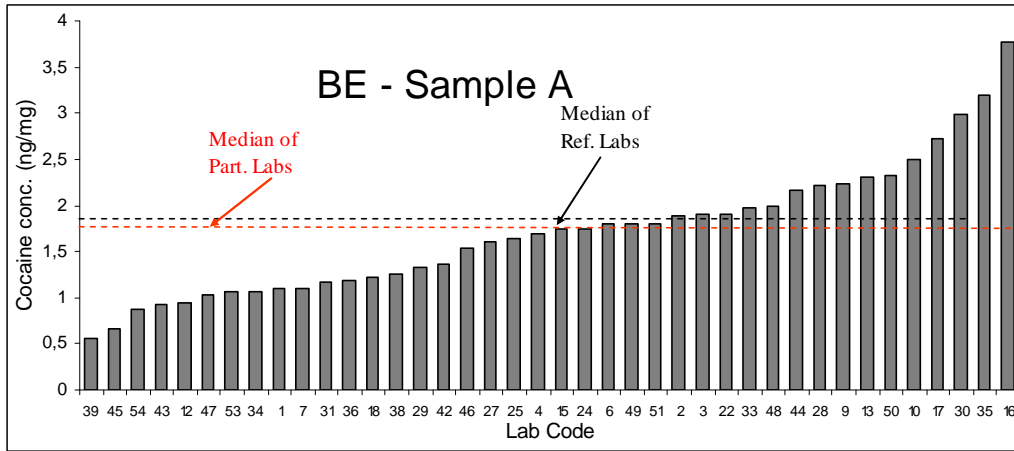


Lab.	Cocaine (ng/mg)	Z-score	Result
31	0,39	-1,28	Satisfactory
45	0,39	-1,28	Satisfactory
13	0,50	-0,94	Satisfactory
12	0,54	-0,82	Satisfactory
36	0,55	-0,78	Satisfactory
27	0,56	-0,75	Satisfactory
47	0,58	-0,69	Satisfactory
39	0,60	-0,63	Satisfactory
7	0,6	-0,62	Satisfactory
42	0,637	-0,51	Satisfactory
43	0,64	-0,50	Satisfactory
15	0,65	-0,47	Satisfactory
49	0,66	-0,44	Satisfactory
21	0,70	-0,31	Satisfactory
50	0,70	-0,31	Satisfactory
44	0,71	-0,28	Satisfactory
46	0,71	-0,28	Satisfactory
1	0,73	-0,22	Satisfactory
53	0,73	-0,22	Satisfactory
29	0,77	-0,08	Satisfactory
48	0,80	0	Satisfactory
25	0,82	0,06	Satisfactory
18	0,83	0,09	Satisfactory
9	0,83	0,09	Satisfactory
38	0,85	0,16	Satisfactory
4	0,86	0,19	Satisfactory

Lab.	Cocaine (ng/mg)	Z-score	Result
2	0,89	0,28	Satisfactory
3	0,90	0,31	Satisfactory
33	0,95	0,47	Satisfactory
34	0,95	0,47	Satisfactory
6	0,96	0,50	Satisfactory
10	1,10	0,94	Satisfactory
22	1,10	0,94	Satisfactory
28	1,10	0,94	Satisfactory
52	1,11	0,97	Satisfactory
51	1,13	1,03	Satisfactory
35	1,20	1,25	Satisfactory
24	1,22	1,31	Satisfactory
17	1,38	1,81	Satisfactory
30	1,55	2,34	Questionable
16	1,56	2,37	Questionable
54	<0,4		
37	p		

Average	0,84
SD	0,28
CV%	33,29
Median	0,80
Minimum	0,39
Quartile 25	0,64
Quartile 75	0,96
Maximum	1,56
Iqr	0,32

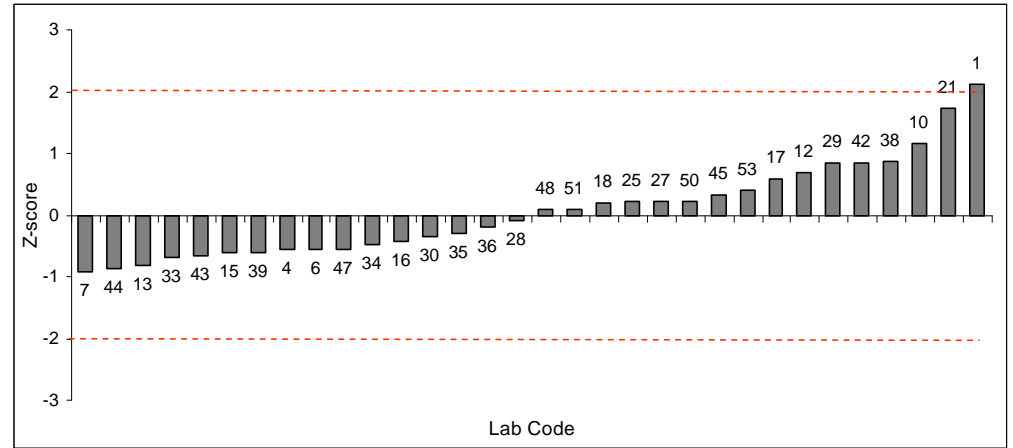
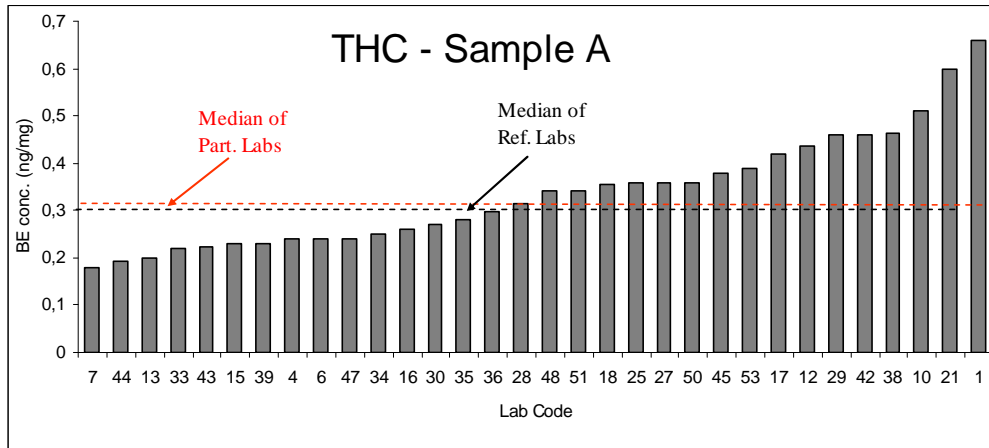
Proficiency Test 2013-2 on Drugs of Abuse in hair



Lab.	BE (ng/mg)	Z-score	Result
39	0,57	-1,30	Satisfactory
45	0,66	-1,19	Satisfactory
54	0,87	-0,96	Satisfactory
43	0,93	-0,89	Satisfactory
12	0,95	-0,87	Satisfactory
47	1,03	-0,78	Satisfactory
53	1,06	-0,75	Satisfactory
34	1,07	-0,73	Satisfactory
1	1,10	-0,70	Satisfactory
7	1,10	-0,70	Satisfactory
31	1,17	-0,62	Satisfactory
36	1,18	-0,61	Satisfactory
18	1,22	-0,56	Satisfactory
38	1,26	-0,52	Satisfactory
29	1,33	-0,44	Satisfactory
42	1,37	-0,40	Satisfactory
46	1,53	-0,22	Satisfactory
27	1,61	-0,13	Satisfactory
25	1,65	-0,08	Satisfactory
4	1,70	-0,03	Satisfactory
15	1,75	0,03	Satisfactory
24	1,75	0,03	Satisfactory
6	1,80	0,08	Satisfactory
49	1,80	0,08	Satisfactory
51	1,80	0,08	Satisfactory
2	1,88	0,17	Satisfactory

Lab.	BE (ng/mg)	Z-score	Result
3	1,90	0,20	Satisfactory
22	1,90	0,20	Satisfactory
33	1,97	0,27	Satisfactory
48	2,00	0,31	Satisfactory
44	2,17	0,50	Satisfactory
28	2,21	0,55	Satisfactory
9	2,23	0,57	Satisfactory
13	2,30	0,65	Satisfactory
50	2,32	0,67	Satisfactory
10	2,50	0,87	Satisfactory
17	2,73	1,13	Satisfactory
30	2,99	1,42	Satisfactory
35	3,20	1,66	Satisfactory
16	3,77	2,30	Questionable
37	P		

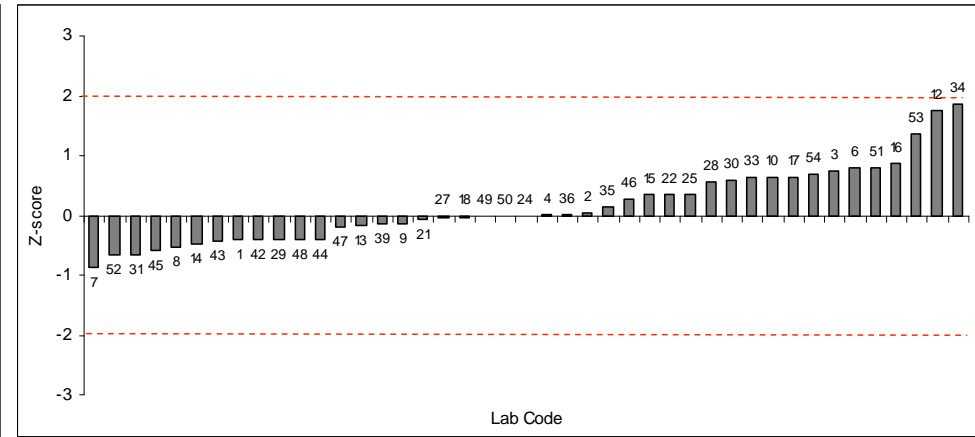
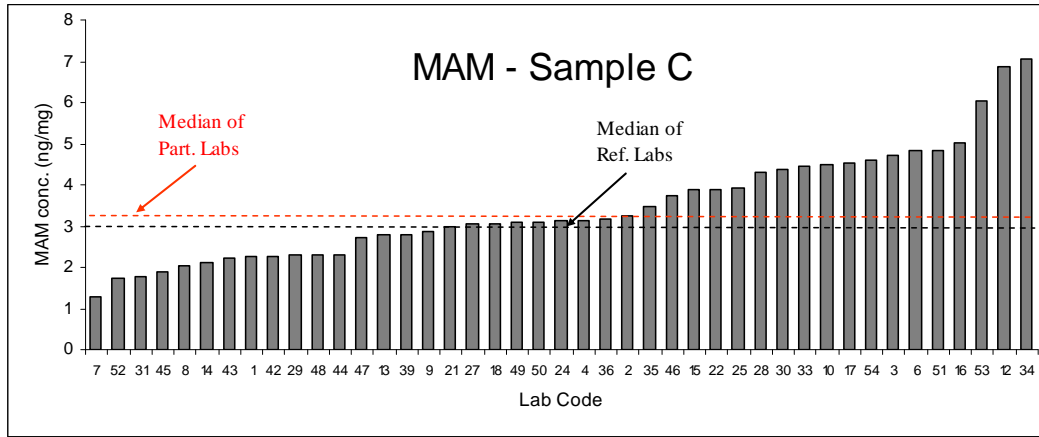
Average	1,71
SD	0,69
CV%	40,53
Median	1,72
Minimum	0,57
Quartile 25	1,15
Quartile 75	2,04
Maximum	3,77
Iqr	0,89



Lab.	THC (ng/mg)	Z-score	Result
7	0,18	-0,93	Satisfactory
44	0,19	-0,86	Satisfactory
13	0,20	-0,81	Satisfactory
33	0,22	-0,68	Satisfactory
43	0,224	-0,65	Satisfactory
15	0,23	-0,62	Satisfactory
39	0,23	-0,62	Satisfactory
4	0,24	-0,55	Satisfactory
6	0,24	-0,55	Satisfactory
47	0,24	-0,55	Satisfactory
34	0,25	-0,49	Satisfactory
16	0,26	-0,43	Satisfactory
30	0,27	-0,36	Satisfactory
35	0,28	-0,30	Satisfactory
36	0,30	-0,19	Satisfactory
28	0,31	-0,08	Satisfactory
48	0,34	0,08	Satisfactory
51	0,34	0,09	Satisfactory
18	0,36	0,18	Satisfactory
25	0,36	0,21	Satisfactory
27	0,36	0,21	Satisfactory
50	0,36	0,21	Satisfactory
45	0,38	0,34	Satisfactory
53	0,39	0,40	Satisfactory
17	0,42	0,58	Satisfactory
12	0,44	0,69	Satisfactory

Lab.	THC (ng/mg)	Z-score	Result
29	0,46	0,85	Satisfactory
42	0,46	0,85	Satisfactory
38	0,463	0,86	Satisfactory
10	0,51	1,16	Satisfactory
21	0,60	1,74	Satisfactory
1	0,66	2,12	Questionable
54	P		
37	P		
31	N		

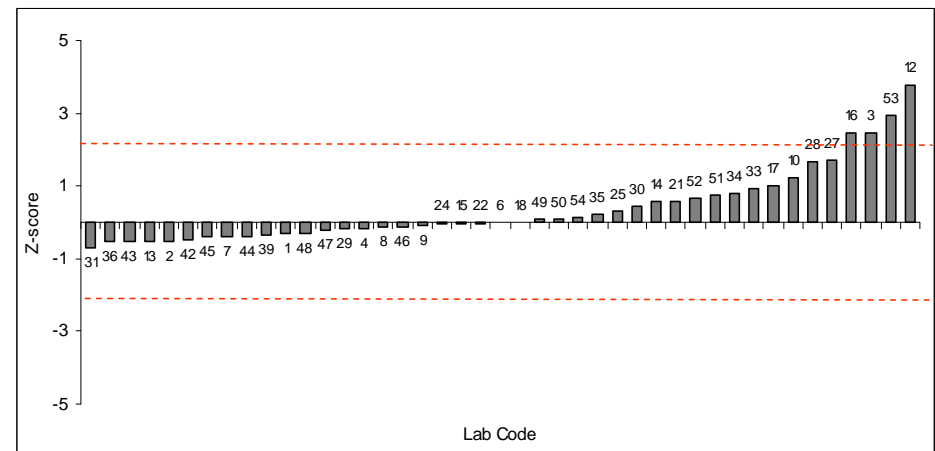
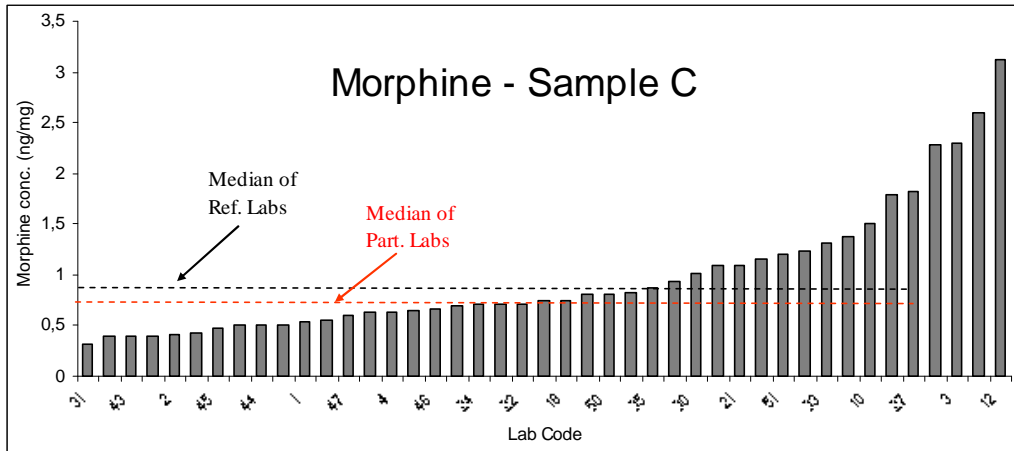
Average	0,34
SD	0,12
CV%	34,80127293
Median	0,33
Minimum	0,18
Quartile 25	0,24
Quartile 75	0,40
Maximum	0,66
Iqr	0,16



Lab.	MAM (ng/mg)	Z-score	Result
7	1,30	-0,87	Satisfactory
52	1,73	-0,66	Satisfactory
31	1,76	-0,65	Satisfactory
45	1,90	-0,58	Satisfactory
8	2,02	-0,53	Satisfactory
14	2,10	-0,49	Satisfactory
43	2,22	-0,43	Satisfactory
1	2,26	-0,41	Satisfactory
42	2,28	-0,40	Satisfactory
29	2,30	-0,40	Satisfactory
48	2,30	-0,40	Satisfactory
44	2,31	-0,39	Satisfactory
47	2,72	-0,20	Satisfactory
13	2,80	-0,16	Satisfactory
39	2,81	-0,15	Satisfactory
9	2,85	-0,14	Satisfactory
21	3,00	-0,07	Satisfactory
27	3,05	-0,04	Satisfactory
18	3,066	-0,03	Satisfactory
49	3,10	-0,02	Satisfactory
50	3,10	-0,02	Satisfactory
24	3,14	0	Satisfactory
4	3,15	0,01	Satisfactory
36	3,18	0,02	Satisfactory
2	3,25	0,05	Satisfactory
35	3,46	0,15	Satisfactory

Lab.	MAM (ng/mg)	Z-score	Result
46	3,74	0,28	Satisfactory
15	3,90	0,36	Satisfactory
22	3,90	0,36	Satisfactory
25	3,91	0,36	Satisfactory
28	4,31	0,55	Satisfactory
30	4,38	0,58	Satisfactory
33	4,47	0,63	Satisfactory
10	4,50	0,64	Satisfactory
17	4,51	0,65	Satisfactory
54	4,61	0,69	Satisfactory
3	4,70	0,73	Satisfactory
6	4,82	0,79	Satisfactory
51	4,84	0,80	Satisfactory
16	5,01	0,88	Satisfactory
53	6,02	1,36	Satisfactory
12	6,85	1,75	Satisfactory
34	7,07	1,85	Satisfactory
37	P		

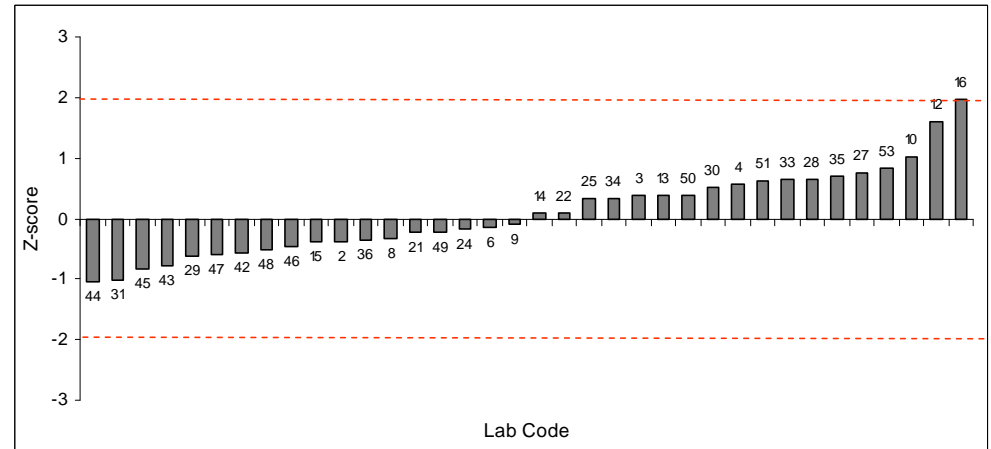
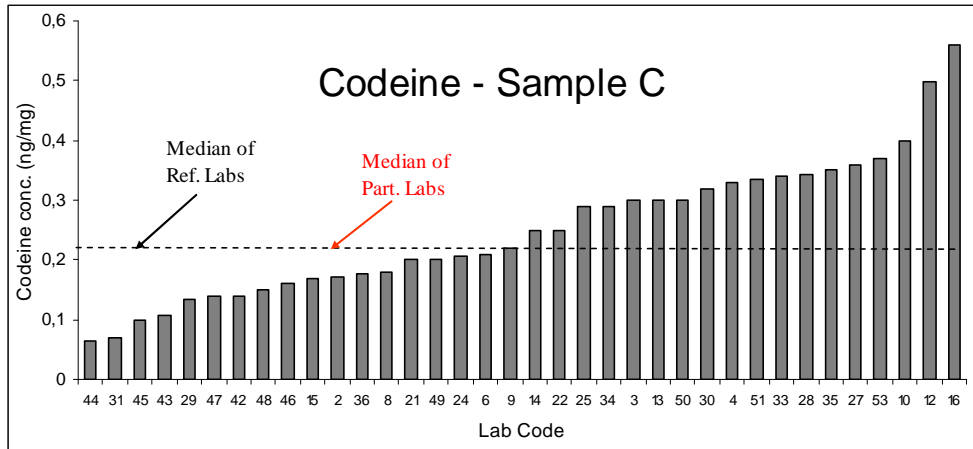
Average	3,46
SD	1,31
CV%	37,87
Median	3,14
Minimum	1,30
Quartile 25	2,30
Quartile 75	4,42
Maximum	7,07
Iqr	2,12



Lab.	Morphine (ng/mg)	Z-score	Result
31	0,31	-0,68	Satisfactory
36	0,39	-0,55	Satisfactory
43	0,39	-0,55	Satisfactory
13	0,40	-0,54	Satisfactory
2	0,41	-0,52	Satisfactory
42	0,43	-0,49	Satisfactory
45	0,48	-0,41	Satisfactory
7	0,50	-0,38	Satisfactory
44	0,50	-0,38	Satisfactory
39	0,51	-0,36	Satisfactory
1	0,54	-0,32	Satisfactory
48	0,55	-0,30	Satisfactory
47	0,60	-0,21	Satisfactory
29	0,628	-0,18	Satisfactory
4	0,63	-0,17	Satisfactory
8	0,65	-0,14	Satisfactory
46	0,66	-0,13	Satisfactory
9	0,69	-0,08	Satisfactory
24	0,71	-0,04	Satisfactory
15	0,72	-0,03	Satisfactory
22	0,72	-0,03	Satisfactory
6	0,74	0	Satisfactory
18	0,75	0,01	Satisfactory
49	0,80	0,09	Satisfactory
50	0,80	0,09	Satisfactory
54	0,82	0,13	Satisfactory

Lab.	Morphine (ng/mg)	Z-score	Result
35	0,87	0,20	Satisfactory
25	0,93	0,30	Satisfactory
30	1,01	0,43	Satisfactory
14	1,10	0,57	Satisfactory
21	1,10	0,57	Satisfactory
52	1,15	0,65	Satisfactory
51	1,20	0,73	Satisfactory
34	1,23	0,78	Satisfactory
33	1,31	0,90	Satisfactory
17	1,38	1,01	Satisfactory
10	1,50	1,21	Satisfactory
28	1,78	1,66	Satisfactory
27	1,82	1,71	Satisfactory
16	2,28	2,44	Questionable
3	2,30	2,48	Questionable
53	2,60	2,95	Questionable
12	3,13	3,79	Unsatisfactory
38	N		
37	U		

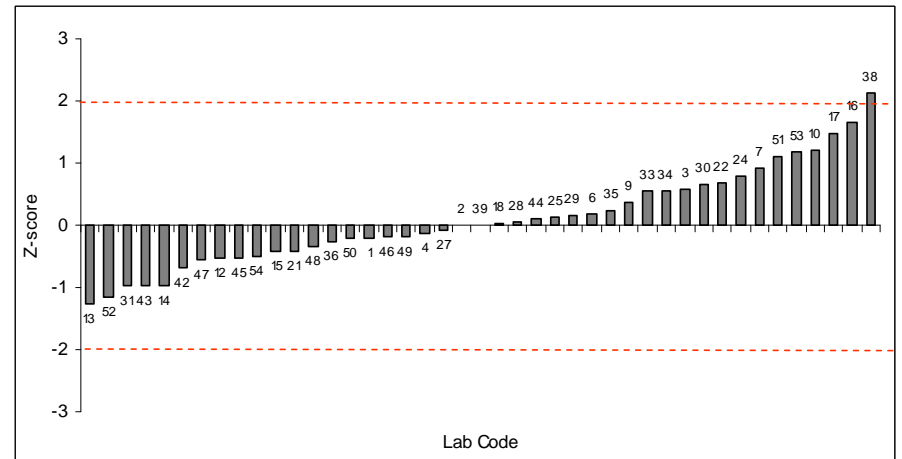
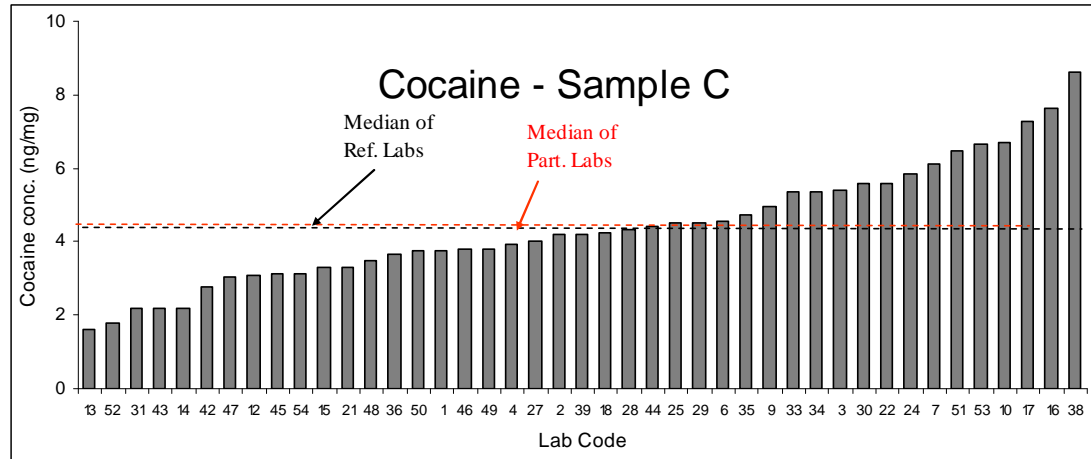
Average	0,98
SD	0,63
CV%	64,76
Median	0,74
Minimum	0,31
Quartile 25	0,54
Quartile 75	1,17
Maximum	3,13
Iqr	0,63



Lab.	Codeine (ng/mg)	Z-score	Result
44	0,06	-1,04	Satisfactory
31	0,07	-1,01	Satisfactory
45	0,10	-0,82	Satisfactory
43	0,11	-0,77	Satisfactory
29	0,13	-0,61	Satisfactory
47	0,14	-0,58	Satisfactory
42	0,14	-0,58	Satisfactory
48	0,15	-0,52	Satisfactory
46	0,16	-0,46	Satisfactory
15	0,17	-0,40	Satisfactory
2	0,17	-0,38	Satisfactory
36	0,18	-0,35	Satisfactory
8	0,18	-0,33	Satisfactory
21	0,20	-0,21	Satisfactory
49	0,20	-0,21	Satisfactory
24	0,21	-0,18	Satisfactory
6	0,21	-0,15	Satisfactory
9	0,22	-0,09	Satisfactory
14	0,25	0,09	Satisfactory
22	0,25	0,09	Satisfactory
25	0,29	0,33	Satisfactory
34	0,29	0,33	Satisfactory
3	0,30	0,40	Satisfactory
13	0,30	0,40	Satisfactory
50	0,30	0,40	Satisfactory
30	0,318	0,51	Satisfactory

Lab.	Codeine (ng/mg)	Z-score	Result
4	0,33	0,58	Satisfactory
51	0,336	0,61	Satisfactory
33	0,34	0,64	Satisfactory
28	0,34	0,66	Satisfactory
35	0,35	0,70	Satisfactory
27	0,36	0,76	Satisfactory
53	0,37	0,82	Satisfactory
10	0,40	1,01	Satisfactory
12	0,50	1,61	Satisfactory
16	0,56	1,98	Satisfactory
37	P		
39	P		
1	N		
7	N		
18	N		
38	N		
52	N		
54	N		

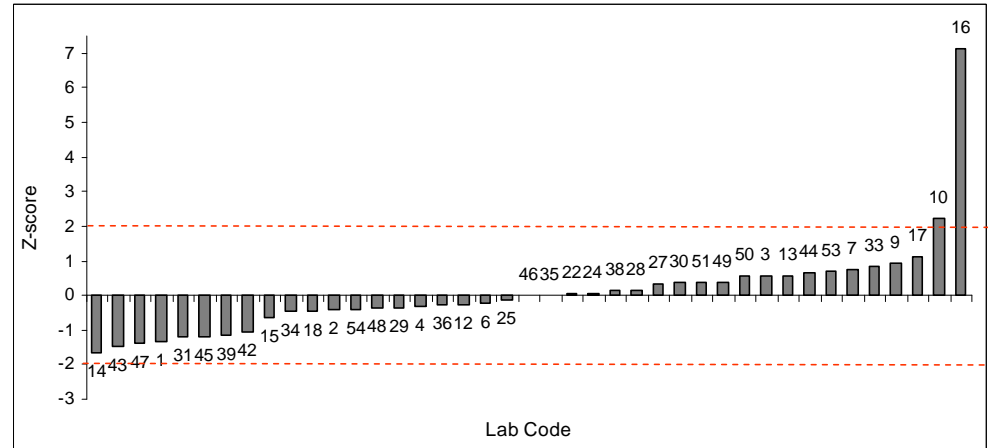
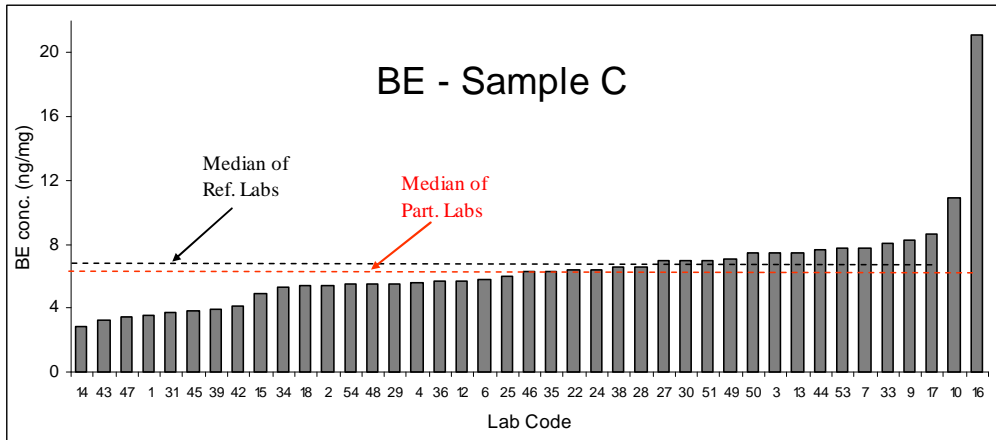
Average	0,25
SD	0,11
CV%	45,27
Median	0,235
Minimum	0,065
Quartile 25	0,1675
Quartile 75	0,33
Maximum	0,56
Iqr	0,164



Lab.	Cocaine (ng/mg)	Z-score	Result
13	1,60	-1,25	Satisfactory
52	1,78	-1,17	Satisfactory
31	2,17	-0,98	Satisfactory
43	2,18	-0,97	Satisfactory
14	2,20	-0,96	Satisfactory
42	2,76	-0,69	Satisfactory
47	3,04	-0,56	Satisfactory
12	3,09	-0,53	Satisfactory
45	3,13	-0,51	Satisfactory
54	3,14	-0,51	Satisfactory
15	3,30	-0,43	Satisfactory
21	3,30	-0,43	Satisfactory
48	3,50	-0,34	Satisfactory
36	3,67	-0,26	Satisfactory
50	3,74	-0,22	Satisfactory
1	3,76	-0,21	Satisfactory
46	3,80	-0,19	Satisfactory
49	3,80	-0,19	Satisfactory
4	3,91	-0,14	Satisfactory
27	4,03	-0,08	Satisfactory
2	4,18	-0,01	Satisfactory
39	4,20	0	Satisfactory
18	4,25	0,02	Satisfactory
28	4,33	0,06	Satisfactory
44	4,42	0,11	Satisfactory
25	4,49	0,14	Satisfactory

Lab.	Cocaine (ng/mg)	Z-score	Result
29	4,53	0,16	Satisfactory
6	4,56	0,17	Satisfactory
35	4,71	0,24	Satisfactory
9	4,97	0,37	Satisfactory
33	5,35	0,55	Satisfactory
34	5,35	0,55	Satisfactory
3	5,40	0,58	Satisfactory
30	5,56	0,65	Satisfactory
22	5,60	0,67	Satisfactory
24	5,83	0,78	Satisfactory
7	6,10	0,91	Satisfactory
51	6,48	1,101	Satisfactory
53	6,63	1,17	Satisfactory
10	6,70	1,20	Satisfactory
17	7,26	1,47	Satisfactory
16	7,65	1,66	Satisfactory
38	8,63	2,13	Questionable
37	P		

Average	4,40
SD	1,58
CV%	35,87
Median	4,20
Minimum	1,60
Quartile 25	3,30
Quartile 75	5,37
Maximum	8,63
Iqr	2,07



Lab.	BE (ng/mg)	Z-score	Result
14	2,80	-1,67	Satisfactory
43	3,21	-1,47	Satisfactory
47	3,43	-1,37	Satisfactory
1	3,54	-1,31	Satisfactory
31	3,75	-1,21	Satisfactory
45	3,82	-1,18	Satisfactory
39	3,92	-1,13	Satisfactory
42	4,08	-1,05	Satisfactory
15	4,90	-0,66	Satisfactory
34	5,28	-0,48	Satisfactory
18	5,37	-0,43	Satisfactory
2	5,41	-0,47	Satisfactory
54	5,46	-0,39	Satisfactory
48	5,50	-0,37	Satisfactory
29	5,52	-0,36	Satisfactory
4	5,64	-0,31	Satisfactory
36	5,69	-0,28	Satisfactory
12	5,71	-0,27	Satisfactory
6	5,82	-0,22	Satisfactory
25	5,96	-0,15	Satisfactory
46	6,26	-0,01	Satisfactory
35	6,30	0,01	Satisfactory
22	6,40	0,06	Satisfactory
24	6,43	0,07	Satisfactory
38	6,57	0,14	Satisfactory
28	6,59	0,15	Satisfactory

Lab.	BE (ng/mg)	Z-score	Result
27	6,99	0,34	Satisfactory
30	7,02	0,35	Satisfactory
51	7,02	0,35	Satisfactory
49	7,10	0,39	Satisfactory
50	7,46	0,56	Satisfactory
3	7,50	0,58	Satisfactory
13	7,50	0,58	Satisfactory
44	7,68	0,67	Satisfactory
53	7,74	0,70	Satisfactory
7	7,80	0,73	Satisfactory
33	8,04	0,84	Satisfactory
9	8,21	0,92	Satisfactory
17	8,66	1,14	Satisfactory
10	10,9	2,21	Questionable
16	21,12	7,11	Unsatisfactory
37	P		

Average	6,44
SD	2,85
CV%	44,31
Median	6,26
Minimum	2,80
Quartile 25	5,372
Quartile 75	7,46
Maximum	21,12
Iqr	2,088