



Corrigendum

Reproducibility of Telomere Length Assessment - An International Collaborative Study

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International Journal of Epidemiology 2014, doi: 10.1093/ije/dyu191

Key Messages

Rankings are similar if different laboratories measure telomere lengths in the same samples.

TLR values for Labs 3 and 4 in round 2 as shown in Tab. 2 were not calculated from the set of raw values shown in suppl. Tab. S2, and this error was propagated through the following analyses. In addition, in suppl. Tab. S3, Pearson correlations were shown instead of Spearman's correlation coefficients. Results based on the set of raw data shown in suppl. Tab S2 are provided below.

We correct the following statements (corrections underlined):

Results: Absolute results from different laboratories differed widely and could thus not be compared directly, but most rankings of relative telomere lengths were highly correlated (correlation coefficients 0.25–0.99).

Table 2. TLR as measured in the participating labs and inter-lab CVs in round 1 (top) and round 2 (bottom)

Sample	Round 1												
	Lab 1 South	Lab 2 South	Lab 3 STELA	Lab 4 qPCR	Lab 5 qPCR	Lab 6 qPCR	Lab 7 qPCR	Lab 8 qPCR	Lab 9 qPCR	CV for All Labs	CV for qPCR Labs	CV for qPCR triplets (median)	CV for South & STELA
A	1.19	1.07	1.35	1.13	1.06	1.23	1.44	0.91	1.10	13.78	15.60	14.75	11.67
B	1.15	1.34	1.28	0.65	1.18	1.14	1.21	1.34	1.16	17.89	21.44	19.23	7.68
C	1.91	1.61	1.85	1.51	1.72	1.53	2.35	1.55	1.78	15.17	18.40	13.66	8.92
D	1.08	1.26	1.07	0.59	0.66	0.83	1.13	0.83	0.63	27.45	25.75	18.78	9.38
E	0.63	0.87		0.44	0.22	0.36	0.79	0.13	0.31	57.53	61.59	52.56	22.86
F	0.63	0.79	0.79	0.39	0.19	0.28	0.46	0.39	0.14	53.46	40.54	42.92	12.80
G ^a	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
H	0.64	0.68	0.75		0.17	0.31	0.33	0.31	0.13	57.93	36.87	41.46	7.79
I	0.91	1.11	0.94	1.30	1.52	1.10	1.80	1.39	1.79	25.44	18.65	16.93	10.86
J	0.90	0.95	0.94	0.88	0.86	0.83	1.15	0.89	0.89	10.21	12.83	9.74	2.68

(continued)

Table 2. Continued

Sample ^b	Round 2											CV for All Labs	CV for qPCR Labs	CV for qPCR triplets (median)	CV for South & STELA	
	Lab 1 South	Lab 2 South	Lab 3 STELA	Lab 4 qPCR	Lab 5 qPCR	Lab 6 qPCR	Lab 7 qPCR	Lab 8 qPCR	Lab 9 qPCR	Lab 10 qPCR	Lab 10-2 qPCR					
B	1.39	1.37	1.51	0.84	1.13	1.06	1.43	1.20	0.99	0.85	0.98	20.62	18.48	16.69	5.54	
C	1.52	1.54		1.54	1.73	1.54	1.50	1.64	1.73	1.93	1.55	11.06	12.32	8.93	6.31	
C	1.56	1.53	1.76	1.78	1.55	1.59	1.61	1.53	1.65	1.63	0.99					
K	0.99	1.05	1.12	0.68	0.58	0.74	1.04	0.84	0.50	0.73	0.74	24.89	22.15	19.87	6.24	
L		0.99	1.08	0.83	0.42	0.60	0.65	0.60	0.65	0.45	0.73	30.74	22.21	19.99	6.53	
G	0.94	0.95	0.94	1.02	0.97	1.03	0.94	1.00	1.01	1.11	1.33	7.93	8.64	4.64	3.25	
G ^a	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00					
H	0.57	0.69	0.75	0.38	0.19		0.31	0.31	0.11	0.12	0.19	62.27	39.89	37.06	13.19	
H	0.56	0.71	0.77	0.38	0.21	0.27	0.28	0.29	0.11	0.13	0.21					
I	0.87	0.99	0.99	1.28	1.48	1.25	1.32	1.37	1.61	1.44	1.38	18.17	8.48	7.26	7.67	
												Median	22.76	20.05	17.86	7.74

TLR, telomere length ratio; CVs, coefficients of variation.

^aAll TLR values were calculated as the ratio of the estimated telomere length for a particular sample, divided by the estimated telomere length for sample G.

^bThe second round of measurements was designed to enable inter-batch comparison and included 5 repeat samples from the first round (B, C, G, H, I), of which samples C, G and H were duplicated (for intra-batch comparison). CVs for qPCR labs were higher than those for Southern/STELA labs (p = 0.000, paired t-test).

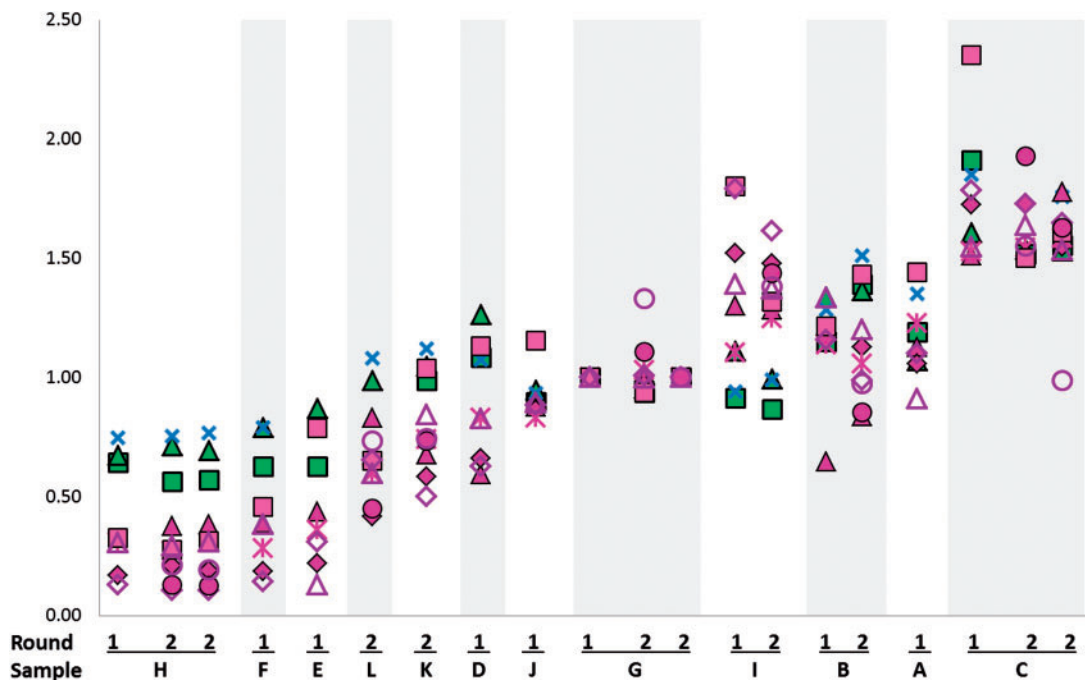


Figure 1. Telomere length ratios (TLRs) by laboratory, round and sample. TLRs are normalized to sample G, first round. Symbols indicate laboratories and techniques. Green indicates SOUTH, blue indicates STELA and pink symbols indicate qPCR. ■ Lab 1 South; ▲ Lab 2 South; × Lab 3 STELA; ▲ Lab 4 qPCR; ◆ Lab 5 qPCR; * Lab 6 qPCR; ■ Lab 7 qPCR; Δ Lab 8 qPCR; ◇ Lab 9 qPCR; ● Lab 10 qPCR duplex; ○ Lab 10-2 qPCR monoplex.

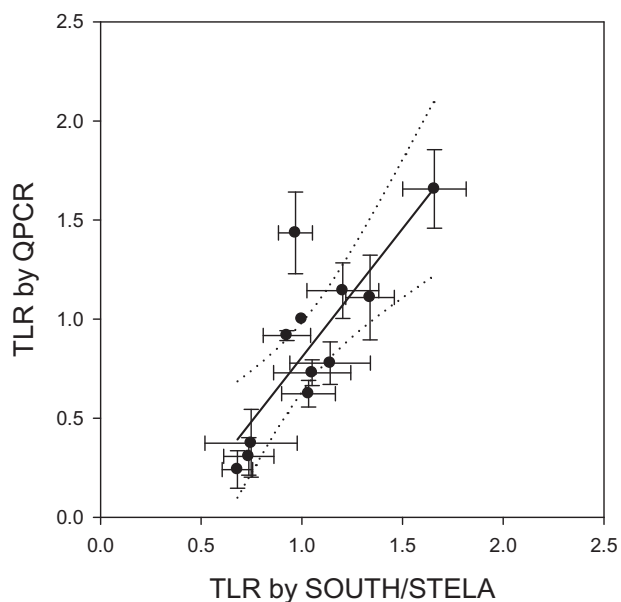


Figure 2.

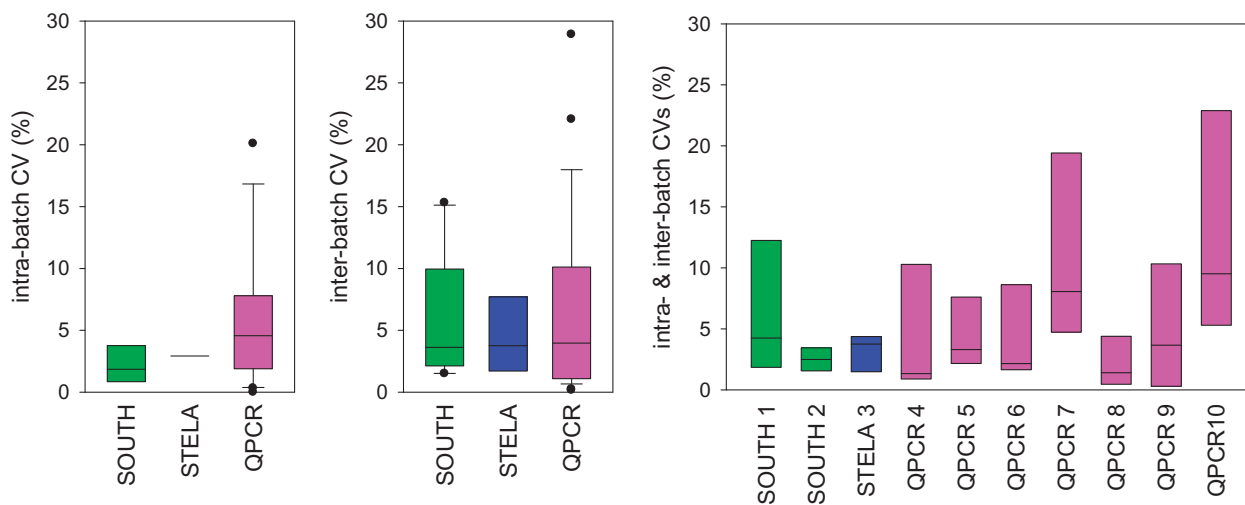


Figure 3. (a– c).

Table 3. Intra-batch CVs per laboratory

Sample name	Lab 1 South	Lab 2 South	Lab 3 STELA	Lab 4 qPCR	Lab 5 qPCR	Lab 6 qPCR	Lab 7 qPCR	Lab 8 qPCR	Lab 9 qPCR	Lab 10 qPCR	Lab 10-2 qPCR
C	1.702	0.178		10.294	7.799	1.903	4.771	4.566	3.354	11.934	31.299
G	4.614	3.481	4.374	1.331	2.162	2.156	4.721	0.324	0.470	7.095	20.089
H	1.083	2.007	1.489	1.304	7.018		8.985	3.861	0.000	2.404	6.264

Table 4. Inter-batch CVs per laboratory

Sample name	Lab 1 Tech 1	Lab 2 Tech 1	Lab 3 Tech 2	Lab 4 Tech 3	Lab 5 Tech 3	Lab 6 Tech 3	Lab 7 Tech 3	Lab 8 Tech 3	Lab 9 Tech 3
B	13.388	1.499	11.627	17.989	3.046	5.215	11.522	7.431	11.314
C	15.305	3.368	3.772	6.497	3.564	1.652	28.906	1.709	3.973
G	2.270	1.719	2.154	0.669	1.073	1.086	2.322	0.162	0.235
H	8.813	2.980	1.259		11.650	8.925	7.144	0.850	13.671
I	3.877	7.991	3.755	0.897	2.175	8.620	22.052	1.093	7.395

Suppl. Table S3. Spearman's rank correlation coefficients between participating laboratories

Round 1	Lab 1 South	Lab 2 South	Lab 3 STELA	Lab 4 qPCR	Lab 5 qPCR	Lab 6 qPCR	Lab 7 qPCR	Lab 8 qPCR	Lab 9 qPCR
Lab 1 South	1.000								
Lab 2 South	0.855	1.000							
Lab 3 STELA	0.983	0.867	1.000						
Lab 4 qPCR	0.650	0.600	0.524	1.000					
Lab 5 qPCR	0.770	0.855	0.750	0.900	1.000				
Lab 6 qPCR	0.879	0.818	0.867	0.867	0.939	1.000			
Lab 7 qPCR	0.770	0.842	0.750	0.883	0.952	0.915	1.000		
Lab 8 qPCR	0.770	0.806	0.700	0.867	0.952	0.867	0.867	1.000	
Lab 9 qPCR	0.709	0.818	0.667	0.883	0.988	0.903	0.939	0.939	1.000

Round 2	Lab 1 South	Lab 2 South	Lab 3 STELA	Lab 4 qPCR	Lab 5 qPCR	Lab 6 qPCR	Lab 7 qPCR	Lab 8 qPCR	Lab 9 qPCR	Lab 10 qPCR	Lab 10-2 qPCR
Lab 1 South	1.000										
Lab 2 South	0.933	1.000									
Lab 3 STELA	0.929	0.950	1.000								
Lab 4 qPCR	0.700	0.685	0.483	1.000							
Lab 5 qPCR	0.783	0.855	0.667	0.927	1.000						
Lab 6 qPCR	0.690	0.733	0.476	0.933	0.967	1.000					
Lab 7 qPCR	0.883	0.927	0.817	0.806	0.927	0.917	1.000				
Lab 8 qPCR	0.800	0.842	0.650	0.915	0.988	0.967	0.939	1.000			
Lab 9 qPCR	0.695	0.693	0.477	0.985	0.936	0.917	0.802	0.936	1.000		
Lab 10 qPCR	0.683	0.733	0.500	0.976	0.952	0.933	0.830	0.939	0.985	1.000	
Lab 10-2 qPCR	0.450	0.576	0.250	0.867	0.855	0.750	0.661	0.842	0.912	0.927	1.000

Suppl. Table S4. z-scored results from all participating laboratories in round 1 (top) and 2 (bottom) and inter-laboratory variation in z scores (as standard deviation) between all laboratories and separated by technique

Lab 1 South round 1	Lab 2 South	Lab 3 STELA	Lab 4 qPCR	Lab 5 qPCR	Lab 6 qPCR	Lab 7 qPCR	Lab 8 qPCR	Lab 9 qPCR	Lab 10 qPCR	lab 10-2 qPCR	SD all	SD qPCR	SD South/ STELA
0.453	-0.012	0.751	0.480	0.306	0.703	0.663	-0.033	0.319			0.288	0.271	0.385
0.344	0.928	0.540	-0.666	0.527	0.492	0.239	0.876	0.417			0.463	0.524	0.296
2.414	1.894	2.280	1.395	1.538	1.419	2.370	1.330	1.484			0.453	0.389	0.270
0.165	0.670	-0.094	-0.795	-0.426	-0.242	0.083	-0.210	-0.491			0.426	0.298	0.390
-1.075	-0.727		-1.172	-1.245	-1.358	-0.561	-1.699	-1.030			0.357	0.379	0.246
-1.073	-1.004	-0.958	-1.280	-1.303	-1.541	-1.176	-1.159	-1.312			0.181	0.138	0.058
-0.061	-0.264	-0.320	0.177	0.201	0.165	-0.162	0.161	0.147			0.209	0.137	0.136
-1.035	-1.416	-1.092		-1.333	-1.474	-1.423	-1.327	-1.337			0.158	0.067	0.205
-0.295	0.129	-0.506	0.891	1.166	0.413	1.338	0.998	1.496			0.723	0.382	0.324
-0.338	-0.457	-0.519	-0.117	-0.054	-0.236	0.124	-0.066	-0.049			0.213	0.117	0.092
round 2													
0.998	1.029	1.242	-0.217	0.435	0.300	0.643	0.591	0.124	-0.143	0.140	0.483	0.317	0.133
1.349	1.635		1.454	1.549	1.455	0.778	1.521	1.386	1.624	1.397	0.398	0.414	0.244
1.449	1.622	1.987	2.030	1.215	1.554	0.974	1.302	1.250	1.131	0.169			
-0.093	-0.098	0.043	-0.592	-0.572	-0.455	-0.095	-0.177	-0.705	-0.336	-0.365	0.247	0.210	0.080
	-0.313	-0.073	-0.231	-0.880	-0.794	-0.817	-0.704	-0.444	-0.803	-0.387	0.289	0.242	0.170
-0.233	-0.434	-0.503	0.222	0.146	0.239	-0.283	0.151	0.158	0.273	0.919	0.310	0.245	0.157
-0.061	-0.264	-0.320	0.177	0.201	0.165	-0.162	0.161	0.147	0.100	0.195			
-1.228	-1.349	-1.077	-1.313	-1.295		-1.446	-1.317	-1.376	-1.336	-1.566	0.138	0.104	0.123
-1.252	-1.278	-1.028	-1.296	-1.258	-1.561	-1.517	-1.352	-1.376	-1.329	-1.527			
-0.428	-0.292	-0.351	0.853	1.081	0.754	0.429	0.953	1.193	0.819	1.024	0.615	0.235	0.068
										median	0.310	0.245	0.170

Table 5. Test results

Analysis	original value in the paper	corrected value
Spearman’s rank correlation coefficients (abstract and re- sults p4 1 st para)	Range: 0.63 –0.99	Range: 0.25 –0.99
Paired T-test CVs (SB+STELA) vs CVs qPCR (Results p.4 2 nd para)	p = 0.001	p = 1.8x10 ⁻⁷
Linear regression of LTRs South/STELA vs qPCR (p6 1 st para)	Offset: -0.55 ± 0.32 Slope: 1.38 ± 0.30	Offset: -0.49 ± 0.32 Slope: 1.30 ± 0.30
Intra-batch CV values Differences between labs (Table 3, p6 2 nd para)	Labs 1 to 10-1 ANOVA, p = 0.299	Labs 1 to 10.1 ANOVA, p = 0.299 Labs 1 to 10-2 Kruskal-Wallis, p = 0.089
Median intra-batch CVs per technique	1.86% (SB); 2.83% (STELA); 4.57% (qPCR)	1.86% (SB); 2.93% (STELA); 4.57% (qPCR)
Differences between tech- niques (Kruskal-Wallis)	p = 0.161	p = 0.201
Differences between tech- niques with SOUTH and STELA combined (Mann-Whitney)	p = 0.075	p = 0.082

(continued)

Table 5. Continued

Analysis		original value in the paper	corrected value
Inter-batch CV values (Table 4, p7)	Differences between labs (Kruskal-Wallis)	p = 0.195	p = 0.190
	Median inter-batch CVs per technique	3.62% (SB); 4.78% (STELA); 4.65% (qPCR)	3.62% (SB); 3.76% (STELA); 3.97% (qPCR)
	Differences between techniques (Kruskal-Wallis)	p = 0.840	p = 0.842
Intra- & Inter-batch CV values combined (p7, 2 nd para)	Differences between labs (Kruskal-Wallis)	p = 0.060	p = 0.052
GLM (p8)	Null hypothesis of equal variance between all groups	F = 1.650; p = 0.096 Partial eta-squared coefficients: LAB .013 TECHN .000 LAB * TECHN .000	F = 1.998; p = 0.036 Partial eta-squared coefficients: LAB .014 TECHN .000 LAB * TECHN .000