

## Supplemental Data

### Non-HDL-C Assays Show Improved Accuracy for Cardiovascular Risk Score

#### Classification Compared to Direct or Calculated LDL-C in a Dyslipidemic Population

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#### Classification into Cardiovascular disease risk score categories:

**LDL-C:** < 70 mg/dL, 71 to 100 mg/dL, 101 to 130 mg/dL, 131 to 160 mg/dL, 161 to 190 mg/dL, > 190 mg/dL

**Non-HDL-C:** <100 mg/dL, 101 to 130 mg/dL, 131 to 160 mg/dL, 161 to 190 mg/dL, 191 to 220 mg/dL, > 220 mg/dL

**HDL-C:** < 40 mg/dL, 40 to 60 mg/dL, > 60 mg/dL

**In case of apoA-I**, the following cutoff values were determined by linear regression analysis with rHDL-C, by calculating the equivalent points in the HDL-C probability distribution that corresponds to NCEP guidelines for HDL-C:

**ApoA-I:** < 136 mg/dL, 137 to 174 mg/dL and > 174 mg/dL

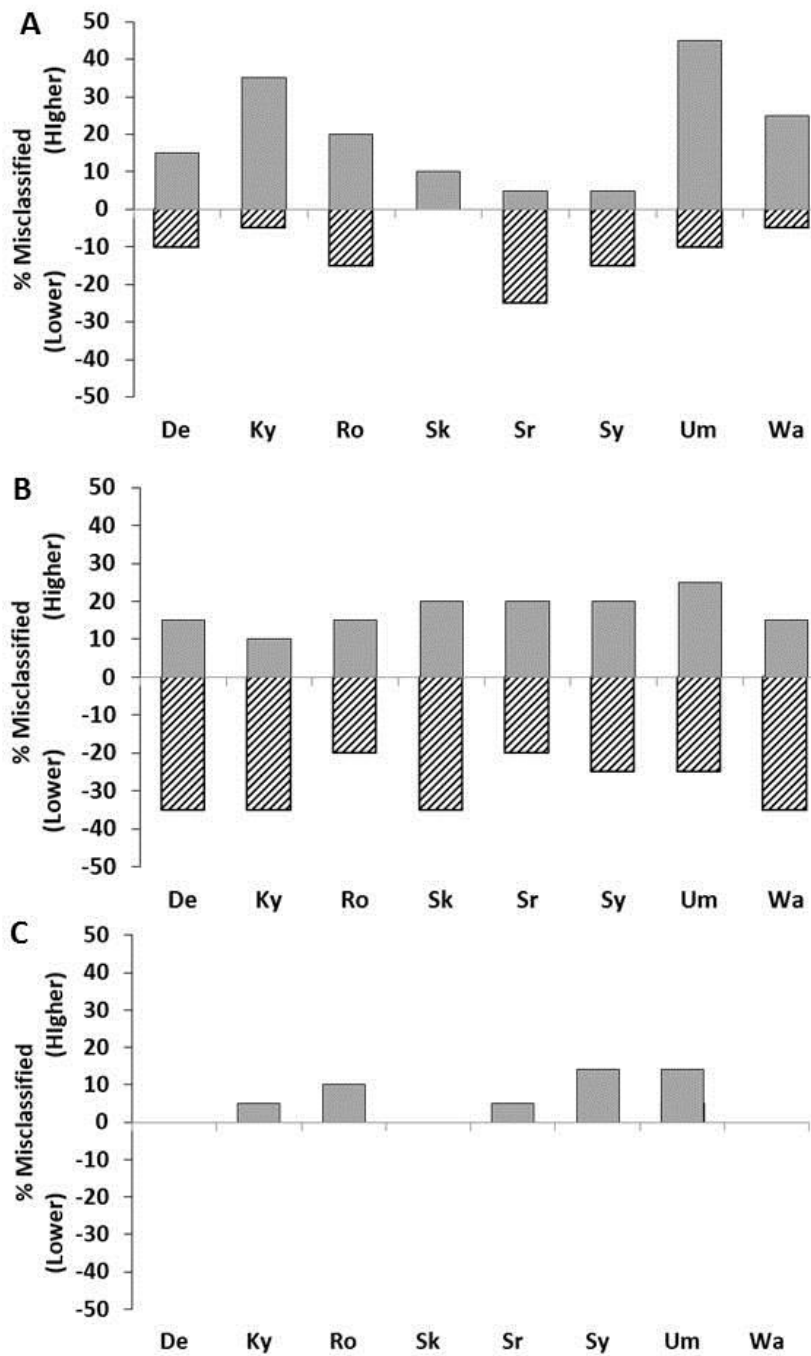
**In case of ApoB**, the following cutoff values were determined by linear regression analysis with rHDL-C, by calculating the equivalent points that corresponds to NCEP guidelines for LDL-C:

**ApoB:** < 77 mg/dL, 78 to 94 mg/dL, 95 to 110 mg/dL, 111 to 127 mg/dL, 128 to 143 mg/dL  
and >143 mg/dL

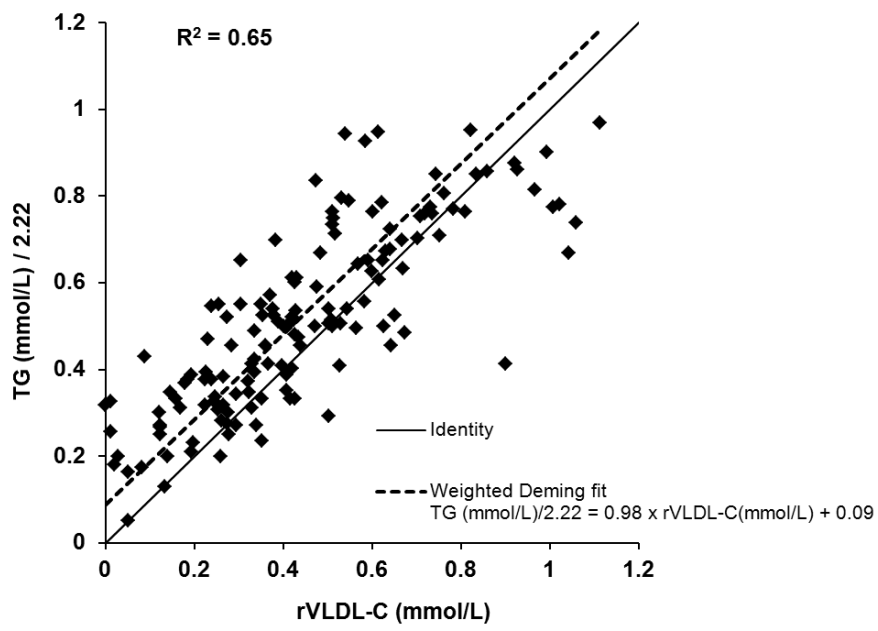
When apoB was compared to non-HDL-C that used rHDL-C in the calculation, the following apoB cut points were determined by linear regression analysis with non-HDL-C, by calculating the equivalent points that correspond to NCEP guidelines for non-HDL-C:

**ApoB:** < 79 mg/dL, 80 to 97 mg/dL, 98 to 115 mg/dL, 116 to 133 mg/dL, 134 to 152 mg/dL,  
>152 mg/dL

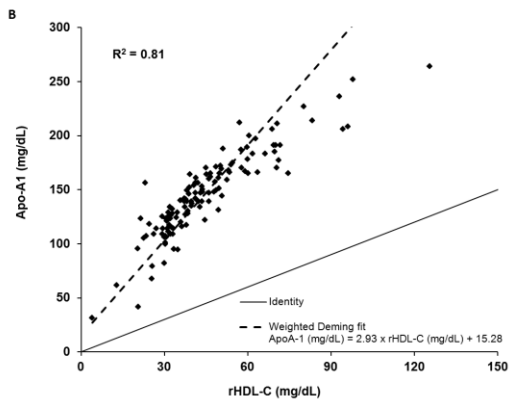
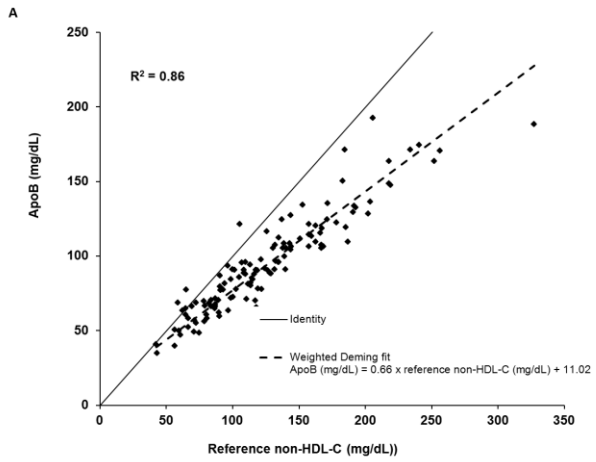
**Supplemental Figures:**



**Supplemental Fig. 1: Misclassification rate for CVD risk for those participants with TG  $\geq$  2.26 mmol/L (200 mg/dL) and  $<$  4.52 mmol/L (400mg/dL), N=20. Percent of test results that were classified into either a higher (open bar) or lower (solid bar) CVD risk category compared to RMPs are shown for dLDL-C (Panel A), cLDL-C (Panel B) or non-HDL-C (Panel C). (De, Denka; Ky, Kyowa; Ro, Roche; Sr, Serotec; Sk, Sekisui, Sy, Sysmex; Um, UMA; and Wa, Wako)**



**Supplemental Fig. 2: Relationship between TG and VLDL-C.** Weighted Deming regression analysis of VLDL-C versus measured TG/2.22.



**Supplemental Fig. 3: Correlation of apolipoproteins with lipoprotein cholesterol values.**

**Panel A:** Weighted Deming regression analysis of apoB versus non-HDL-C.

**Panel B:** Weighted Deming regression analysis of apoA-1 vs rHDL-C.

## Supplemental Tables:

**Supplemental Table 1: Directly measured and calculated LDL-C vs. rLDL-C for all participants (N = 28) with Triglycerides  $\geq 2.26$  mmol/L (200 mg/dL) including 7 with TG  $>4.52$  ( $>400$ mg/dL).**

dLDL-C versus rLDL-C (TG $\geq 2.26$ mmol/L (200 mg/dL)) (N=27)								
	Denka	Kyowa	Roche	Sekisui	Serotec	Sysmex	UMA	Wako
R <sup>2</sup>	0.93	0.78	0.78	0.97	0.79	0.78	0.75	0.82
S y x mmol/L	0.18	0.52	0.48	0.16	0.40	0.35	0.47	0.34
Slope (95 % CI)	0.97 (0.84 to 1.11)	1.34 (1.09 to 1.59)*	1.25 (1.02 to 1.48)*	0.96 (0.82 to 1.10)	1.13 (0.93 to 1.33)	1.02 (0.88 to 1.15)	1.33 (1.11 to 1.56)	0.91 (0.73 to 1.10)
Intercept (95 % CI) mmol/L	0.08 (-0.22 to 0.38)	-0.74 (-1.20 to -0.27)*	-0.65 (-1.09 to -0.21)*	0.21 (-0.20 to 0.62)	-0.74 (-1.05 to -0.43)	-0.10 (-0.46 to 0.27)	-0.70 (-1.06 to -0.34)	0.33 (-0.26 to 0.92)
% observed agreement (95 % CI), Kappa	70% (50 to 86), 0.62	63% (42 to 81), 0.54	67% (46 to 83), 0.58	81% (62 to 94), 0.76	67% (46 to 83), 0.57	81% (62 to 94), 0.76	52% (32 to 71), 0.40	67% (46 to 83), 0.57
% in Lower/Higher Risk category	11 / 19 %	7 / 30 %	15 / 19 %	0 / 19 %	30 / 4 %	15 / 4 %	11 / 37 %	7 / 26 %
% Exceeding TE Goal	19 %	37 %	26 %	11 %	52 %	19 %	48 %	41 %
cLDL-C versus rLDL-C (TG $\geq 2.26$ mmol/L (200 mg/dL)) (N=27)								
	Denka	Kyowa	Roche	Sekisui	Serotec	Sysmex	UMA	Wako
R <sup>2</sup>	0.84	0.84	0.85	0.84	0.82	0.85	0.83	0.82
S y x mmol/L	0.23	0.23	0.24	0.24	0.24	0.25	0.24	0.24
Slope (95 % CI)	1.23 (1.06 to 1.40)*	1.26 (1.09 to 1.43)*	1.28 (1.11 to 1.46)*	1.27 (1.09 to 1.45)*	1.28 (1.10 to 1.46)*	1.29 (1.10 to 1.47)*	1.29 (1.11 to 1.47)*	1.19 (1.02 to 1.37)*
Intercept (95 % CI) mmol/L	-0.85 (-1.18 to -0.52)*	-0.87 (-1.21 to -0.53)*	-0.89 (-1.23 to -0.55)*	-0.88 (-1.22 to -0.54)*	-0.89 (-1.23 to -0.54)*	-0.89 (-1.23 to -0.55)*	-0.89 (-1.24 to -0.55)*	-0.83 (-1.16 to -0.50)*
% observed agreement (95 % CI), Kappa	56 (35 to 75), 0.43	63 (42 to 81), 0.52	70 (50 to 86), 0.62	56 (35 to 75), 0.43	63 (42 to 81), 0.52	59 (39 to 78), 0.48	59 (39 to 78), 0.48	52 (32 to 71), 0.38
% in Lower/Higher Risk category	33 / 11 %	30 / 7 %	19 / 11 %	30 / 15 %	22 / 15 %	26 / 15 %	22 / 19 %	37 / 11 %
% Exceeding TE Goal	56 %	56 %	56 %	63 %	56 %	48 %	56 %	63 %



**Supplemental Table 3: rLDL-C, dLDL-C and cLDL-C vs. ApoB**

<b>rLDL-C and dLDL-C versus ApoB (All Participants) (N=126)</b>									
	<b>rLDL-C (N=125)</b>	<b>Denka</b>	<b>Kyowa</b>	<b>Roche</b>	<b>Sekisui</b>	<b>Serotec</b>	<b>Sysmex</b>	<b>UMA</b>	<b>Wako</b>
R <sup>2</sup>	0.56	0.60	0.57	0.58	0.60	0.55	0.56	0.47	0.61
S <sub>yx</sub> mg/dL	0.32	0.33	0.33	0.31	0.31	0.30	0.34	0.39	0.27
Slope (95 % CI)	1.25 (1.09 to 1.41)	1.31 (1.15 to 1.48)	1.28 (1.13 to 1.43)	1.21 (1.08 to 1.35)	1.27 (1.11 to 1.43)	1.15 (1.00 to 1.30)	1.27 (1.11 to 1.44)	1.29 (1.09 to 1.50)	1.21 (1.07 to 1.35)
Intercept (95 % CI) mg/dL	-16.81 (-28.88 to -4.73)	-23.08 (-35.60 to -10.56)	-20.80 (-32.07 to -9.54)	-19.38 (-29.43 to -9.33)	-19.81 (-32.27 to -7.34)	-17.67 (-29.28 to -6.06)	-25.71 (-38.03 to -13.39)	-23.17 (-40.64 to -5.71)	-10.66 (-20.35 to -0.96)
% observed agreement (95 % CI), Kappa	62% (53 to 70), 0.51	60% (50 to 68), 0.49	62% (53 to 70), 0.52	67% (58 to 75), 0.57	64% (54 to 72), 0.53	60% (50 to 68), 0.47	65% (56 to 73), 0.55	57% (48 to 66), 0.45	63% (54 to 71), 0.53
% in Lower/Higher Risk category	17 / 22 %	15 / 25 %	18 / 20 %	21 / 12 %	17 / 19 %	29 / 12 %	21 / 13 %	21 / 22 %	15 / 22 %
<b>rLDL-C and dLDL-C versus ApoB ((TG &lt; 2.26 mmol/L (200 mg/dL)) (N=102)</b>									
	<b>rLDL-C</b>	<b>Denka</b>	<b>Kyowa</b>	<b>Roche</b>	<b>Sekisui</b>	<b>Serotec</b>	<b>Sysmex</b>	<b>UMA</b>	<b>Wako</b>
R <sup>2</sup>	0.88	0.90	0.88	0.88	0.89	0.85	0.85	0.74	0.89
S <sub>yx</sub> mg/dL	0.16	0.17	0.17	0.17	0.17	0.18	0.20	0.27	0.15
Slope (95 % CI)	1.37 (1.26 to 1.49)	1.43 (1.32 to 1.54)	1.37 (1.26 to 1.49)	1.30 (1.21 to 1.40)	1.39 (1.27 to 1.50)	1.27 (1.16 to 1.37)	1.38 (1.26 to 1.51)	1.36 (1.20 to 1.52)	1.33 (1.23 to 1.43)
Intercept (95 % CI) mg/dL	-20.05 (-29.06 to -11.05)	-25.71 (-34.98 to -16.44)	-21.93 (-30.03 to -13.84)	-21.35 (-28.73 to -3.97)	-22.96 (-32.58 to -13.34)	-20.75 (-28.96 to -12.53)	-28.64 (-38.87 to -18.41)	-22.69 (-35.86 to -9.51)	-14.94 (-22.54 to -7.33)
% observed agreement (95 % CI), Kappa	66% (56 to 75), 0.56	63% (53 to 72), 0.52	67% (57 to 76), 0.57	73% (63 to 81), 0.64	66% (56 to 75), 0.55	68% (58 to 77), 0.57	72% (62 to 80), 0.62	63% (53 to 72), 0.51	66% (58 to 74), 0.55
% in Lower/Higher Risk category	8 / 26 %	7 / 30 %	11 / 23 %	14 / 14 %	11 / 24 %	19 / 14 %	13 / 16 %	13 / 25 %	3 / 31 %
<b>cLDL-C* versus ApoB (mg/dL) (TG &lt; 2.26 mmol/L (200 mg/dL)) (N=102)</b>									
	<b>cLDL (rHDL-C) #</b>	<b>Denka</b>	<b>Kyowa</b>	<b>Roche</b>	<b>Sekisui</b>	<b>Serotec</b>	<b>Sysmex</b>	<b>UMA</b>	<b>Wako</b>
R <sup>2</sup>	0.85	0.86	0.86	0.86	0.85	0.86	0.85	0.85	0.84
S <sub>yx</sub> mg/dL	0.21	0.19	0.20	0.20	0.20	0.20	0.21	0.22	0.22
Slope (95 % CI)	1.44 (1.30 to 1.59)	1.38 (1.24 to 1.52)	1.42 (1.27 to 1.56)	1.43 (1.28 to 1.58)	1.43 (1.28 to 1.57)	1.44 (1.28 to 1.59)	1.45 (1.30 to 1.60)	1.45 (1.28 to 1.62)	1.45 (1.30 to 1.61)
Intercept (95 % CI) mg/dL	-30.19 (-42.24 to -18.13)	-24.80 (-36.39 to -13.22)	-28.78 (-41.14 to -16.43)	-27.46 (-40.01 to -14.92)	-26.19 (-38.26 to -14.11)	-27.69 (-40.25 to -15.13)	-26.72 (-39.09 to -14.35)	-31.81 (-46.26 to -17.35)	-34.21 (-47.25 to -21.17)
% observed agreement (95 % CI), Kappa	65% (55 to 74), 0.54	73% (63 to 81), 0.64	72% (62 to 90), 0.63	64% (54 to 73), 0.53	64% (54 to 73), 0.53	65% (55 to 74), 0.55	62% (52 to 71), 0.51	65% (55 to 74), 0.54	69% (59 to 77), 0.58
% in Lower/Higher Risk category	12 / 24 %	8 / 20 %	10 / 19 %	8 / 28 %	8 / 28 %	7 / 28 %	7 / 31 %	12 / 24 %	15 / 17 %

\*cLDL-C was calculated using direct HDL-C from each indicated manufacturer, #cLDL-C calculated using reference HDL-C



**Supplemental Table 4: Apo-B vs. Non-HDL-Cholesterol**

non-HDL-C (mg/dL) versus apo-B (mg/dL) (N=126)									
	Non-HDL-C (rHDL-C) (N=125)	Denka	Kyowa	Roche	Sekisui	Serotec	Sysmex	UMA	Wako
R <sup>2</sup>	0.86	0.84	0.84	0.84	0.84	0.84	0.84	0.83	0.83
S <sub>yx</sub> mg/dL	0.17	0.17	0.18	0.18	0.18	0.19	0.18	0.20	0.20
Slope (95 % CI)	1.51 (1.40 to 1.62)	1.47 (1.35 to 1.59)	1.53 (1.40 to 1.66)	1.52 (1.40 to 1.65)	1.50 (1.39 to 1.62)	1.53 (1.40 to 1.67)	1.52 (1.40 to 1.64)	1.58 (1.42 to 1.75)	1.54 (1.41 to 1.68)
Intercept (95 % CI)	-16.64 (-25.88 to -7.40)	-12.97 (-22.46 to -3.47)	-18.54 (-29.4 to -7.68)	-15.79 (-26.48 to -5.10)	-13.35 (-22.99 to -3.72)	-16.43 (-27.48 to -5.39)	-13.19 (-23.14 to -3.24)	-23.40 (-37.42 to -9.39)	-22.44 (-34.18 to -10.70)
% observed agreement (95 % CI), Kappa	69% (60 to 77), 0.59	67% (59 to 76), 0.58	67% (59 to 76), 0.58	66% (57 to 74), 0.56	66% (57 to 74), 0.56	64% (55 to 73), 0.54	66% (57 to 74), 0.56	65% (56 to 73), 0.55	67% (59 to 76), 0.57
% Categorized in Lower / Higher HDL-C category	13 / 18 %	13 / 19 %	13 / 19 %	11 / 23 %	13 / 21 %	13 / 23 %	10 / 24 %	15 / 20 %	17 / 15 %

**Supplemental Table 5: ApoA-1 vs. HDL-C for all patients**

dHDL-C (mg/dL) versus apoA-1 (mg/dL) (N=130)									
	rHDL-C (N=129)	Denka	Kyowa	Roche	Sekisui	Serotec	Sysmex	UMA	Wako
R <sup>2</sup>	0.81	0.82	0.78	0.78	0.83	0.72	0.81	0.66	0.74
S <sub>yx</sub> mg/dL	0.09	0.08	0.09	0.09	0.08	0.12	0.10	0.13	0.10
Slope (95% CI)	0.34 (0.29 to 0.40)	0.35 (0.31 to 0.40)	0.34 (0.30 to 0.38)	0.32 (0.28 to 0.35)	0.34 (0.30 to 0.39)	0.27 (0.19 to 0.34)	0.26 (0.18 to 0.34)	0.36 (0.31 to 0.41)	0.26 (0.14 to 0.39)
Intercept (95 % CI)	-5.21 (-12.88 to 2.46)	-6.69 (-12.69 to -0.69)	-4.39 (-9.70 to 0.93)	-3.39 (-8.42 to 1.63)	-7.72 (-14.13 to -1.30)	3.85 (-7.42 to 15.12)	2.72 (-8.40 to 13.85)	-7.25 (-13.81 to 0.70)	9.24 (-8.28 to 26.75)
% observed agreement (95 % CI), Kappa	81% (74 to 88), 0.70	76% (68 to 83), 0.62	75% (67 to 83), 0.61	75% (67 to 83), 0.61	74% (65 to 81), 0.58	74% (65 to 81), 0.58	71% (62 to 78), 0.53	72% (63 to 79), 0.56	80% (72 to 87), 0.69
% Categorized in Lower / Higher HDL-C category	13 / 5 %	17 / 7 %	15 / 9 %	21 / 4 %	22 / 4 %	22 / 5 %	26 / 3 %	18 / 10 %	7 / 13 %

**Supplemental Table 6: Directly measured and calculated LDL-C vs. rLDL-C , Fasting and non-fasting**

Fasting (> 12 hours): dLDL-C versus rLDL-C (TG < 2.26 mmol/L (200 mg/dL)) (N=85)								
	Denka	Kyowa	Roche	Sekisui	Serotec	Sysmex	UMA	Wako
R <sup>2</sup>	0.97	0.98	0.98	0.99	0.97	0.97	0.89	0.99
S <sub>YX</sub> mmol/L	0.09	0.08	0.08	0.07	0.08	0.11	0.16	0.05
Slope (95 % CI) mmol/L	0.99 (0.92 to 1.07)	1.01 (0.97 to 1.04)	0.94 (0.89 to 1.00)	0.99 (0.96 to 1.02)	0.91 (0.83 to 1.00)	0.91 (0.72 to 1.11)	1.00 (0.88 to 1.12)	1.00 (0.94 to 1.05)
Intercept (95 % CI) mmol/L	-0.04 (-0.20 to 0.12)	-0.06 (-0.12 to 0.01)	-0.04 (-0.16 to 0.09)	-0.04 (-0.10 to 0.02)	-0.01 (-0.20 to 0.18)	0.01 (-0.46 to 0.48)	-0.03 (-0.31 to 0.24)	0.05 (-0.07 to 0.18)
% observed agreement (95 % CI), Kappa	86%(77 to 93), 0.82	92%(84 to 97), 0.89	80%(77 to 88), 0.74	93%(85 to 97), 0.91	74%(63 to 83), 0.67	80%(77 to 88), 0.74	87%(78 to 93), 0.83	91%(82 to 96),0.88
% in Lower/Higher Risk category	7 / 7 %	6 / 2 %	19 / 1 %	6 / 1 %	25 / 1 %	19 / 1 %	9 / 4 %	4 / 6 %
% Exceeding TE Goal	15 %	8 %	20 %	9 %	39 %	29 %	13 %	7 %
Non-Fasting (≤ 12 hours): dLDL-C versus rLDL-C (TG < 2.26 mmol/L (200 mg/dL)) (N=58)								
	Denka	Kyowa	Roche	Sekisui	Serotec	Sysmex	UMA	Wako
R <sup>2</sup>	0.97	0.98	0.98	0.98	0.98	0.96	0.75	0.98
S <sub>YX</sub> mmol/L	0.06	0.06	0.06	0.05	0.05	0.11	0.22	0.05
Slope (95 % CI) mmol/L	1.04 (1.00 to 1.09)	1.01 (0.96 to 1.06)	0.96 (0.92 to 1.00)	1.01 (0.97 to 1.04)	0.93 (0.89 to 0.98)	0.91 (0.72 to 1.11)	1.11 (0.90 to 1.33)	0.96 (0.93 to 1.00)
Intercept (95 % CI) mmol/L	-0.10 (-0.18 to -0.01)	-0.06 (-0.18 to 0.05)	-0.06 (-0.16 to 0.03)	-0.04 (-0.12 to 0.04)	-0.07 (-0.17 to 0.04)	0.01 (-0.46 to 0.48)	-0.37 (-0.88 to 0.13)	0.12 (0.03 to 0.21)
% observed agreement (95 % CI), Kappa	88%(77 to 95), 0.83	88%(77 to 95), 0.83	79%(67 to 89), 0.71	88%(77 to 95), 0.83	72%(59 to 83), 0.62	85%(73 to 93), 0.78	85%(73 to 93), 0.79	93%(83 to 98), 0.90
% in Lower/Higher Risk category	3 / 9 %	10 / 2 %	21 / 0 %	9 / 3 %	28 / 0 %	16 / 0 %	9 / 7 %	3 / 3 %
% Exceeding TE Goal	3 %	3 %	14 %	2 %	28 %	21 %	16 %	3 %
Fasting (> 12 hours): cLDL-C versus rLDL-C (TG < 2.26 mmol/L (200 mg/dL)) (N=85)								
	Denka	Kyowa	Roche	Sekisui	Serotec	Sysmex	UMA	Wako
R <sup>2</sup>	0.98	0.99	0.98	0.98	0.98	0.97	0.97	0.97
S <sub>YX</sub> mmol/L	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.11
Slope (95 % CI) mmol/L	0.98 (0.90 to 1.07)	0.97 (0.82 to 1.11)	1.00 (0.92 to 1.09)	1.00 (0.88 to 1.11)	1.00 (0.89 to 1.11)	0.99 (0.87 to 1.11)	0.95 (0.80 to 1.10)	0.94 (0.68 to 1.21)
Intercept (95 % CI) mmol/L	-0.04 (-0.24 to 0.16)	-0.04 (-0.37 to 0.29)	-0.06 (-0.26 to 0.13)	-0.02 (-0.28 to 0.24)	-0.04 (-0.29 to 0.21)	0.01 (-0.27 to 0.30)	0.04 (-0.31 to 0.40)	-0.04 (-0.65 to 0.58)
% observed agreement (95 % CI), Kappa	89%(81 to 95), 0.86	88%(79 to 94), 0.85	93%(85 to 97), 0.91	91%(82 to 96), 0.88	91%(82 to 96), 0.88	89%(81 to 95), 0.86	88%(79 to 94), 0.85	85%(75 to 92), 0.80
% in Lower/Higher Risk category	7 / 4 %	9 / 2 %	4 / 4 %	4 / 6 %	4 / 6 %	2 / 8 %	7 / 5 %	13 / 2 %
% Exceeding TE Goal	15 %	15 %	13 %	11 %	11 %	11 %	12 %	25 %
Non-Fasting (≤ 12 hours): cLDL-C versus rLDL-C (TG < 2.26 mmol/L (200 mg/dL)) (N=58)								
	Denka	Kyowa	Roche	Sekisui	Serotec	Sysmex	UMA	Wako
R <sup>2</sup>	0.98	0.98	0.99	0.98	0.99	0.98	0.92	0.98
S <sub>YX</sub> mmol/L	0.05	0.05	0.05	0.06	0.05	0.06	0.15	0.06
Slope (95 % CI) mmol/L	1.00 (0.95 to 1.05)	1.03 (0.99 to 1.08)	1.04 (1.00 to 1.09)	1.04 (0.99 to 1.09)	1.06 (1.02 to 1.10)	1.06 (1.01 to 1.11)	1.17 (0.98 to 1.35)	1.07 (1.01 to 1.12)
Intercept (95 % CI) mmol/L	-0.09 (-0.22 to 0.04)	-0.19 (-0.31 to -0.07)	-0.15 (-0.27 to -0.02)	-0.11 (-0.24 to 0.02)	-0.18 (-0.28 to -0.07)	-0.12 (-0.25 to 0.00)	-0.55 (-1.01 to -0.08)	-0.32 (-0.46 to -0.17)
% observed agreement (95 % CI), Kappa	93%(83 to 98), 0.90	88%(77 to 95), 0.83	97%(88 to 100), 0.95	95%(86 to 99), 0.93	97% (88 to 100), 0.95	90%(79 to 96), 0.86	78%(65 to 88), 0.69	81%(69 to 90), 0.74
% in Lower/Higher Risk category	7 / 0 %	12 / 0 %	2 / 2 %	2 / 3 %	0 / 3 %	10 / 0 %	16 / 7 %	19 / 0 %
% Exceeding TE Goal	7 %	10 %	5 %	3 %	3 %	7 %	17 %	24 %

\*cLDL-C was calculated using direct HDL-C from each indicated manufacturer (2 participants with unsure fasting status excluded from analysis)