College of American Pathologists (CAP) GH5 Survey Data:

(updated 5/16)

The American Diabetes Association (ADA) recommends that laboratories use only HbA1c assay methods that have been NGSP certified and report results as "%HbA1c". The ADA also recommends that all laboratories performing HbA1c testing participate in the College of American Pathologists (CAP) fresh sample proficiency testing survey (see ADA Recommendations section on this website for more details). CAP GH5 data for the **first** survey of 2016 are summarized below. The NGSP target or reference values are based on replicate analyses using seven NGSP certified secondary reference methods.

Commentary by R. Little, Ph.D., NGSP Network Coordinator for the NGSP Steering Committee

Beginning in 2015 there are two CAP programs for HbA1c proficiency testing using fresh whole blood samples - GH2 and GH5. GH2 samples will be shipped twice a year with three samples in each mailing as before. GH5 will be shipped three times a year with five samples in each mailing. The three samples in each of the two GH2 mailings will also be included in two of the GH5 mailings. Therefore the NGSP follows the three GH5 surveys which include all the samples used for both surveys.

In 2016, based on data from the GH5-A survey:

- **Bias from the NGSP target and variability (±2SD) are shown in Table 1 and in figure 1 (ordered by HbA1c level in figure) for each method. The shaded rectangle (fig 1) reflects the current CAP acceptance limit of ±6. The method-specific biases were > 0.30 (green shaded cells, table) for five methods (Architect i, D-10, Variant II, Premier and Vitros) for the highest level sample; the VII also showed a bias >0.3% on one other sample. All other biases were ≤0.3% HbA1c.**
- **Method-specific, between-laboratory CV's ranged from 0.6% to 5.9%. The Abbott Architect i immunoassay had CVs over 4% for all 5 samples and the Architect c immunoassay had CVs over 4% for two of the three samples shown on the report. The Advia and the c311 showed >4% CV for two of the five samples. Two methods, the Afinion and DCA Vantage, had CVs >4% for one of the five samples. The lowest CVs, ≤2% for 5/5 samples, were seen with the Abbott Architect c (enzymatic), Tosoh G8 and G7 methods. Good precision (CVs≤2%) was also seen with the Arkray HA-8180 (3/3 samples), Sebia Capillarys 2/Minicap (3/5 samples), and Bio-Rad VII Turbo 2.0 (3/5 samples). Approximately 42% of laboratories are using methods with CVs ≤3% at all five HbA1c levels; approximately 71% of laboratories are using methods with CVs ≤3.5% at all five HbA1c levels.**
- **The current pass limit for the GH5 survey is ±6%. The overall pass rates for this survey were 96.4%, 96.3%, 97.8%, 93.0% and 96.5% for GH5-01 through 05, respectively. For individual methods, the lowest pass rate was 66.7% and the highest was 100% (Sacks, Chemistry Resource Committee, CAP GH5-A 2016). As expected, methods with small bias and low CVs will have the highest pass rates and, conversely, methods with large bias and/or high CVs will have the lowest pass rates.**
- **The overall CVs for the last 12 surveys are shown in Table 2. CVs were <3.5% for all samples.**

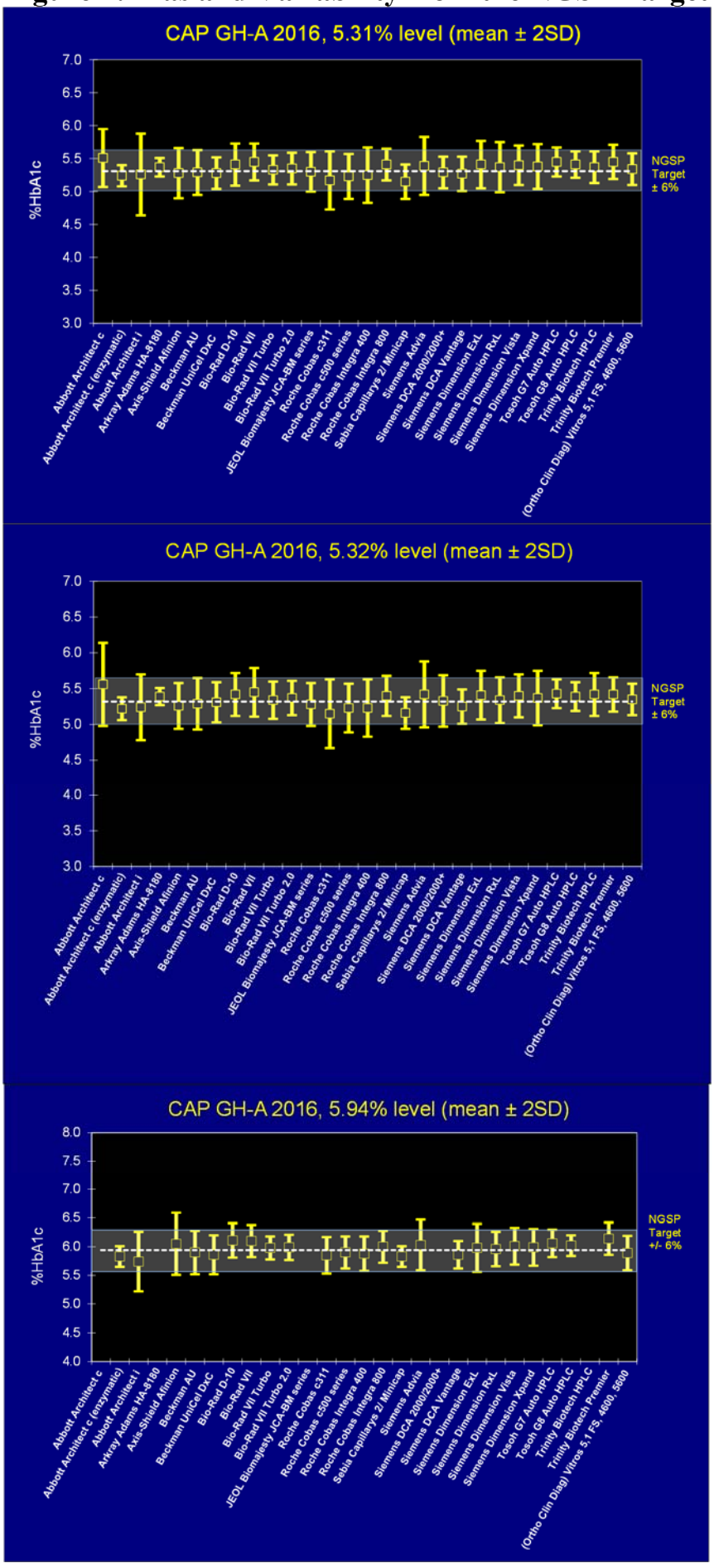
NOTE: The NGSP certification evaluates agreement of each method at the manufacturing site using one lot of reagents and calibrators, one instrument, and one application under optimal conditions. CAP precision reflects between-laboratory reproducibility, often with more than one lot of reagents and calibrators, and sometimes with different instruments (e.g. Cobas Integra 400 & Cobas Integra 800) and/or different applications (e.g. Cobas Integra hemolysate or whole blood application). In addition, if changes were made in the method just prior to NGSP certification, it is possible that not all participating laboratories in the field would have made the change at the time of the CAP survey. For these reasons, it is important that laboratories review not only the certification status of HbA1c methods but also their performance in the CAP survey over time (a good indication of field performance) when selecting or evaluating HbA1c assay methods.

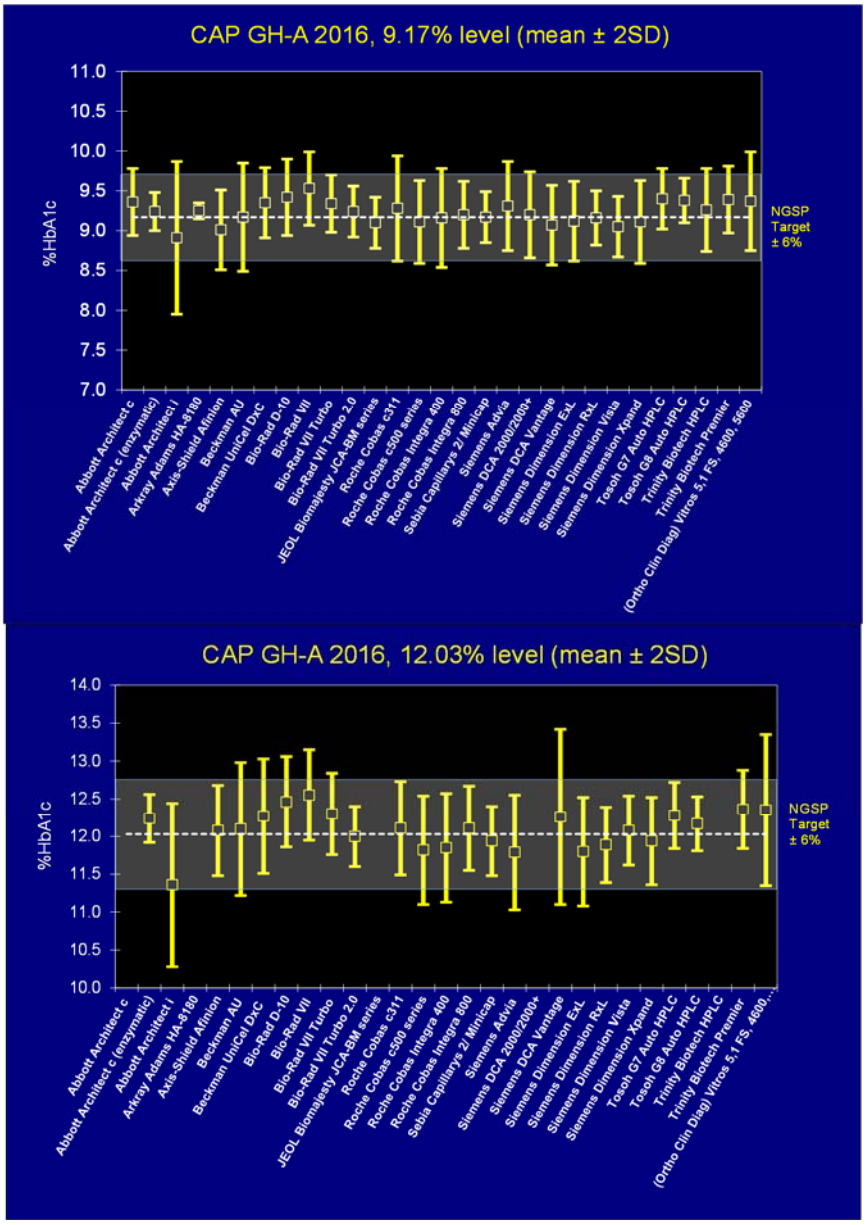
TABLE 1: 2016 GH5-A (fresh pooled samples)

		GH5-01			GH5-02			GH5-03			GH5-04			GH5-05		
[t] NGSP %HbA1c Reference Value (95% CI)		5.32 (5.27-5.37)			9.16 (9.11-9.23)			5.31 (5.25-5.36)			12.03 (11.95-12.11)			5.94 (5.89-6.00)		
	no. labs	Mean %HbA1c	Mean bias	% CV	Mean %HbA1c	Mean bias	% CV	Mean %HbA1c	Mean bias	% CV	Mean %HbA1c	Mean bias	% CV	Mean %HbA1c	Mean bias	% CV
Abbott Architect c	5-14	5.56	0.24	5.30	9.36	0.20	2.2	5.51	0.20	4.1						
Abbott Architect c (enzymatic)	90-103	5.22	-0.10	1.50	9.24	0.08	1.3	5.24	-0.07	1.5	12.24	0.21	1.3	5.83	-0.11	1.6
Abbott Architect i	12-17	5.24	-0.08	4.30	8.91	-0.25	5.4	5.26	-0.05	5.90	11.36	-0.67	4.70	5.74	-0.20	4.50
Arkray Adams HA-8180	16	5.39	0.07	1.10	9.25	0.09	0.6	5.37	0.06	1.3						
Axis-Shield Afinion	13-57	5.26	-0.06	3.10	9.01	-0.15	2.7	5.28	-0.03	3.6	12.08	0.05	2.5	6.05	0.11	4.5
Beckman AU	50-83	5.29	-0.03	3.40	9.17	0.01	3.7	5.29	-0.02	3.2	12.10	0.07	3.7	5.90	-0.04	3.3
Beckman UniCel DxC	111-142	5.31	-0.01	2.60	9.35	0.19	2.4	5.28	-0.03	2.4	12.27	0.24	3.1	5.86	-0.08	2.8
Bio-Rad D-10	127-176	5.42	0.10	2.80	9.42	0.26	2.5	5.41	0.10	2.9	12.46	0.43	2.4	6.11	0.17	2.4
Bio-Rad VII	50-59	5.45	0.13	3.00	9.53	0.37	2.4	5.45	0.14	2.5	12.55	0.52	2.4	6.10	0.16	2.3
Bio-Rad VII Turbo	82-89	5.34	0.02	2.50	9.34	0.18	1.9	5.33	0.02	2.1	12.30	0.27	2.2	5.98	0.04	1.6
Bio-Rad VII Turbo 2.0	146-173	5.37	0.05	2.10	9.24	0.08	1.7	5.35	0.04	2.3	12.00	-0.03	1.7	5.99	0.05	1.9
JEOL Biomajesty JCA-BM series	8-10	5.28	-0.04	2.80	9.10	-0.06	1.7	5.30	-0.01	2.8						
Roche Cobas c311	16-25	5.15	-0.17	4.60	9.28	0.12	3.6	5.17	-0.14	4.2	12.11	0.08	2.6	5.85	-0.09	2.7
Roche Cobas c500 series	319-381	5.23	-0.09	3.20	9.11	-0.05	2.8	5.23	-0.08	3.3	11.82	-0.21	3.0	5.90	-0.04	2.3
Roche Cobas Integra 400	31-57	5.23	-0.09	3.90	9.16	0.00	3.4	5.25	-0.06	4.0	11.85	-0.18	3.0	5.88	-0.06	2.5
Roche Cobas Integra 800	105-120	5.40	0.08	2.60	9.20	0.04	2.2	5.41	0.10	2.2	12.11	0.08	2.3	6.00	0.06	2.3
Sebia Capillarys 2/ Minicap	19-31	5.16	-0.16	2.20	9.17	0.01	1.7	5.15	-0.16	2.5	11.94	-0.09	1.9	5.83	-0.11	1.6
Siemens Advia	25-27	5.42	0.10	4.20	9.31	0.15	3.0	5.39	0.08	4.1	11.79	-0.24	3.3	6.03	0.09	3.7
Siemens DCA 2000/2000+	8-26	5.33	0.01	3.30	9.20	0.04	2.9	5.29	-0.02	2.2						
Siemens DCA Vantage	189-473	5.25	-0.07	2.20	9.07	-0.09	2.8	5.27	-0.04	2.5	12.26	0.23	4.7	5.86	-0.08	2.0
Siemens Dimension ExL	132-205	5.41	0.09	3.10	9.12	-0.04	2.7	5.41	0.10	3.2	11.80	-0.23	3.1	5.98	0.04	3.4
Siemens Dimension RxL	16-23	5.34	0.02	2.90	9.16	0.00	1.9	5.37	0.06	3.5	11.89	-0.14	2.1	5.96	0.02	2.6
Siemens Dimension Vista	260-285	5.40	0.08	2.70	9.05	-0.11	2.1	5.40	0.09	2.7	12.08	0.05	1.9	6.01	0.07	2.6
Siemens Dimension Xpand	25-47	5.37	0.05	3.50	9.11	-0.05	2.9	5.38	0.07	3.1	11.94	-0.09	2.5	5.99	0.05	2.7
Tosoh G7 Auto HPLC	36-46	5.43	0.11	1.90	9.40	0.24	2.0	5.45	0.14	2.0	12.28	0.25	1.8	6.06	0.12	2.0
Tosoh G8 Auto HPLC	308-362	5.39	0.07	1.90	9.38	0.22	1.5	5.41	0.10	1.8	12.17	0.14	1.5	6.02	0.08	1.6
Trinity Biotech HPLC	9-10	5.42	0.10	2.70	9.26	0.10	2.8	5.37	0.06	2.2						
Trinity Biotech Premier	54-63	5.42	0.10	2.30	9.39	0.23	2.2	5.45	0.14	2.3	12.36	0.33	2.1	6.14	0.20	2.3
(Ortho Clin Diag) Vitros 5,1 FS, 4600, 5600	157-187	5.35	0.03	2.10	9.37	0.21	3.3	5.34	0.03	2.2	12.35	0.32	4.1	5.89	-0.05	2.6

Gray shading indicates bias > 0.3% HbA1c or CV > 4% Note: these are arbitrary limits chosen to highlight methods with the highest bias and CV.

Figure 1: Bias and Variability from the NGSP Target




CAP GH-A 2016, 9.17% level (mean ± 2SD)
%HbA1c
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
NGSP Target ± 6%
Abbott Architect c
Abbott Architect c (enzymatic)
Abbott Architect i
Arkray Adams HA-8180
Axis-Shield Afinion
Beckman AU
Beckman UniCel DxC
Bio-Rad D-10
Bio-Rad Vll
Bio-Rad Vll Turbo
Bio-Rad Vll Turbo 2.0
JEOL Biomajesty JCA-BM series
Roche Cobas c311
Roche Cobas c500 series
Roche Cobas Integra 400
Roche Cobas Integra 800
Sebia Capillarys 2/ Minicap
Siemens Advia
Siemens DCA 2000/2000+
Siemens DCA Vantage
Siemens Dimension ExL
Siemens Dimension RxL
Siemens Dimension Vista
Siemens Dimension Xpand
Tosoh G7 Auto HPLC
Tosoh G8 Auto HPLC
Trinity Biotech Premier
(Ortho Clin Diag) Vitros 5,1 FS, 4600, 5600

CAP GH-A 2016, 12.03% level (mean ± 2SD)
%HbA1c
14.0
13.5
13.0
12.5
12.0
11.5
11.0
10.5
10.0
NGSP Target ± 6%
Abbott Architect c
Abbott Architect c (enzymatic)
Abbott Architect i
Arkray Adams HA-8180
Axis-Shield Afinion
Beckman AU
Beckman UniCel DxC
Bio-Rad D-10
Bio-Rad Vll
Bio-Rad Vll Turbo
Bio-Rad Vll Turbo 2.0
JEOL Biomajesty JCA-BM series
Roche Cobas c311
Roche Cobas c500 series
Roche Cobas Integra 400
Roche Cobas Integra 800
Sebia Capillarys 2/ Minicap
Siemens Advia
Siemens DCA 2000/2000+
Siemens DCA Vantage
Siemens Dimension ExL
Siemens Dimension RxL
Siemens Dimension Vista
Siemens Dimension Xpand
Tosoh G7 Auto HPLC
Tosoh G8 Auto HPLC
Trinity Biotech Premier
(Ortho Clin Diag) Vitros 5,1 FS, 4600...

Table 2: Overall Variability for 2010-2016 for all GH participants

Mailing	Sample#	# of labs	Target	All method mean	S.D.	C.V.
A-2010	01	2573	5.9	6.03	0.23	3.9
	02	2566	9.8	9.73	0.39	4.0
	03	2581	7.4	7.43	0.31	4.2
B-2010	04	2693	5.2	5.34	0.21	4.0
	05	2691	8.7	8.67	0.33	3.8
	06	2685	6.3	6.37	0.23	3.5
A-2011	01	2652	8.5	8.58	0.28	3.2
	02	2645	5.4	5.52	0.20	3.5
	03	2649	6.4	6.51	0.21	3.2
B-2011	04	2877	6.3	6.36	0.24	3.8
	05	2872	7.6	7.69	0.29	3.8
	06	2871	9.2	9.28	0.34	3.7
A 2012	01	3298	5.6	5.62	0.20	3.5
	02	3316	9.4	9.44	0.37	3.9
	03	3301	7.2	7.28	0.29	3.9
B2012	04	3222	5.4	5.51	0.21	3.9
	05	3208	8.3	8.31	0.31	3.7
(HbAS)	06	3172	5.65	5.75	0.32	5.6
A 2013	01	2816	7.1	7.12	0.25	3.5
	02	2829	9.3	9.39	0.31	3.3
	03	2840	6.1	6.13	0.24	3.9
B2013	04	2912	8.1	8.04	0.31	3.8
	05	2907	5.3	5.33	0.20	3.8
	06	2908	6.4	6.17	0.24	3.9
A2014	01	3277	6.5	6.60	0.25	3.8
	02	3267	7.0	7.09	0.27	3.8
	03	3253	9.7	9.72	0.33	3.4
B2014	04	3278	6.58	6.64	0.23	3.5
	05	3273	8.39	8.45	0.30	3.6
	06	3266	5.65	5.67	0.21	3.6
A2015	01	3237	6.79	6.82	0.25	3.6
	02	3246	10.28	10.19	0.36	3.5
	03	3252	6.82	6.82	0.25	3.6
	04	2365	8.63	8.63	0.30	3.4
	05	2362	5.32	5.36	0.18	3.4
B2015	06	2379	5.84	5.87	0.20	3.5
	07	2392	11.71	11.68	0.44	3.8
	08	2402	9.53	9.50	0.33	3.5
	09	2386	5.04	5.08	0.17	3.4
	10	2403	7.38	7.35	0.26	3.5
C2015	11	3284	11.69	11.68	0.47	4.1
	12	3285	5.93	5.95	0.19	3.3
	13	3286	5.17	5.20	0.17	3.3
	14	2410	8.14	8.12	0.24	2.9
	15	2408	9.30	9.25	0.29	3.2
A2016	01	3358	5.32	5.33	0.16	3.1
	02	3365	9.17	9.21	0.28	3.0
	03	3357	5.31	5.33	0.16	3.1
	04	2425	12.03	12.12	0.40	3.3
	05	2419	5.94	5.96	0.16	2.8