Leaping Forward in Capacity

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DCHHS
Safe families, healthy lives.
Dallas County Health and Human Services

2013-2014:

Year Overview

Year 0

- Predicted Capacity ranges were between 85 - 90 specimens a week
- 4 week period from 12/16/2012 to 01/12/2013
- 319 specimens tested

Year 1

- Predicted Capacity ranges were between 105 - 115 specimens a week
- 4 week period from 12/22/2013 to 01/18/2014
- 470 specimens tested

Factors Effecting Year 0 to Year 1 Capacity Difference	
Year 0	Year 1
Increased workload for supporting staff	Addition of one full time employee (FTE)
	Decrease in foot traffic
	LEAN implementation
	Addition of dedicated All-in-one printer station

Results TAT

Year 0

- Year 0 had an average TATα of 2.0 days
- Year 0 TATβ on average took 3.28 days
- Year 0 TATγ on average was 5.4 days

Year 1

- Year 1 had an average TATα of .91 days
- Year 1 on average took 3.95 days
- Year 0 TATγ on average was 4.9 days

Significance of TAT Results		
Turnaround time	Definition	P-Value < .001
TATα	Associated with accession to reporting	$3.24X10^{-21}$
TATβ	Associated with collection to accession	.0017
TATγ	Associated with collection to reporting	.057

Results QA

Year 0

- In Year 0 averaged .16 errors per specimen
- Year 0 had an average error percent of 49.99%

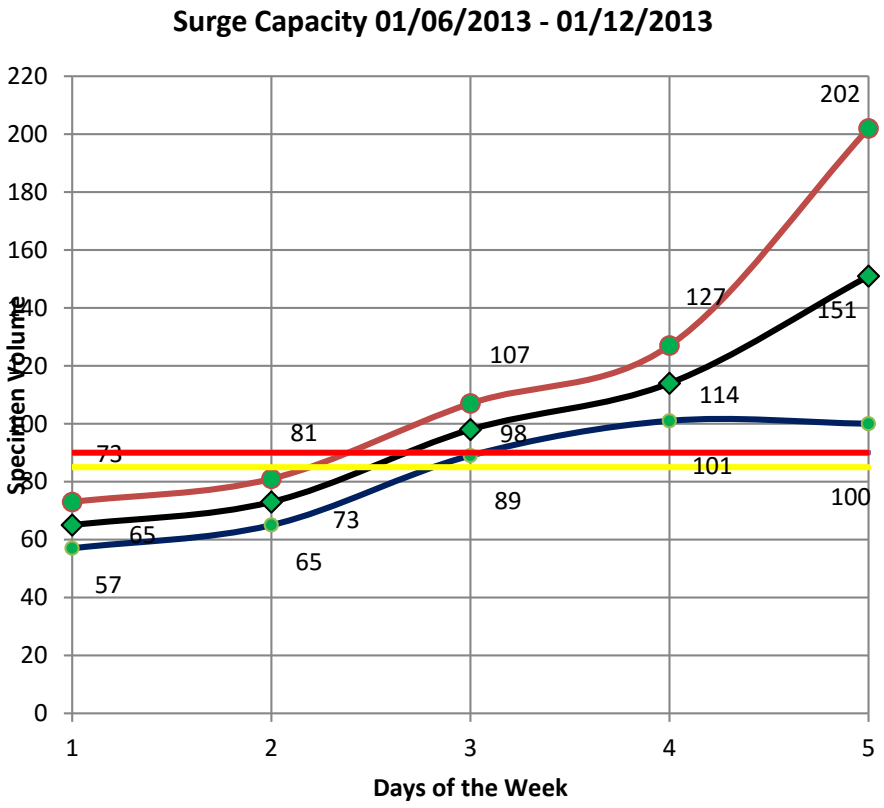
Year 1

- In Year 0 averaged .002 errors per specimen
- Year 1 had an average error percent of 8.47%

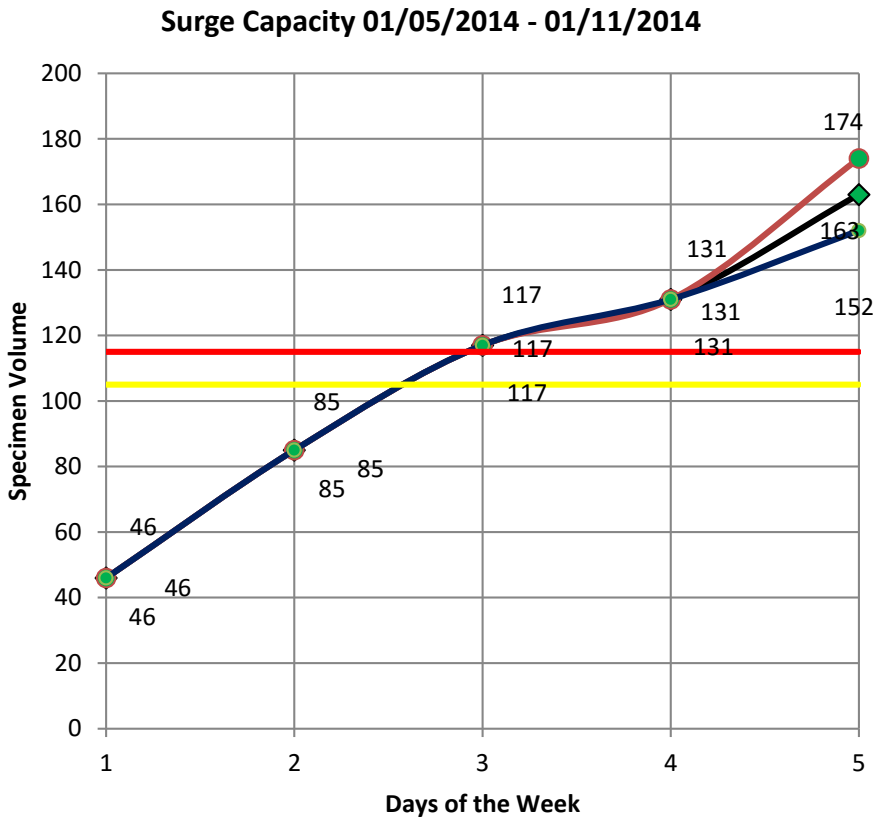
Significance of TAT Results	
Errors	P-Value < .001
Error per Specimen	$2.029X10^{-8}$
Average Error Percent	0.046

Surge Reports: Peak Volume

Year 0: Surge Report

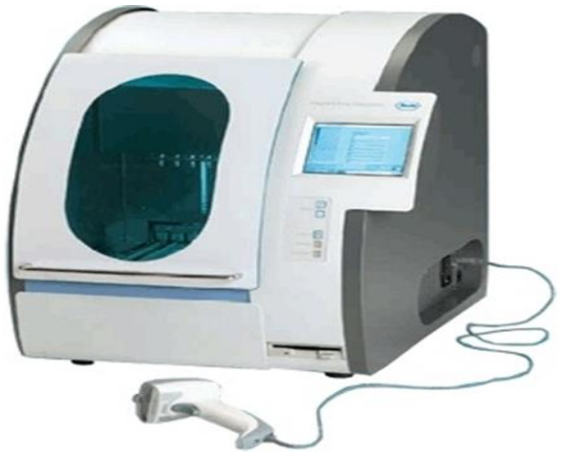


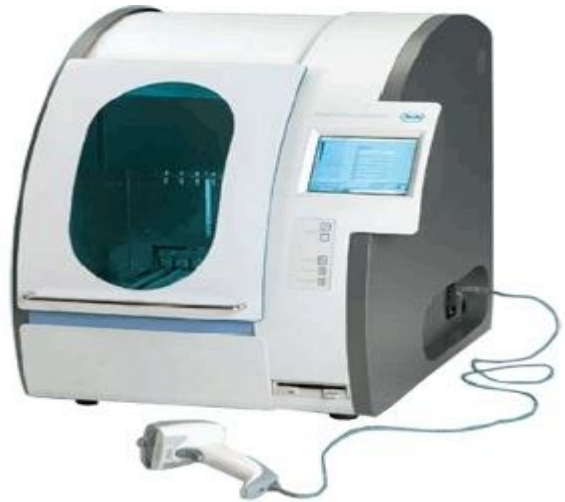
Year 1:Surge Report



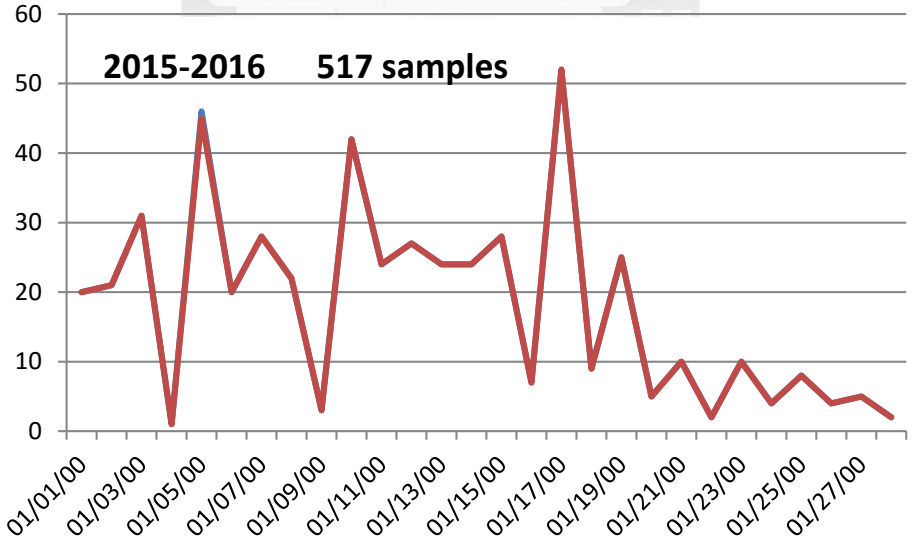
Extractions - 2015-2016

Roche Compact



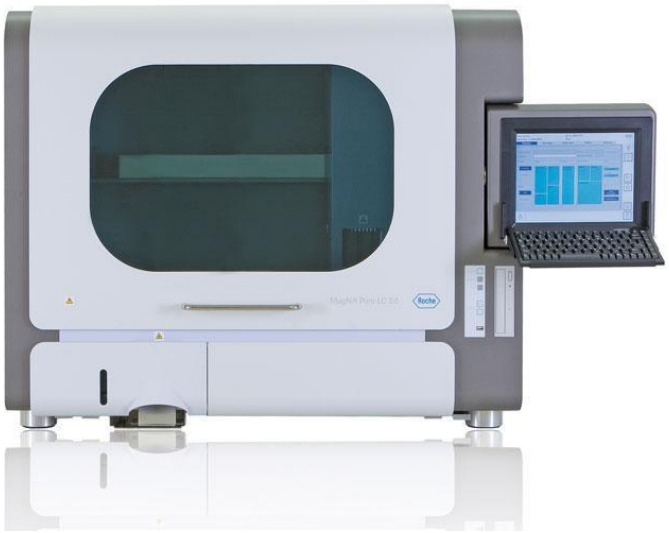


Roche LC 2.0



Replacing Old with New

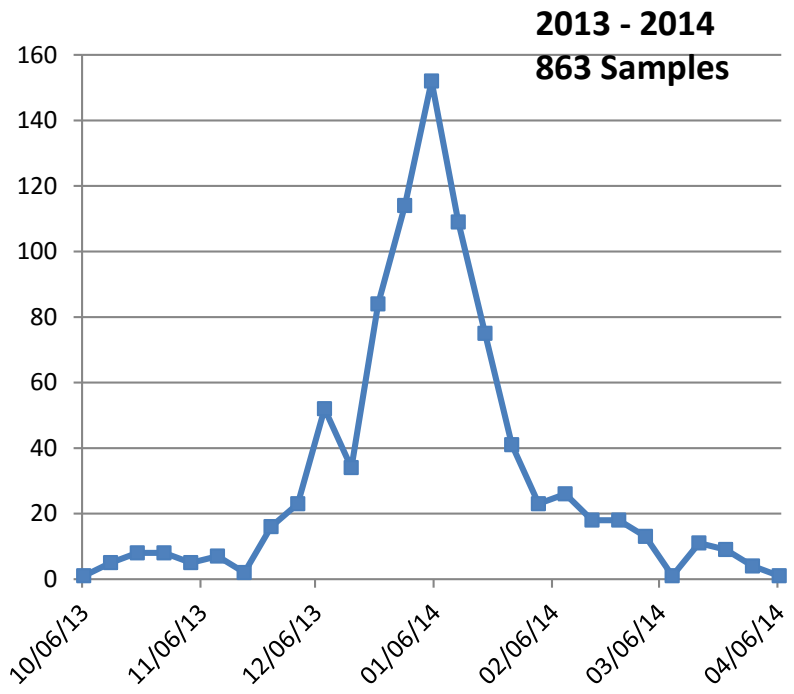
Roche LC 2.0



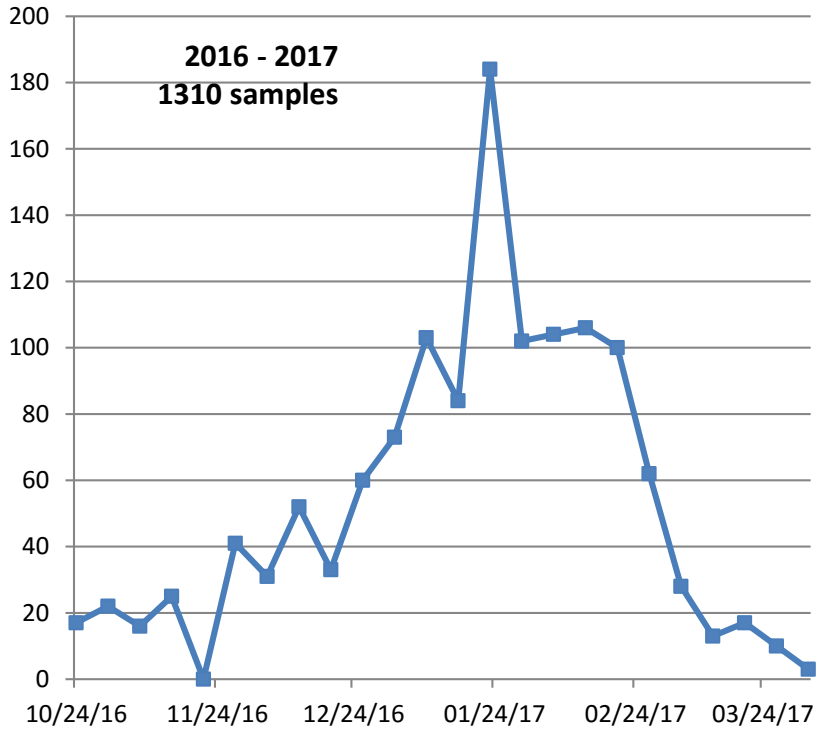
Roche LC 96

Last tested capacity in 2013-2014

152 sample week, 3 weeks 100+ numbers



184 sample week, 5 weeks straight 100+ samples, 6 weeks 100+ samples.



That is a 21% increase in weekly sample max

Influenza 2016-2017

Validating Equipment

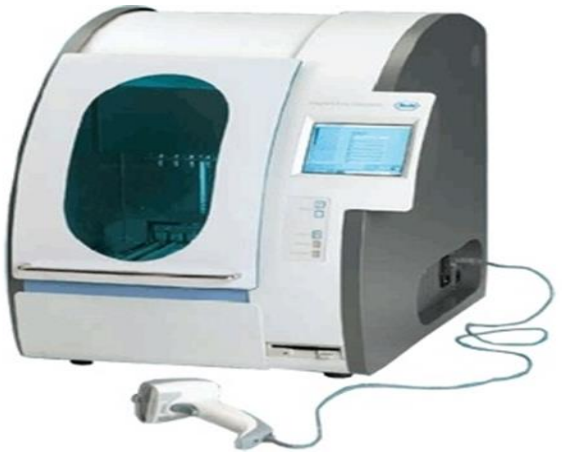
- Validate Roche MagNA Pure LC 96 on CDC's Influenza A & Influenza B subtyping panels
- 6 ABI 7500 Fast DX analyzers
- MagNA Pure Compact serves as a reference point for MagNA pure LC 96

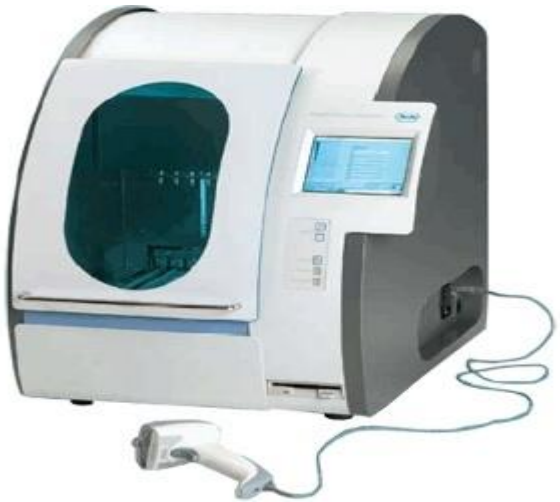
Maximizing Capacity

- Routine operations, FMEA, 5s implementation
- Pre-analytical Sorting
- Sample transfer to 96 well processing cartridge
- Single channel vs multichannel sample transfers
- Level loading PCR for 6 plates

Referring New to Old

Roche Compact





Roche LC 96

Validation Notes

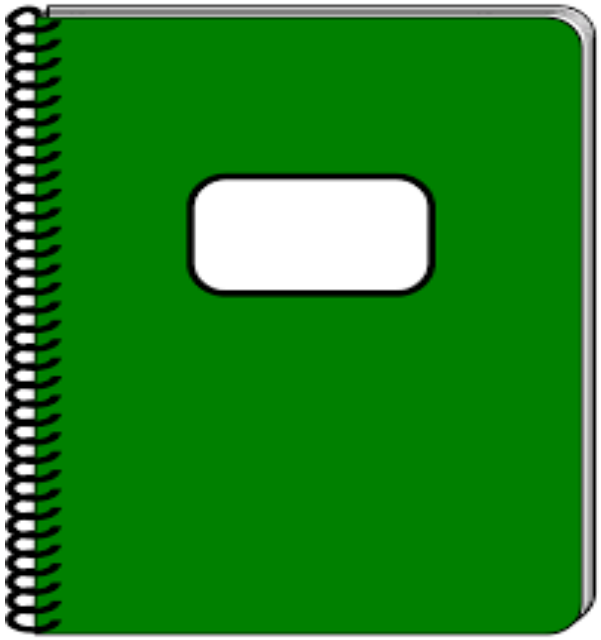
It was a good amount of work, required at least 3-4 personnel and lasted ~2-3 weeks.

20 samples of each type, with the exception of Bvic and Byam lineages.

Samples were from the local Dallas County population with a majority of submissions coming from a County and Pediatric Hospital.

Concentrations were determined from quantified control materials and serially diluted in VTM for necessary experiments

Information for validating Influenza A subtyping and Influenza B lineage panels can be located in CDC package insert



Accuracy

Samples were extracted simultaneously on both the compacts and LC 96.

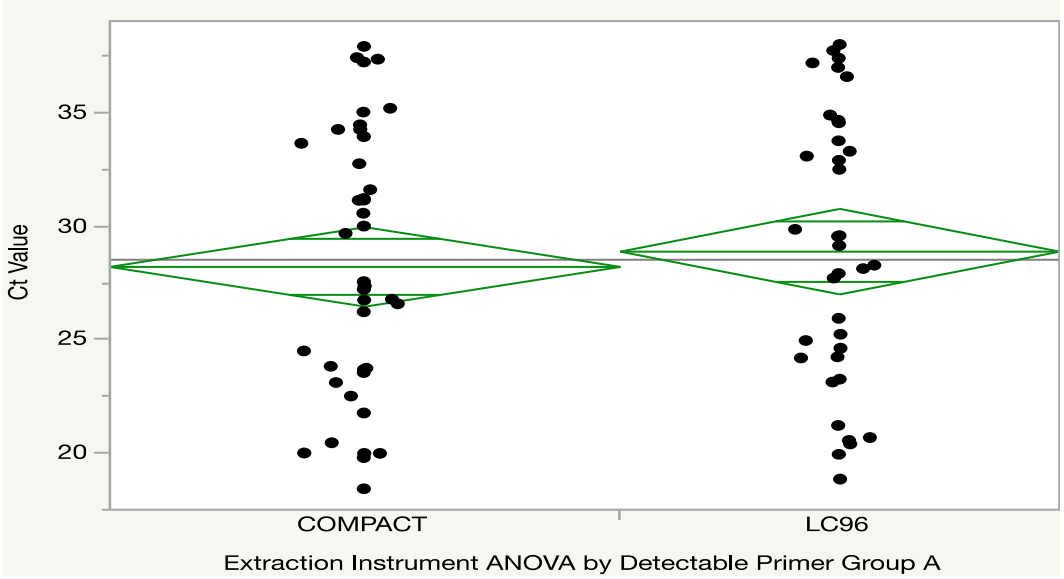
Samples were run across 6 platforms with both compacts and LC 96 samples

Run side by side

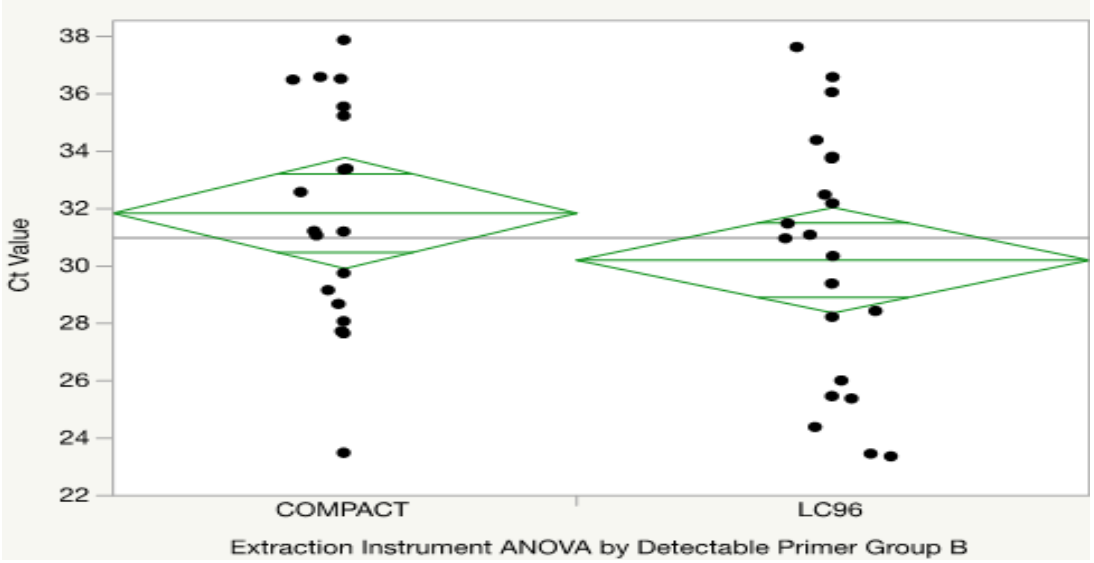
All primer sets were run, though Influenza A and RP created the most data points

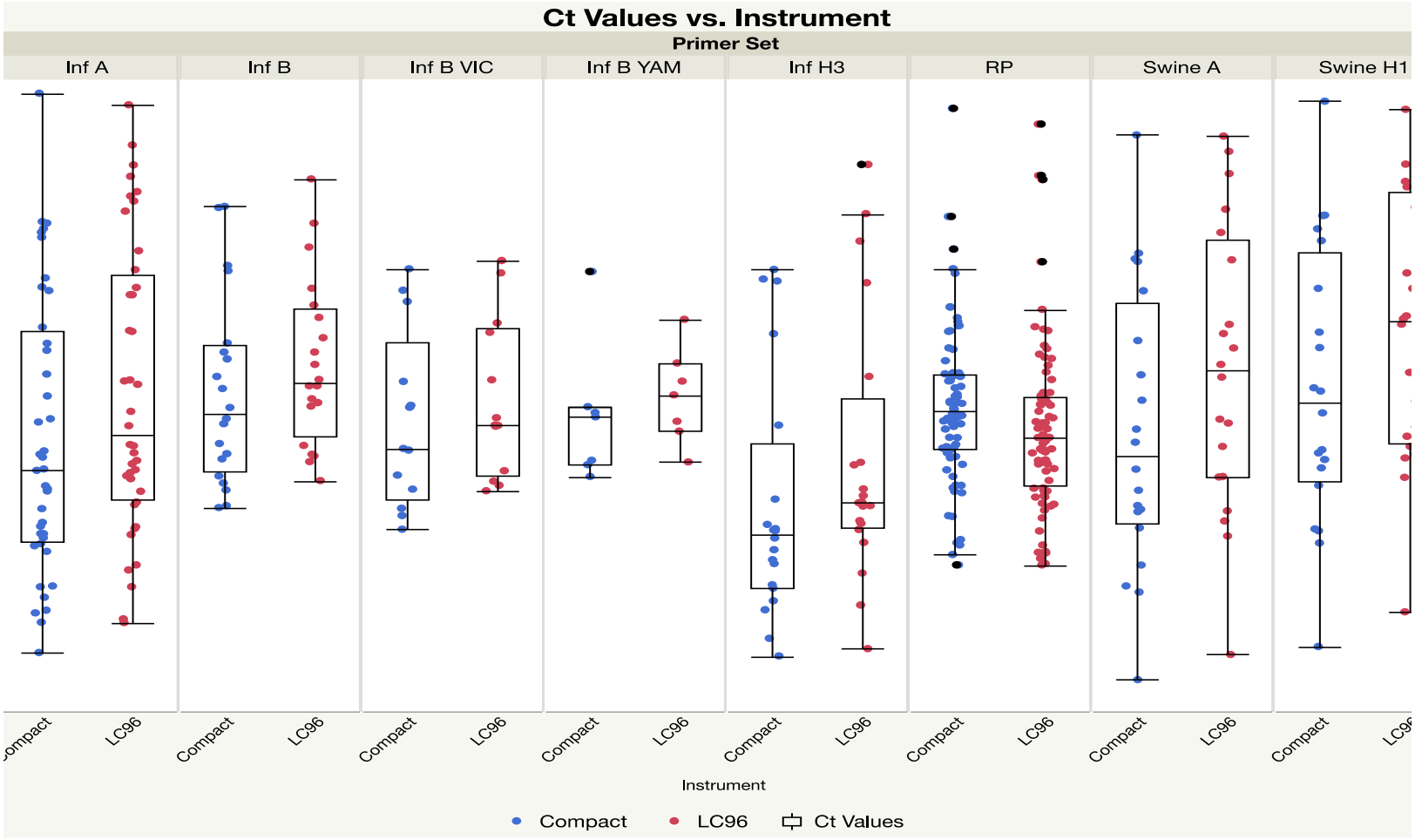
Mean values were determined along with standard error in a one way ANOVA analysis

Their proves no significant difference between compact and LC 96 CT values when p<.05



Primer Set	Compact		LC96			P
	Mean	SE	Mean	SE		
Group A	28.2066	0.87901	28.8783	0.9476		0.6048
Group B	31.8350	0.95261	30.195	0.90612		0.2199





Anova Analysis

Assigning statistical significance to the variance of two extraction methods

Precision

Known Conc. Of positive control was spiked into VTM, multiple points from runs were plotted together

Compact R2 for Group A = .942

LC 96 R2 for Group A = .885

Compact R2 for Group B = .696

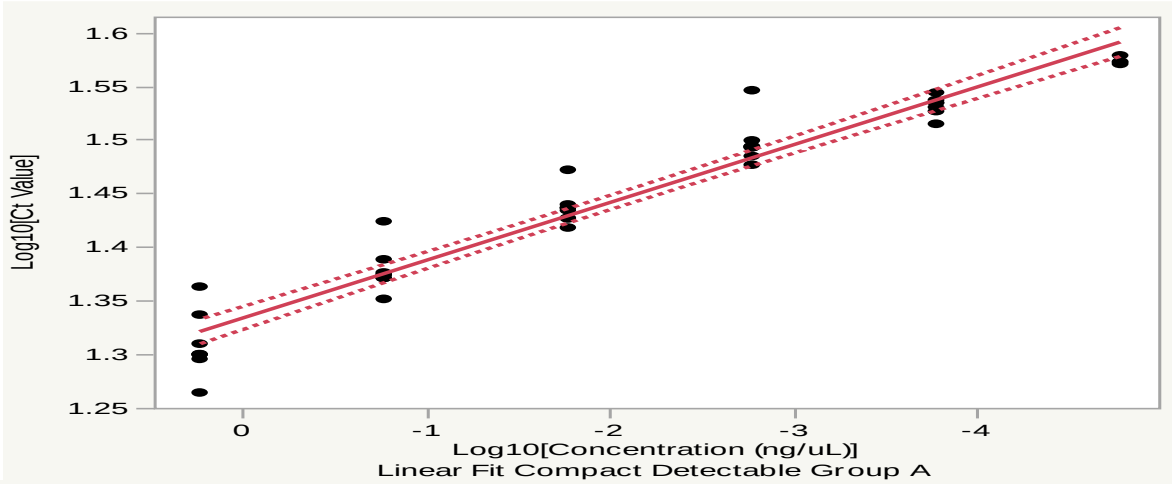
LC 96 R2 for Group B = .916

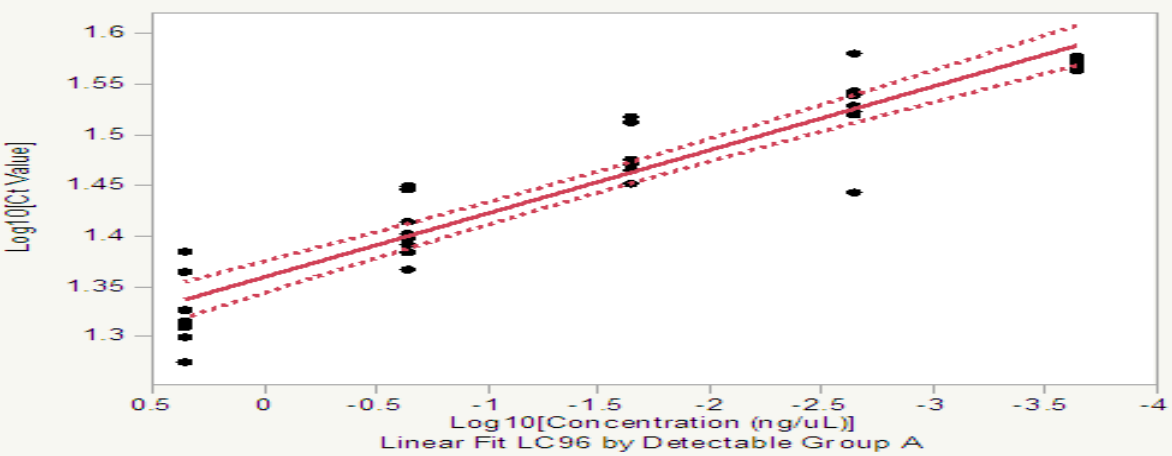
Coefficient of Variation LC 96 Group A: 5%

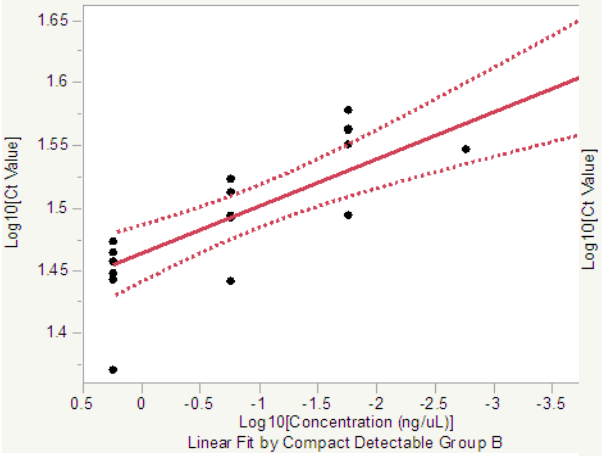
Coefficient of Variation Compact Group A: 3%

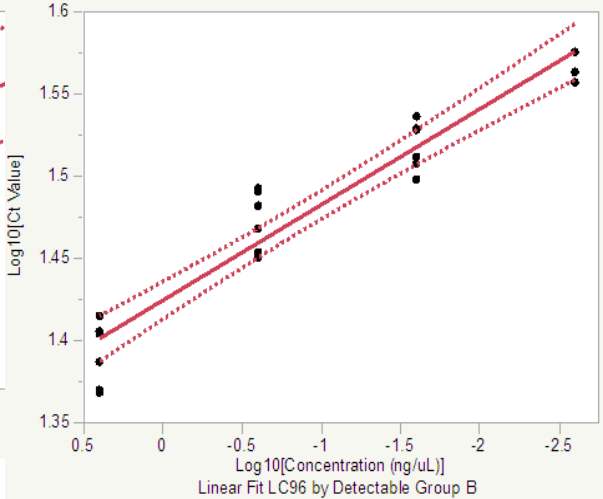
Coefficient of Variation LC 96 Group B: 8%

Coefficient of Variation Compact Group B: 11%









Reportable Range (linearity)

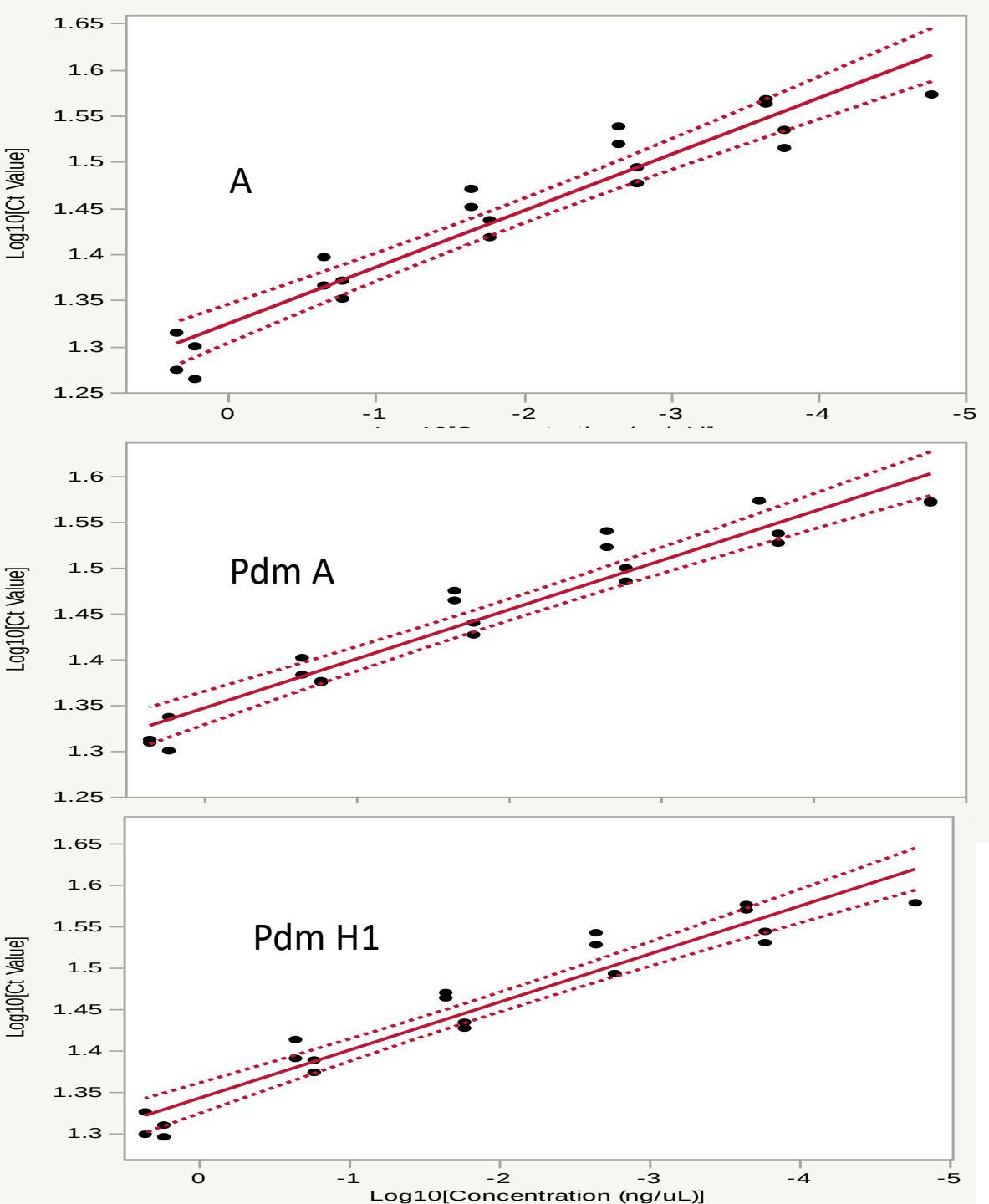
Known concentrations of positive control were spiked into VTM for 12 serial dilutions

Values below 38 CT were accepted

Linearity was observed across all primer sets

Linear regression models determined likely extinction values for beginning of the LOD

Our findings show H1N1 having the largest reportable range



Limit of Detection

Limit of detection estimates were determined through Reportable Range studies

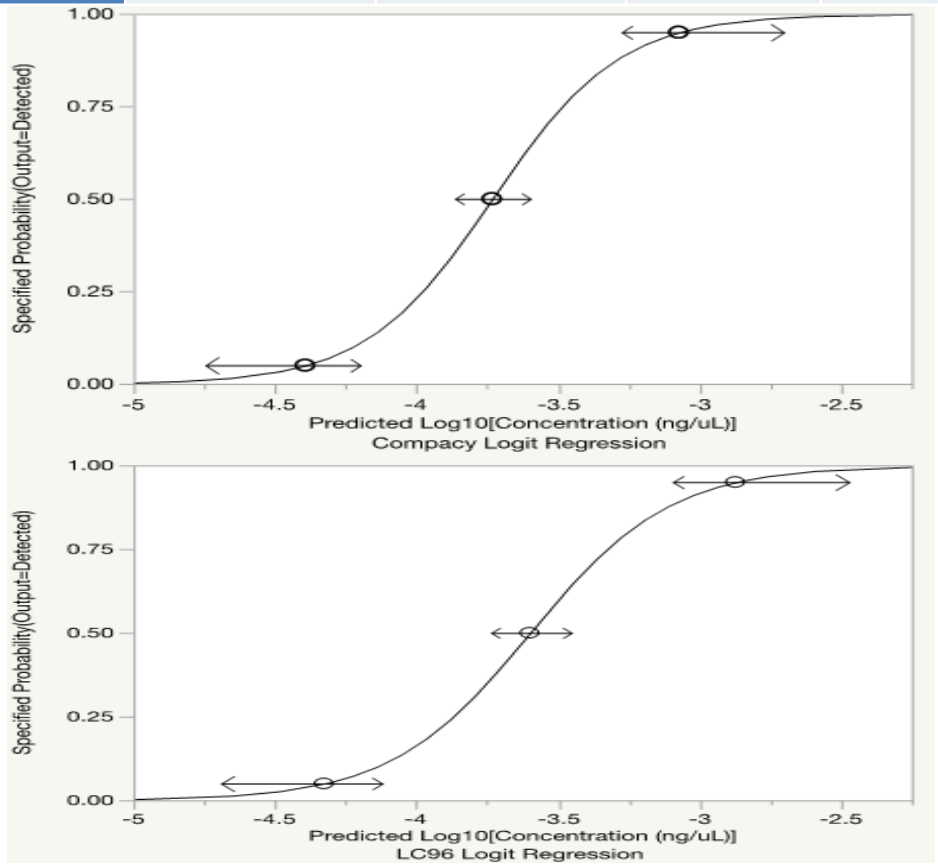
Four dilutions for each primer set were carried out from the upper limit of estimated detection and repeated

Dilution series proceeded in fractions of a log phase

Logit analysis determined the upper 95%, lower 5% and 50 % ranges.

Additionally each set of ranges above provided a overlapping ranges based on variability

COMPACT	Inverse Prediction			
	Probability of Detection	Predicted [ng/uL]	Lower 95%	Upper 95%
Logit	5%	4.034E-05	1.785E-05	6.313E-05
	50%	1.843E-04	1.362E-04	2.521E-04
	95%	8.419E-04	5.282E-04	1.980E-03



LC96	Inverse Prediction			
	Probability of Detection	Predicted [ng/uL]	Lower 95%	Upper 95%
Logit	5%	4.703E-05	2.028E-05	7.544E-05
	50%	2.507E-04	1.825E-04	3.522E-04
	95%	1.336E-03	8.014E-04	3.370E-03

Reference Interval/Specificity

- 40 Male / 40 Female
- 75 patients between 0-16 years of age
- 21 patients between 17-54 years of age
- 4 patients 55 years and older

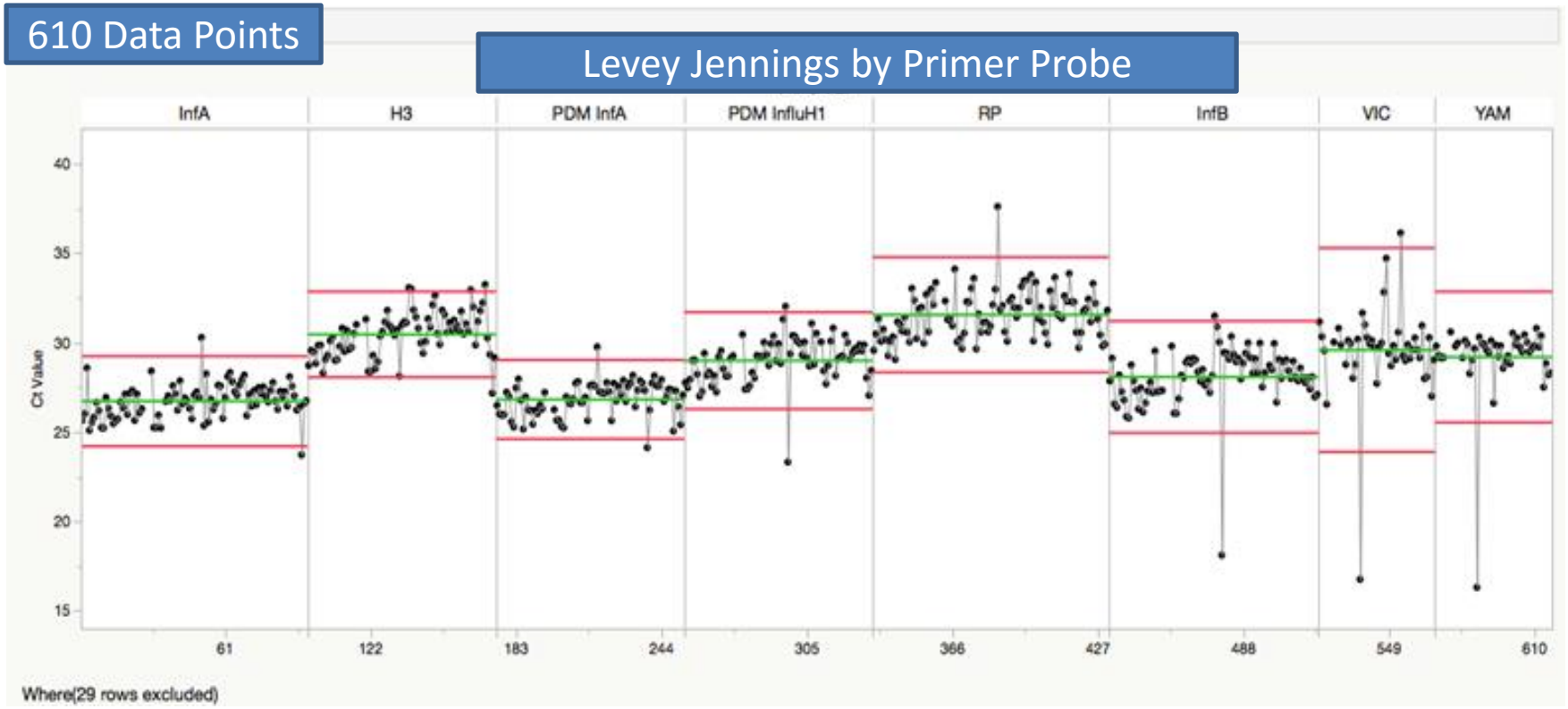
Specificity

- Determine cross-reactivity by running additional Respiratory virus
- CDC has a great example of inclusivity and exclusivity provided in the package insert.

Monitoring Assay Performance 2016-2017

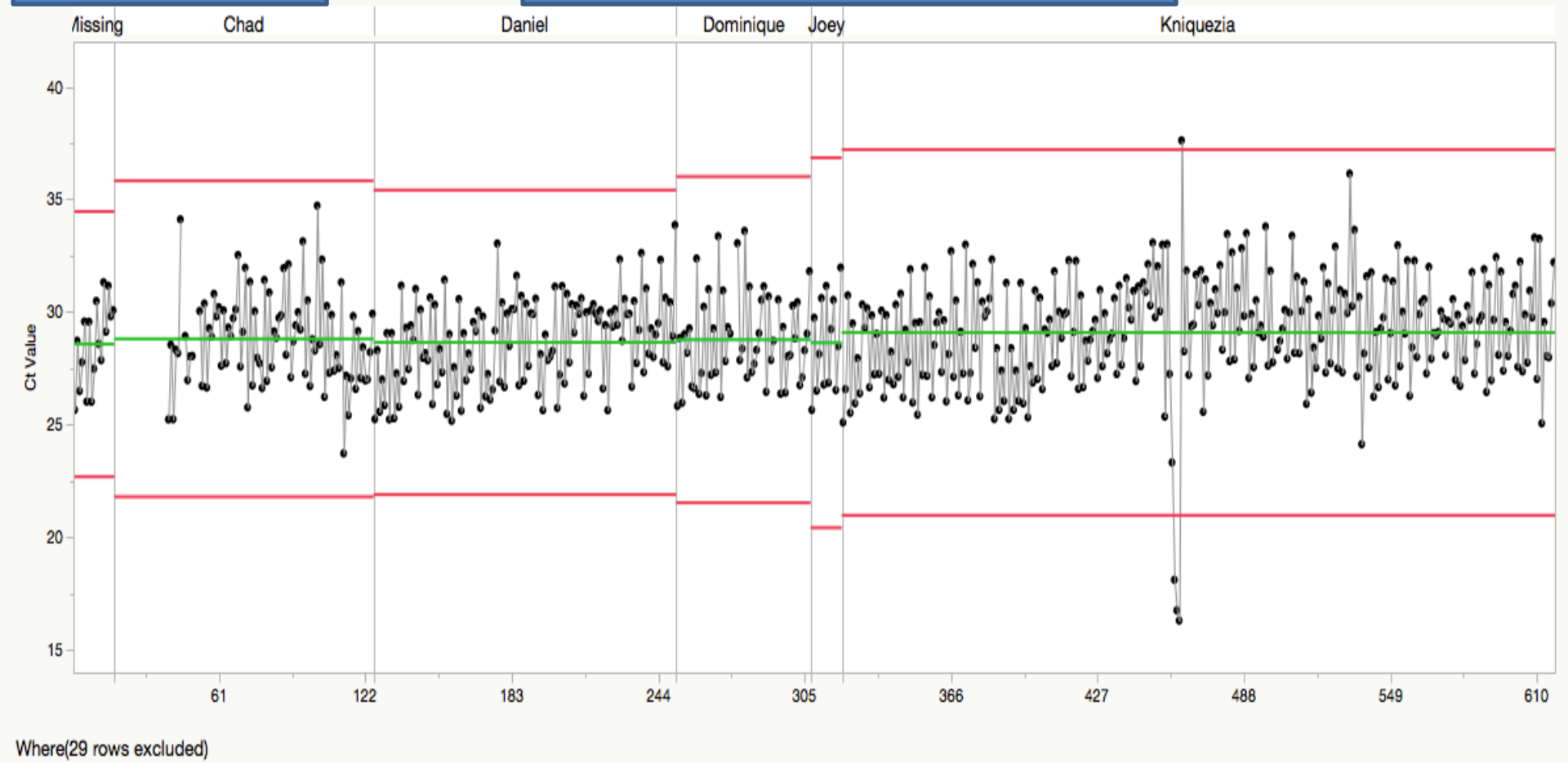
610 Data Points

Levey Jennings by Primer Probe



2016-2017

Levey Jennings by PCR technician



Three technicians, 1 supervisor and the General Laboratory Manager extract and run flu samples

During influenza season approximately 800 Zika samples were run on PCR and MAC-ELISA

Errors in the Levey Jennings charts were routinely investigated and Root Cause Analysis reports completed

Corrective actions from root cause analysis were discussed at weekly quality meetings

Tech to Tech Comparison

P values approaching .05 show a significant change in how one tech sets thresholds opposed to other techs

And / Or

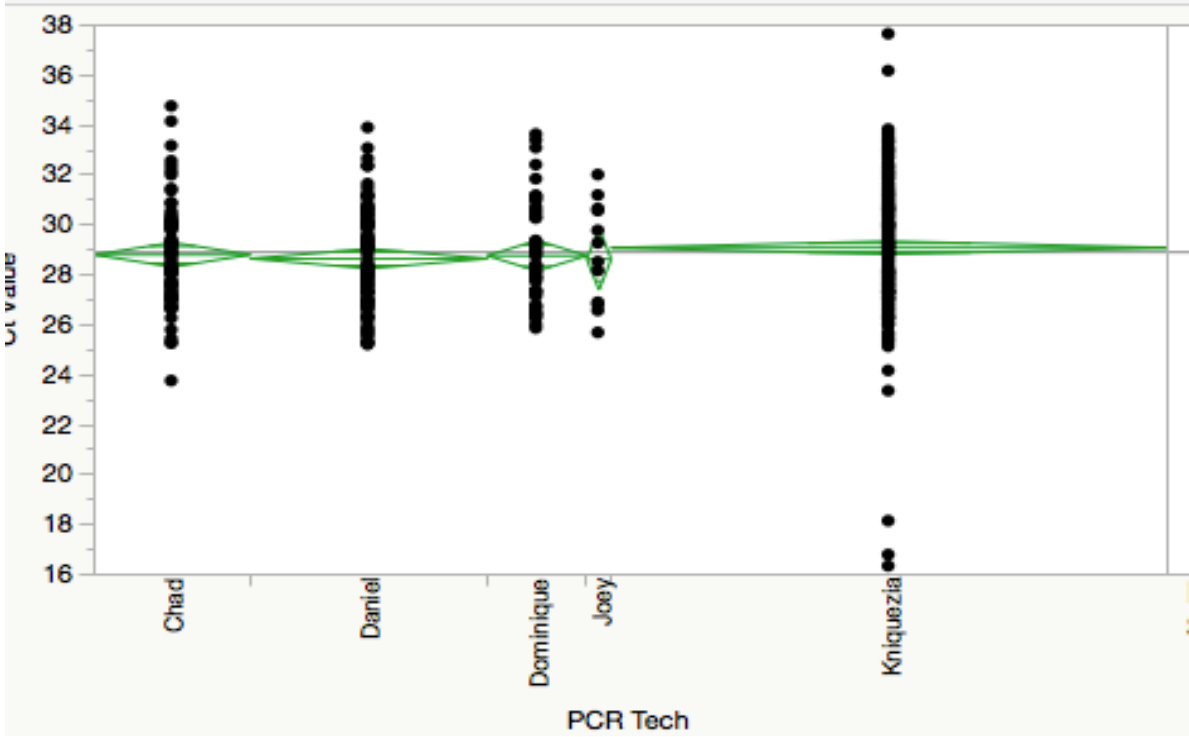
Detects errors in assay performance

Assessing technical and assay performance can be used in investigations leading to either;

the correction of errors regarding assay's pre-analytical, analytical and post analytical procedures

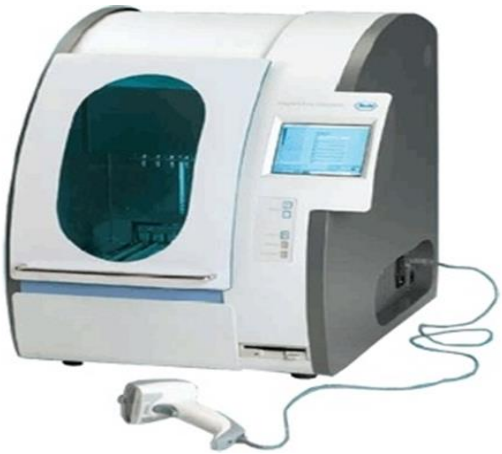
As well as,

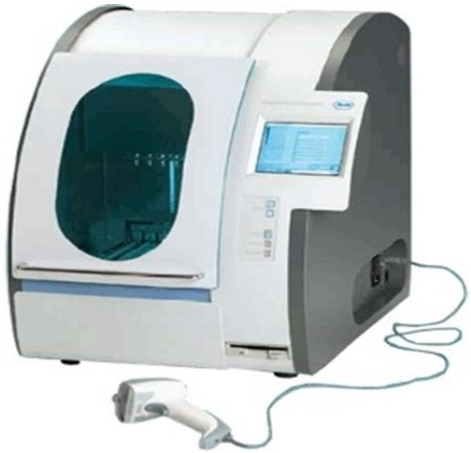
the training of personnel in appropriate quality assurance measures to improve the reliability of results



Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
Kniquezia	Joey	0.4569298	0.6416570	-0.80339	1.717249	0.4767
Kniquezia	Daniel	0.4357405	0.2408609	-0.03735	0.908831	0.0710
Kniquezia	Dominique	0.3183947	0.3377304	-0.34496	0.981753	0.3462
Kniquezia	Chad	0.2807526	0.2812392	-0.27165	0.833153	0.3186
Chad	Joey	0.1761772	0.6754079	-1.15043	1.502789	0.7943
Chad	Daniel	0.1549879	0.3201032	-0.47375	0.783723	0.6284
Dominique	Joey	0.1385351	0.7008153	-1.23798	1.515051	0.8434
Dominique	Daniel	0.1173458	0.3707187	-0.61081	0.845498	0.7517
Chad	Dominique	0.0376421	0.3981381	-0.74437	0.819651	0.9247
Daniel	Joey	0.0211893	0.6596167	-1.27441	1.316785	0.9744

2018 and Beyond





Thanks to:

The Technologists involved with running the Flu assay

The quality assurance team and their time and technical know-how