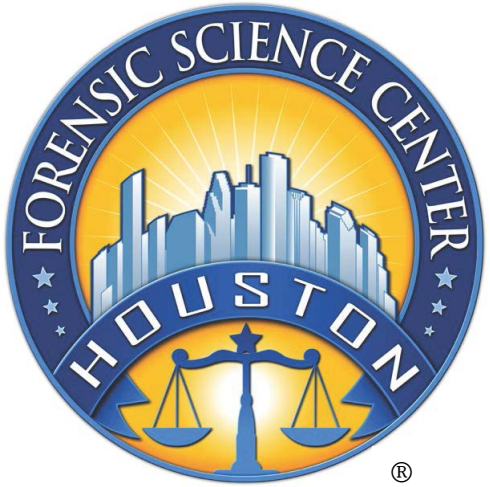
The Recovery of Houston

Peter Stout, Ph.D., F-ABFT



Objectives

Why HFSC?

What is HFSC?

How has it gone so far?

Tools that have been important?

The cost of wrong and the cost of late.

The New York Times ON THE WEB

March 11, 2003

Worst Crime Lab in the Country

Or is Houston Typical?

By ADAM LIPTAK

When Josiah Sutton went on trial for rape in 1999, prosecutors in Houston had little to build a ca was the only eyewitness, and her recollection was faulty. But they did have the rapist's DNA, the Houston police crime laboratory told the jury that it was a solid match.

That was enough to persuade the jurors to convict Mr. Sutton and send him to prison for 25 years.

But new testing has conclusively demonstrated that the DNA was not Mr. Sutton's, the Houston Polic yesterday.

What is HFSC

- *2012 --* formed a Local Government Corporation
  - A corporation "to aid and act on behalf of one or more local governments to accomplish any governmental purpose of those local governments." Tex. Transportation Code §431.101(a).

What is HFSC

- Corporate structure
  - 9 member board of directors
  - Corporate officers
  - Forensic functions from HPD
  - Justice Agency
  - 501(c)(3)
- ***April 2014*** – Took management responsibility

Would a City-County Merger Jeopardize Progress at Houston's New and Improved Crime Lab?

BY MEAGAN FLYNN

THURSDAY, APRIL 7, 2016 AT 9 A.M.

"…the lab is focusing too much on quality control and in turn is just slowing things down, creating more backlog that prevents police from solving crimes."

-- SPO Ray Hunt, President HPOU

HPD Wants Its Crime Scene Unit Back. Crime Lab's Civilian Leadership Says No.

BY **MEAGAN FLYNN**

MONDAY, AUGUST 22, 2016 AT 6 A.M.

"In the past, we had a problem with rape kits; we had a problem with processing of evidence — but we didn't have any problem with CSU,"

Chron Sections

Crime-scene errors put 65 cases under review, audit finds

DNA swabs, fingerprints, bloody footprints left behind

By Brian Rogers, Cindy George, Keri Blakinger, and St. John Barned-Smith

Updated 8:07 pm, Wednesday, April 12, 2017

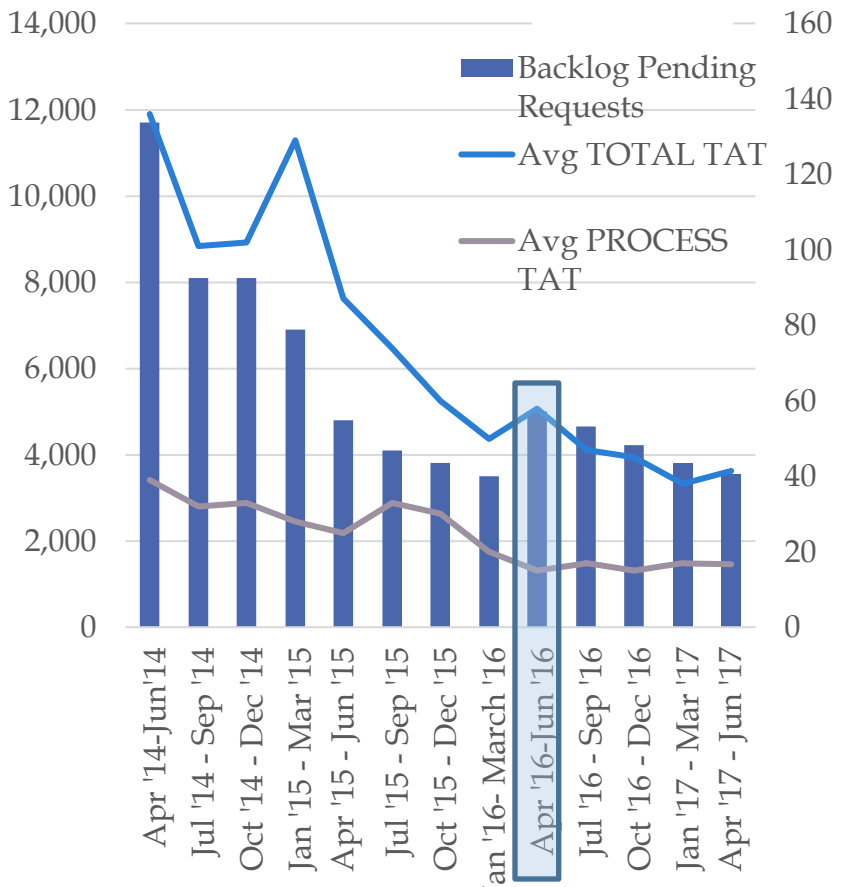
"I'm tired of every time they have a problem, they want to put the blame on a police officer," Hunt said Wednesday. "So let's let it lie where it belongs –on the management of the Houston Forensic Science Center."

What is so great about "independent" ?

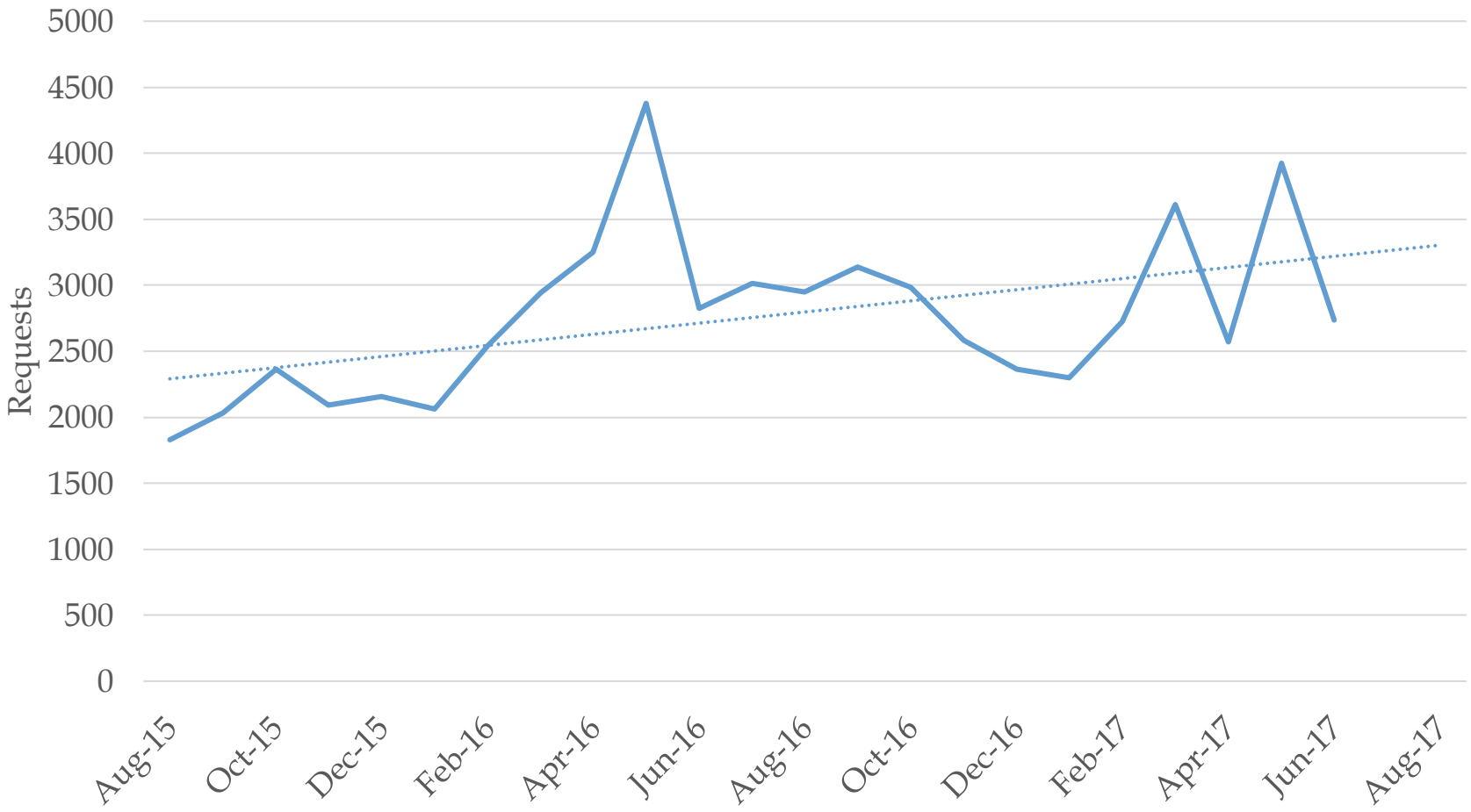
- Control of procurement
- Control of HR
- Control of quality systems
- Control of message
- Control of being transparent
- ***Parity***

From the start of HFSC

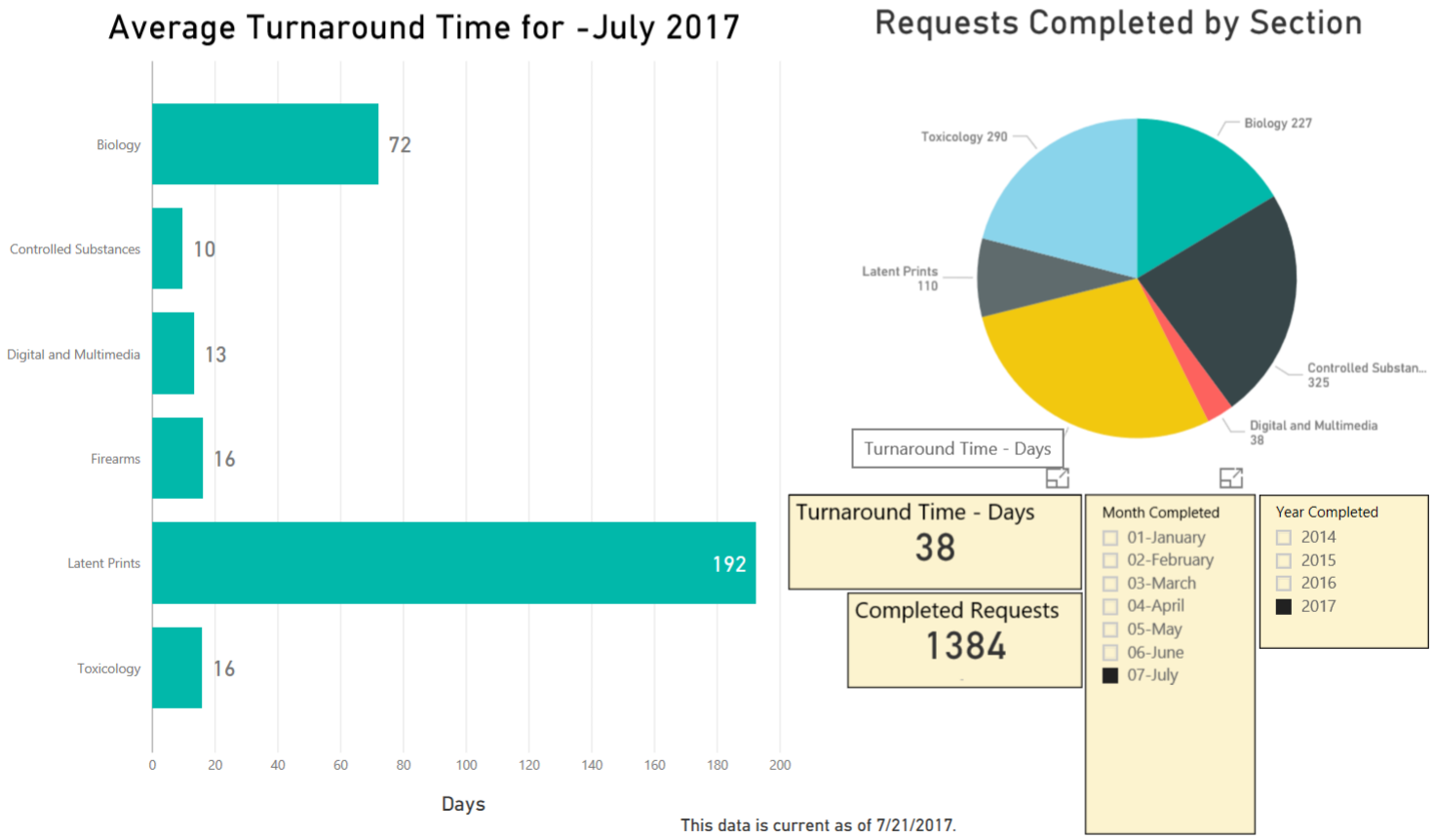
- 69% in backlogged requests
- 69% in Avg TOTAL turnaround time
- 57% in Avg PROCESS turnaround time



Requests received



HFSC at a glance:

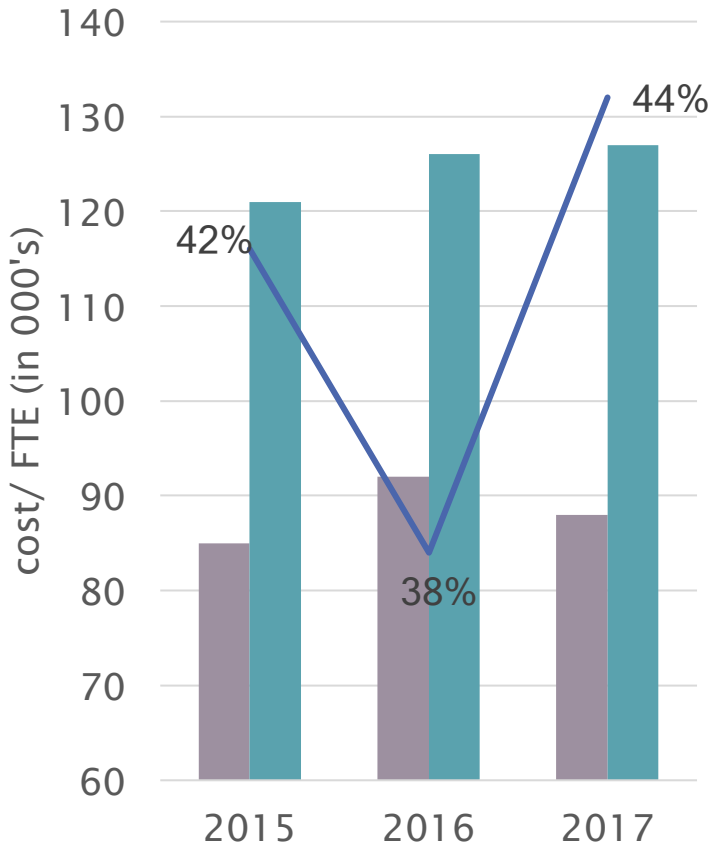


July 21, 2017: Backlogs >30 days

Latents: 2,683 | Biology: 693

Changes in the labor pool

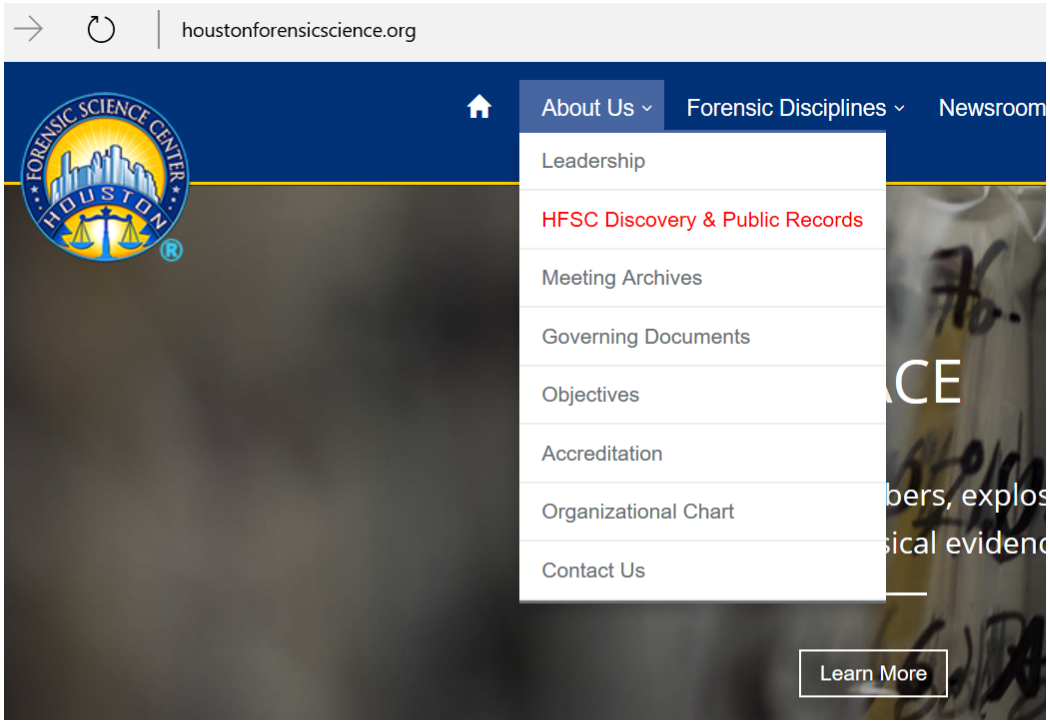
- HFSC more than 40% less per FTE
- In April of 2014
  - 5 HFSC employees & 131COH
- In June of 2017
  - 161 HFSC
  - 35 COH
- Direct wage for HFSC 10% higher than COH



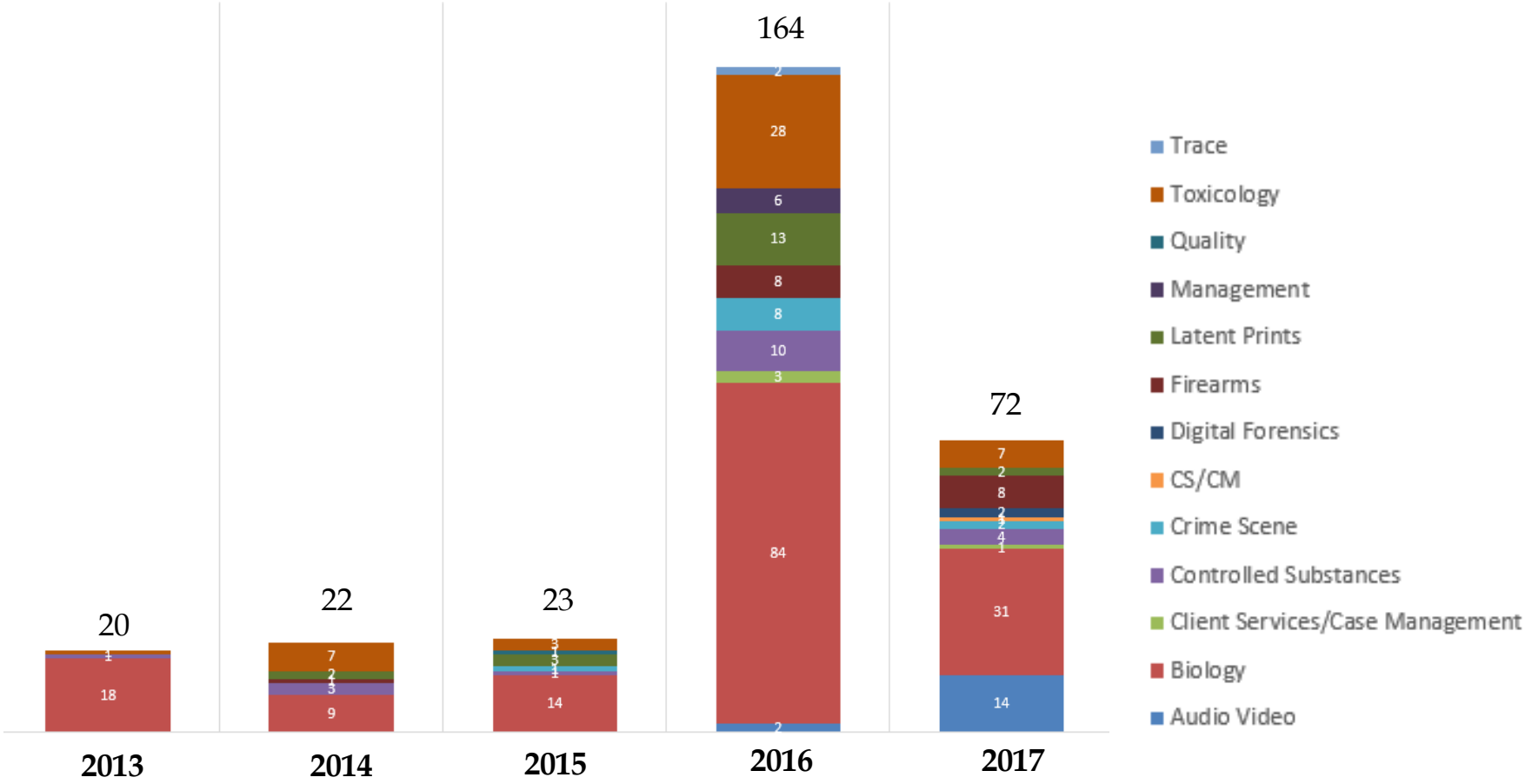
Information transparency

eDiscovery

- "Radical transparency"
  - Increased reporting
  - Increased access
  - Approximately 4,000 documents all public



Quality Tracking Events



Blind Quality Control

Blind Chocolate Chip Cookie Project

Method & Materials

- Four staff members each baked their favorite chocolate chip cookie recipe
- The cookies, labeled “A”, “B”, “C”, and “D”, were divided into three test groups
- Each cookie was baked with the same brand of chocolate morsels
- Each test group was the same size – 14 people

Group 1

Control Group

- Participants did not know any information about the cookies

Group 2

Obvious Bias

- Participants were asked to look at the brand of chocolate chip morsel
- A =
- B =
- C =
- D =

Group 3

Obvious Bias

- Each cookie was packaged with a different color ribbon
- A = White
- B = Yellow
- C = Hot Pink
- D = Royal Blue

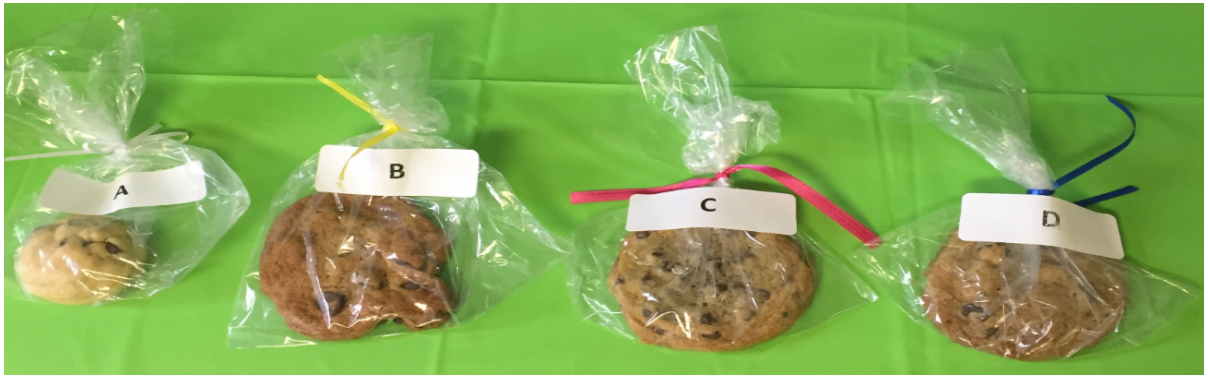
Does chocolate chip morsel brand or color of packaging influence taste test?

Blind Chocolate Chip Cookie Project

Results and Conclusions

Which cookie was your favorite?

- Biased groups (2 and 3) did not vary from control group 1
- When intentional bias was introduced to Group 2 some analysts preferred to participate in the test first and then view brands so that their opinion would not be biased



Chocolate chip morsel brand and color of ribbon packaging did not influence the results for overall best cookie

Program Feedback

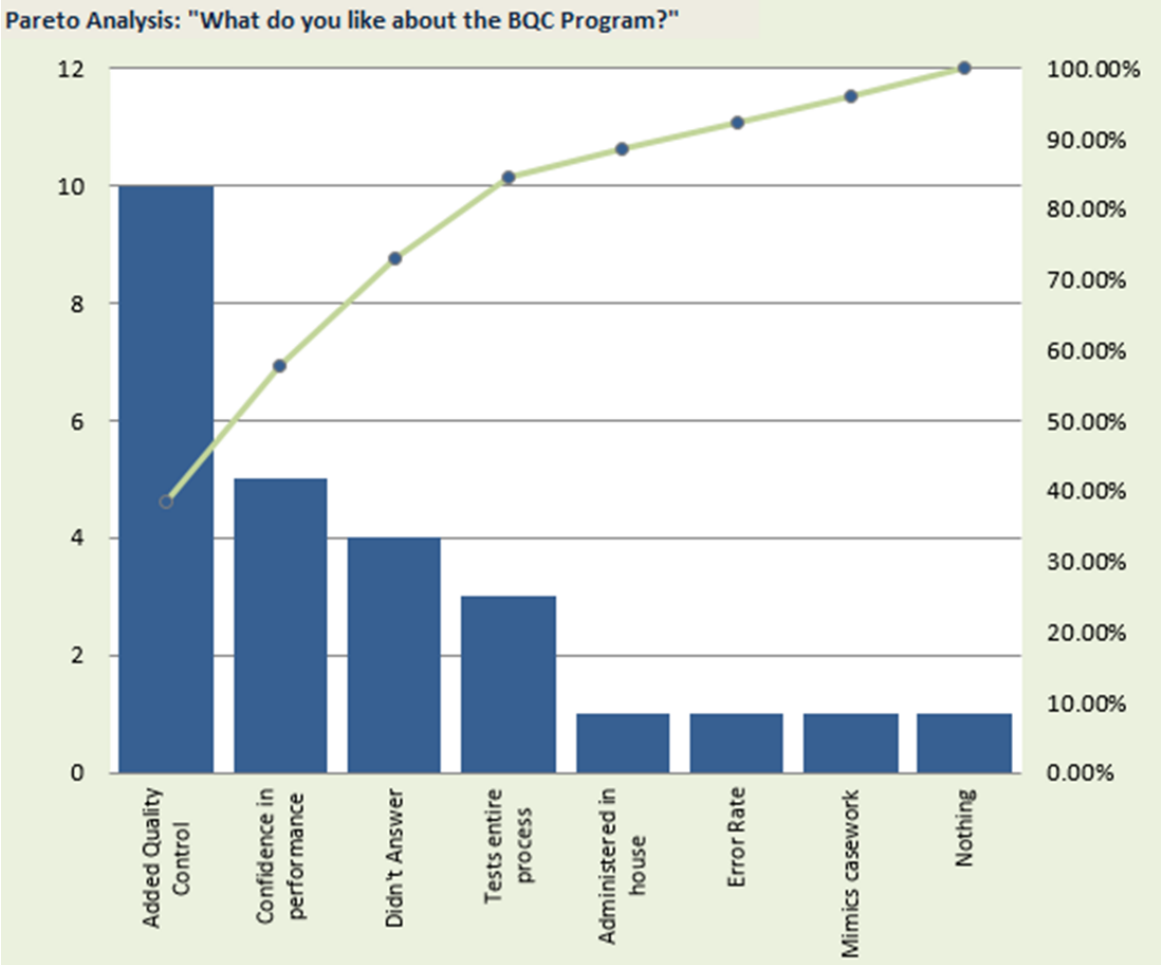
Anonymous survey

- 26 Participants

Sent to cookie project participants

Responses

- Added Quality Control
- Confidence in Performance



HFSC's Program

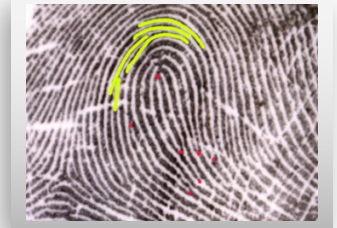
Blind Testing

- Materials Purchased
- Tests made in-house
- Mimic actual casework
- Analysts do not know whether they are analyzing a real case or participating in blind test
- Evaluates entire Quality Management System
- Issued by Quality Division

Blind Verification

- Independent second review
- Case conclusions from 1st examiner masked
- 1st and 2nd examiner record conclusions
- Conclusions evaluated for consistency
- Issued by Section

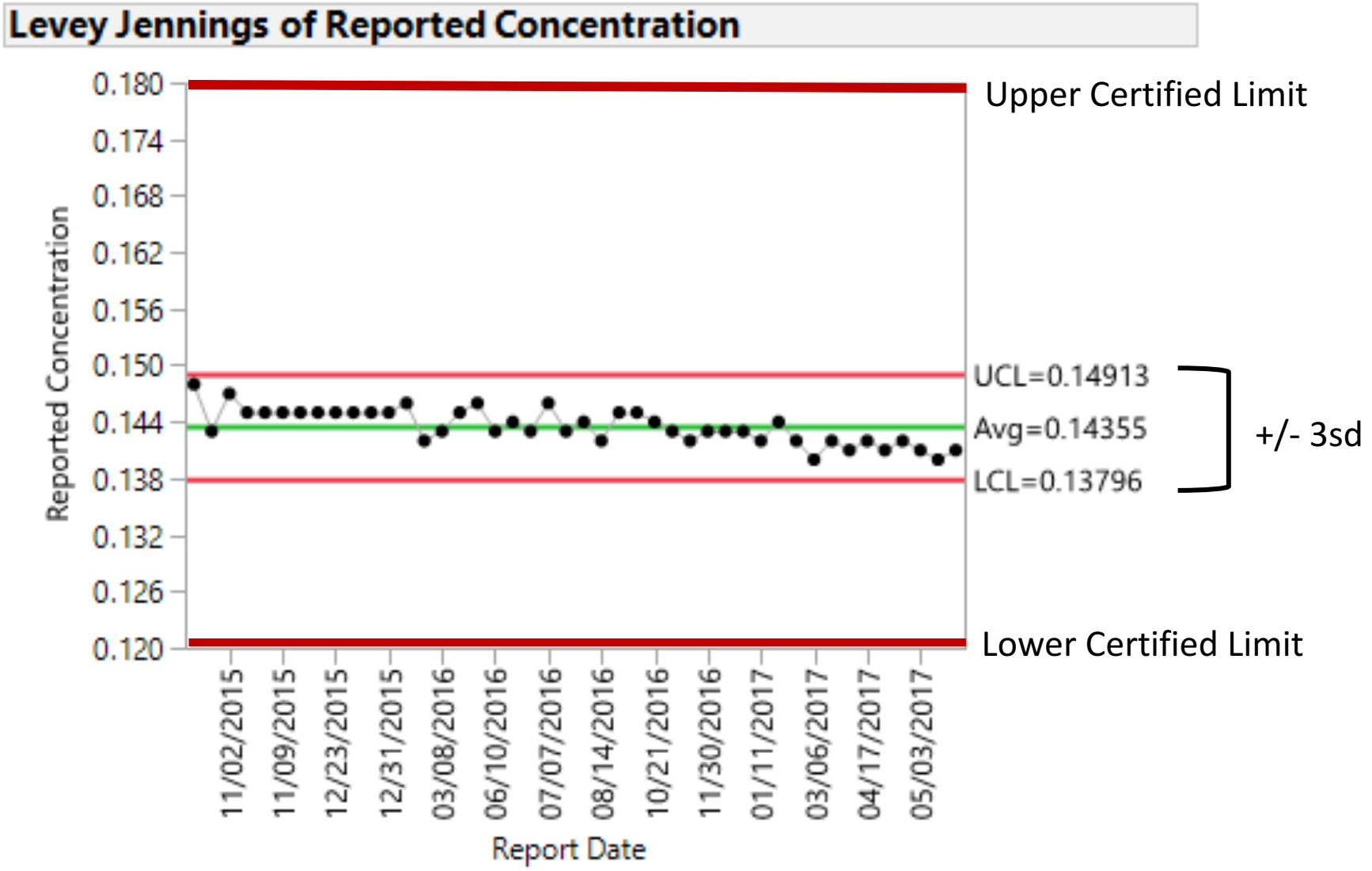
Forensic Disciplines

Toxicology	Controlled Substances	Firearms	Biology	Latent Prints
				

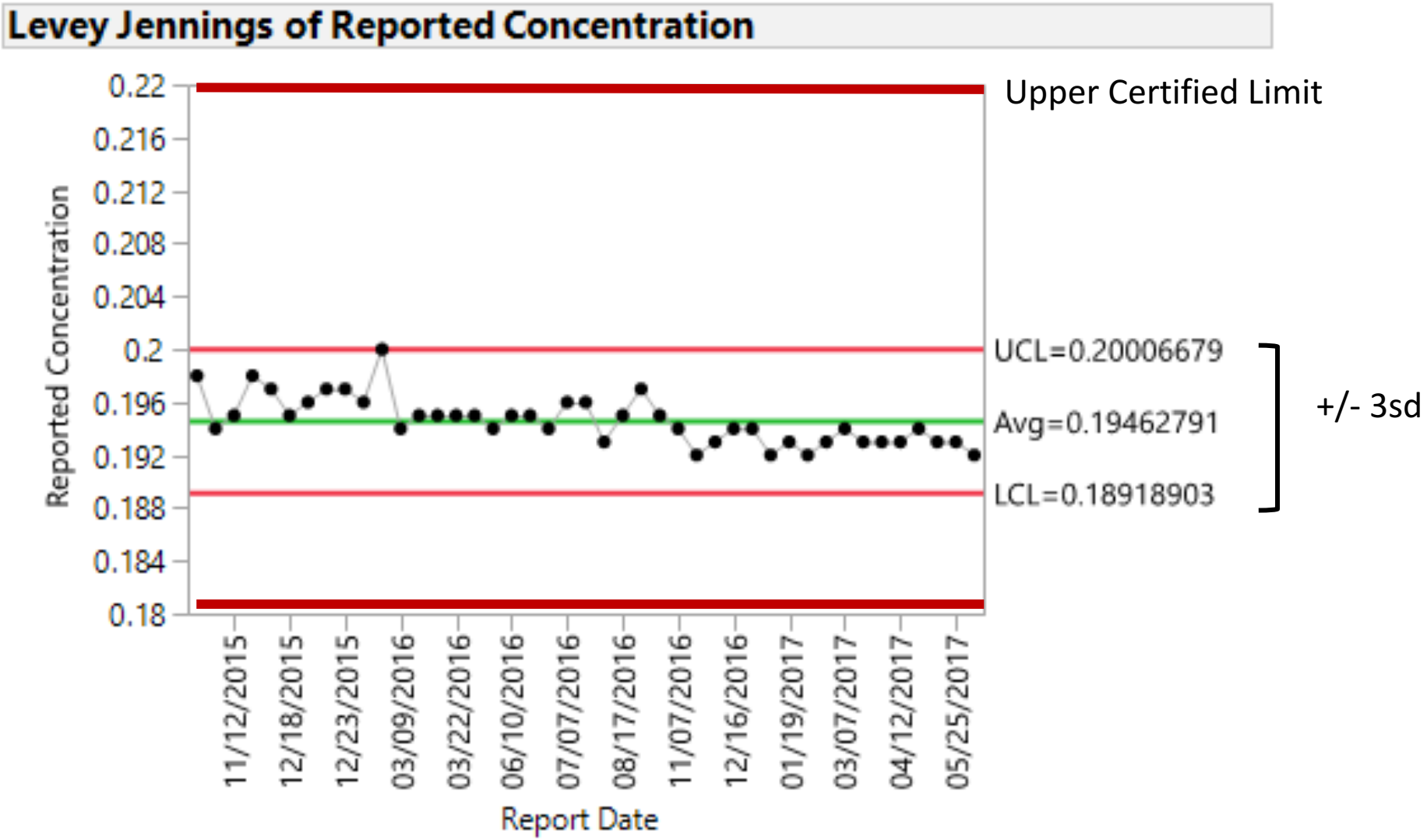
Toxicology

Blind Quality Control
Error rate determination

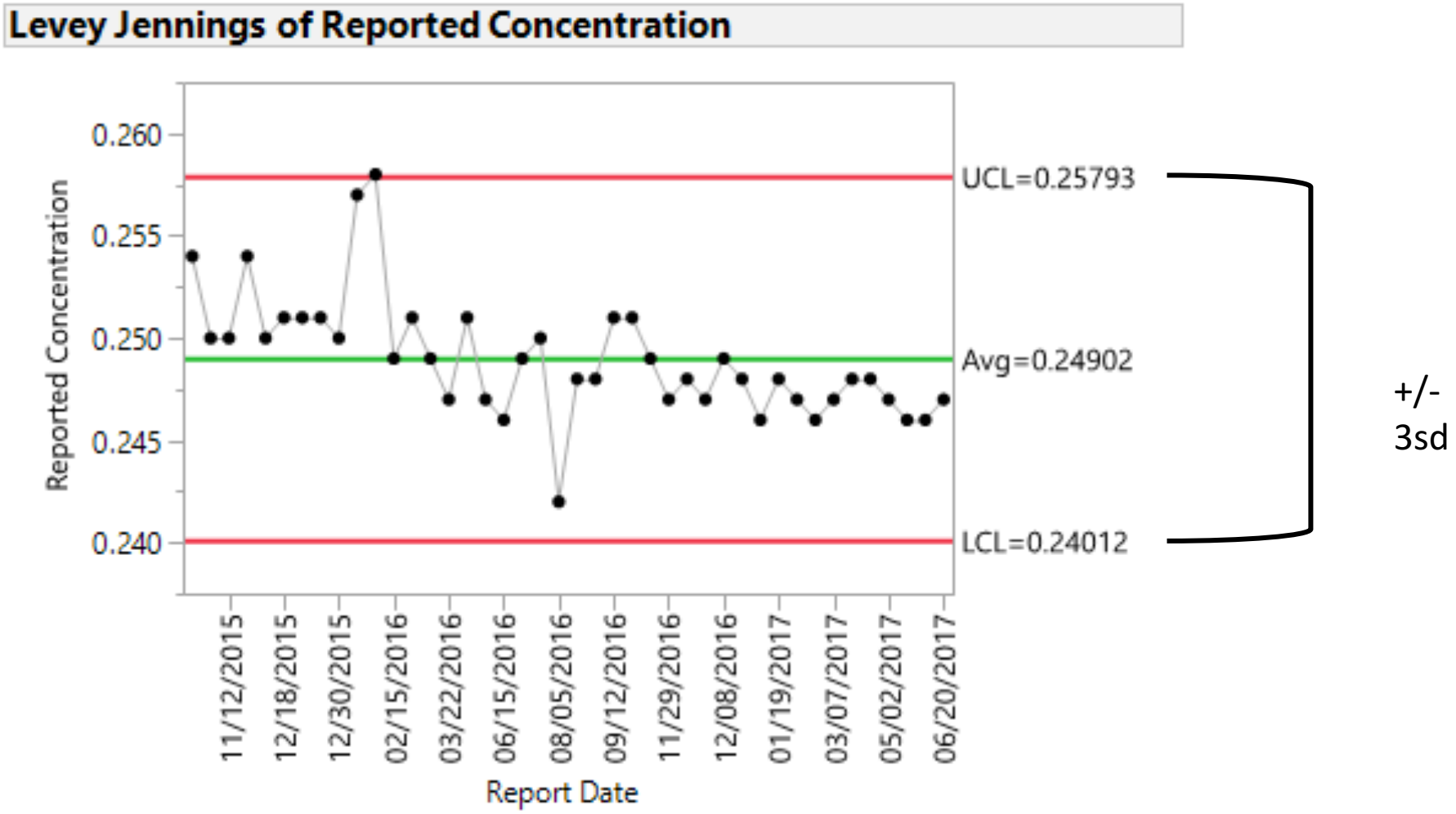
Toxicology blinds – 0.15 g/100mL



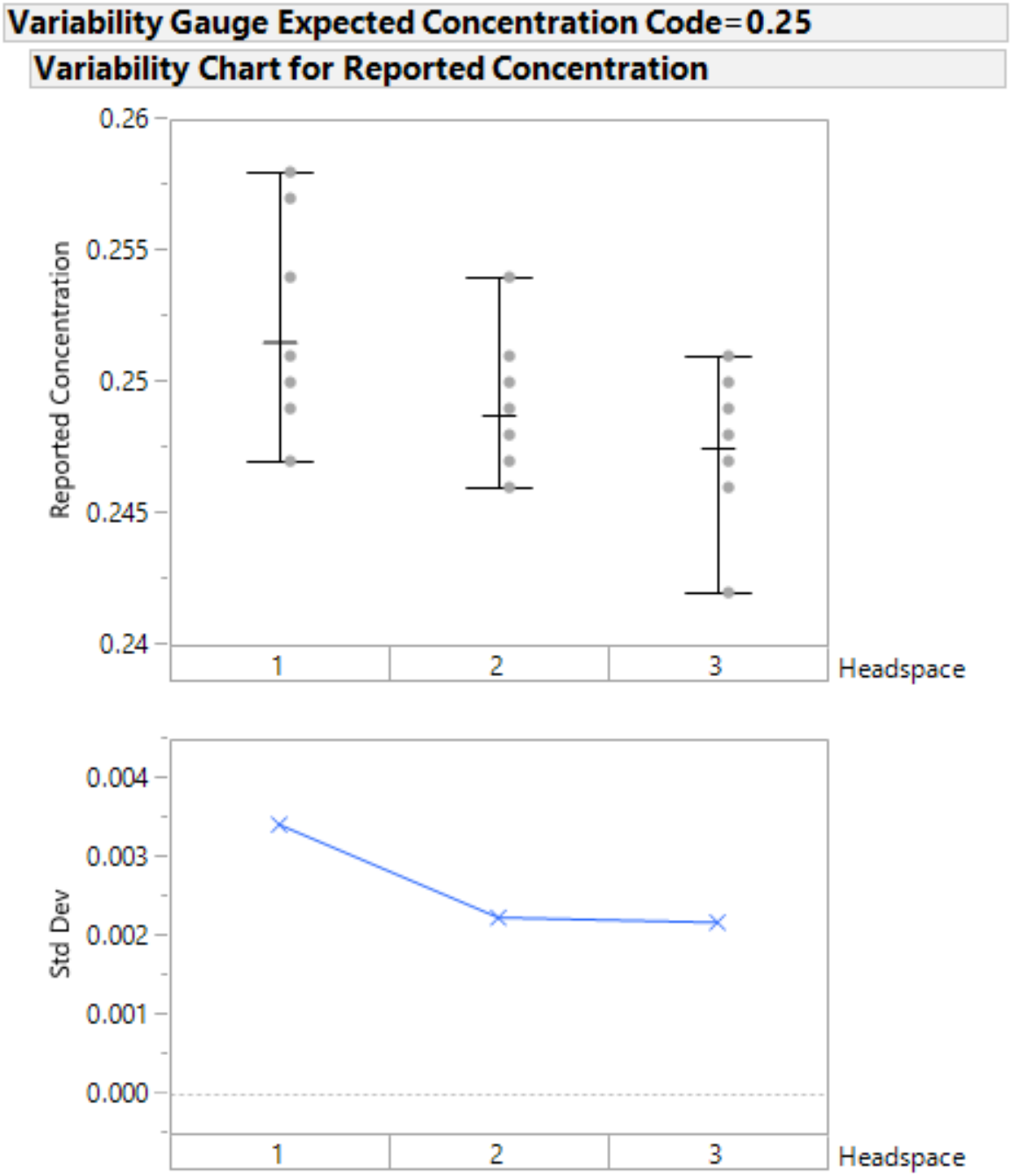
Toxicology blinds – 0.20 g/100mL



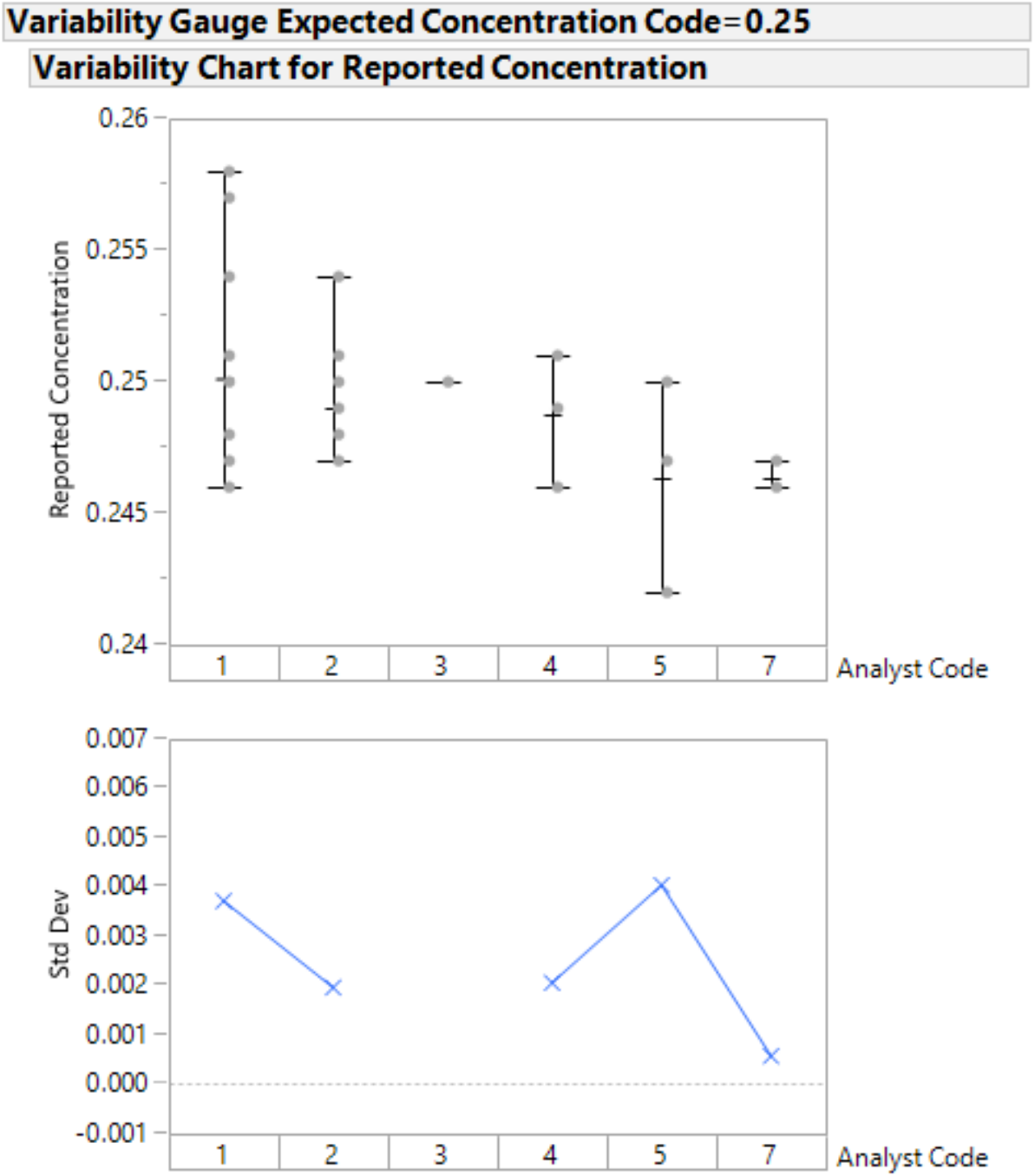
Toxicology blinds – 0.25 g/100mL



Instrument contribution



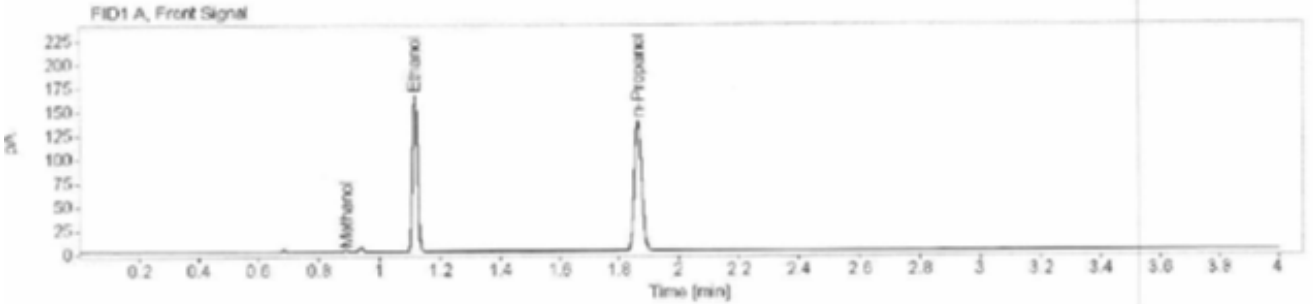
Analyst contribution

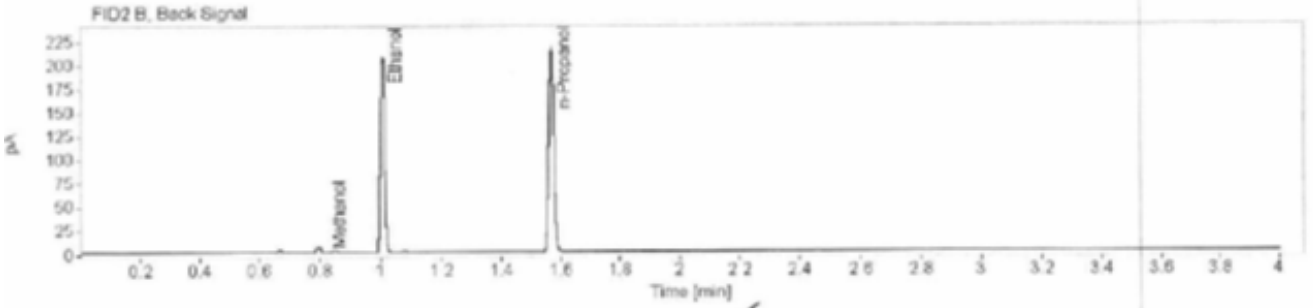


Methanol in Samples

Houston Forensic Science Center, Inc.
Forensic Analysis Division
Toxicology - Volatile Analysis Chromatograms

Sample name: 2017-00977 6.1 Description: Alq 2 Vial Number: 63
Instrument: Headspace 3 Acq. method: VOLATILES.M Injection date: 1/23/2017 8:53:52 PM
Data file: C:\Chem32\1\Data\ALC_20170123_AAJ_HS3\ALC_20170123_AAJ_HS3 2017-01-23 15-22-42\F-063-63-2017-00977 6.1.D





Name FID1A ✓ ✓ ✓

Compound	Peak Symmetry	Peak to Valley Ratio	RT [min]	Expected RT[min]	Area	Concentration [g/100 mL]
Methanol	1.23236	10.1148039253826	0.892	0.891	1.8018	0.0007
Ethanol	0.88666		1.117	1.117	191.8072	0.1202
n-Propanol	0.85319		1.865	1.864	244.9489	0.0100

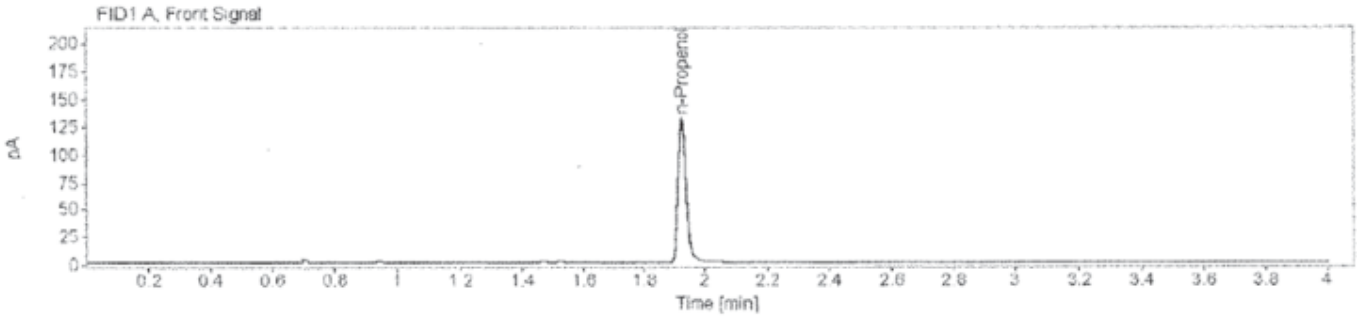
Name FID2B ✓ ✓

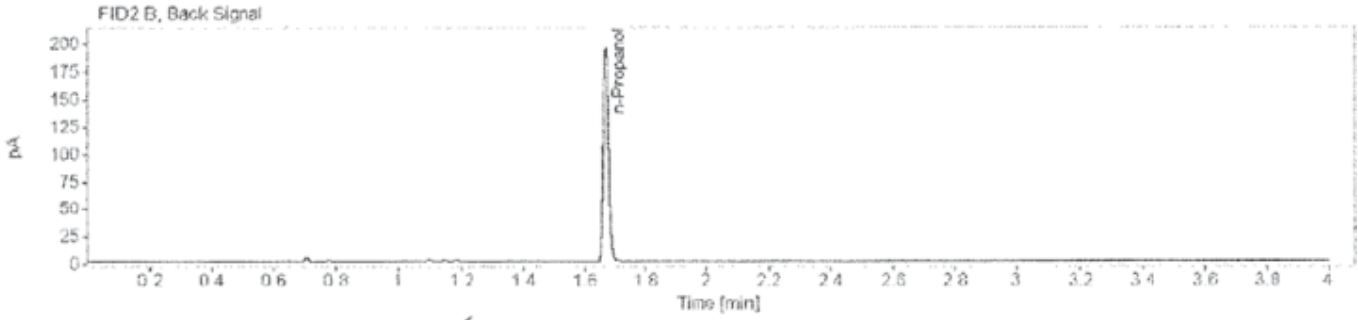
Compound	Peak Symmetry	Peak to Valley Ratio	RT [min]	Expected RT[min]	Area	Concentration [g/100 mL]
Methanol	1.32738		0.852	0.853	2.0275	0.0007 *
Ethanol	0.93978		1.008	1.008	204.0158	0.1216
n-Propanol	0.90283		1.568	1.568	257.4041	0.0100

Clean blind

Houston Forensic Science Center, Inc.
Forensic Analysis Division
Toxicology - Volatile Analysis Chromatograms

Sample name: 2016-20951 1.1 Description: Alq 1 Vial Number: 13
Instrument: Headspace 2 Acq. method: VOLATILES.M Injection date: 11/14/2016 1:38:47 PM
Data file: C:\Chem32\1\Data\20161114_AAJ\20161114_AAJ 2016-11-14 12-27-22\013F1301.D





Name FID1A ✓

Compound	Peak Symmetry	Peak to Valley Ratio	RT [min]	Area	Concentration [g/100 mL]
n-Propanol	0.72896		1.921	240.4136	0.0100

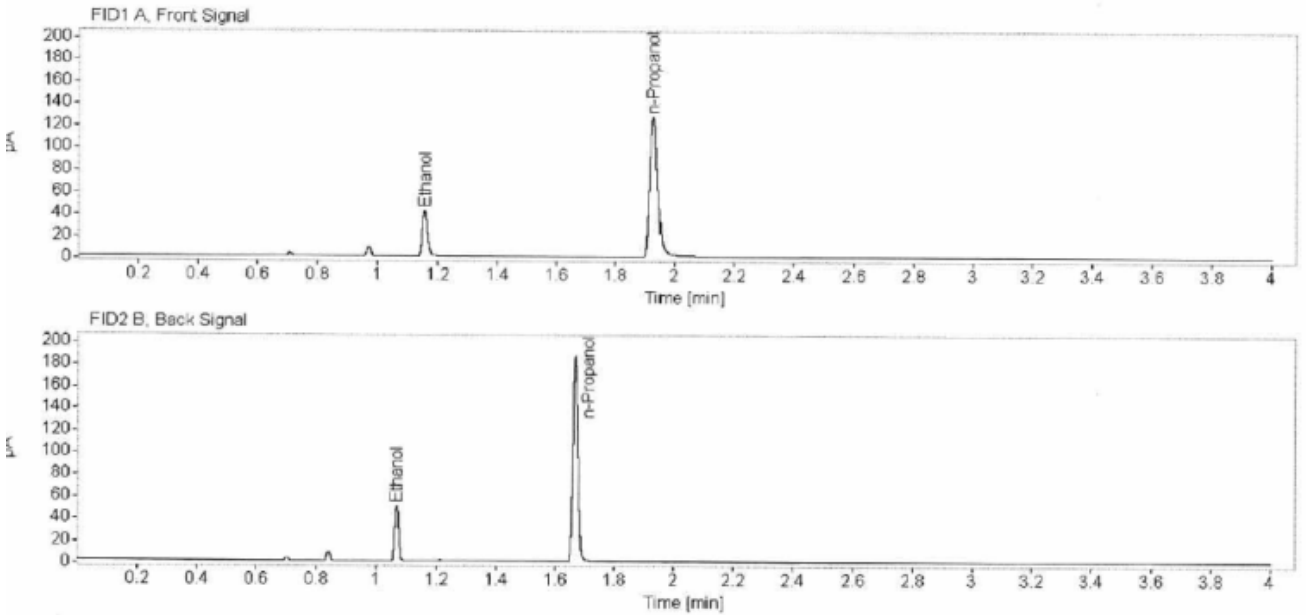
Name FID2B ✓

Compound	Peak Symmetry	Peak to Valley Ratio	RT [min]	Area	Concentration [g/100 mL]
n-Propanol	0.88789		1.669	230.5987	0.0100

Methanol at collection

Houston Forensic Science Center, Inc.
Forensic Analysis Division
Toxicology - Volatile Analysis Chromatograms

Sample name:	BZK Antiseptic Towelette - 1		Description:	Vial Number:	82
Instrument:	Headspace 2	Acq. method:	VOLATILES.M	Injection date:	3/17/2017 12:07:13 AM
Data file:	C:\Chem32\1\Data\ALC_20170316_ASG_HS2\ALC_20170316_ASG_HS2 2017-03-16 16-58-14\082F8201.D				



Name FID1A

Compound	Peak Symmetry	Peak to Valley Ratio	RT [min]	Expected RT[min]	Area	Concentration [g/100 mL]
Ethanol	0.76941		1.157	1.156	49.4507	0.0330
n-Propanol	0.71240		1.930	1.929	233.1467	0.0100

Name FID2B

Compound	Peak Symmetry	Peak to Valley Ratio	RT [min]	Expected RT[min]	Area	Concentration [g/100 mL]
Ethanol	0.88855		1.068	1.068	48.1844	0.0332
n-Propanol	0.89151		1.669	1.668	221.3510	0.0100

Actual error rate determination

- 95% confidence, rate of error in positive samples is <3%
- 95% confidence, rate of error in negative sample is <9%

Firearms

Blind Quality Control
Blind Verification

Firearms Blind Testing v. Blind Verification

Blind Testing

Evidence varies by quantity and type

Scenario:

- Two firearms of same make and model as the source of fired bullets and casings
- One of the firearms is submitted as a known
- Examiner determines which, if any, of the fired evidence was fired in known gun
- 12 Cases submitted; 0 Consultations

Blind Verification

Evidence varies to account for what is seen in casework

Examples:

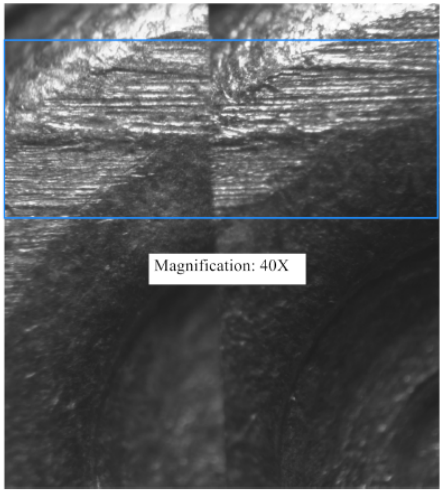
- Fired casings and bullet not fired in the firearm submitted
- Three groups of casings
- 6 fired casings fired in one gun. 8 fired casings from a second gun
- Comparisons between two cases
- 25 Cases submitted; 5 Consultations

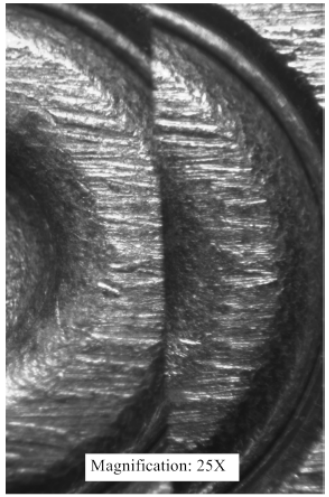
Firearms: Independent Second Verification

Both examiners concluded in same region of evidence, exact same spot – 6 o'clock

Primary Examiner

Evidence Items Compared: Items 1.2-1.6 to Item 1.1
Result of Comparison: Identification

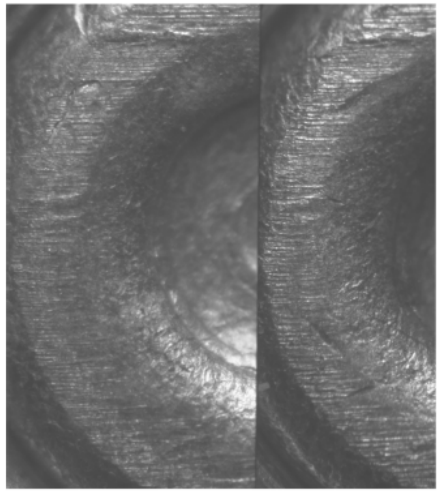


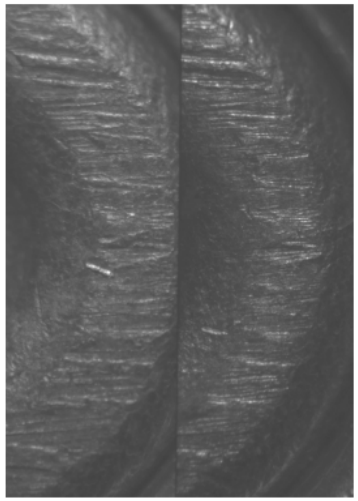


Item 1.2 to Item 1.1	Item 1.2 to Item 1.1
Evidence Index Identification: Dot at 6	*Photo Date: 10/31/2016*

Second Examiner

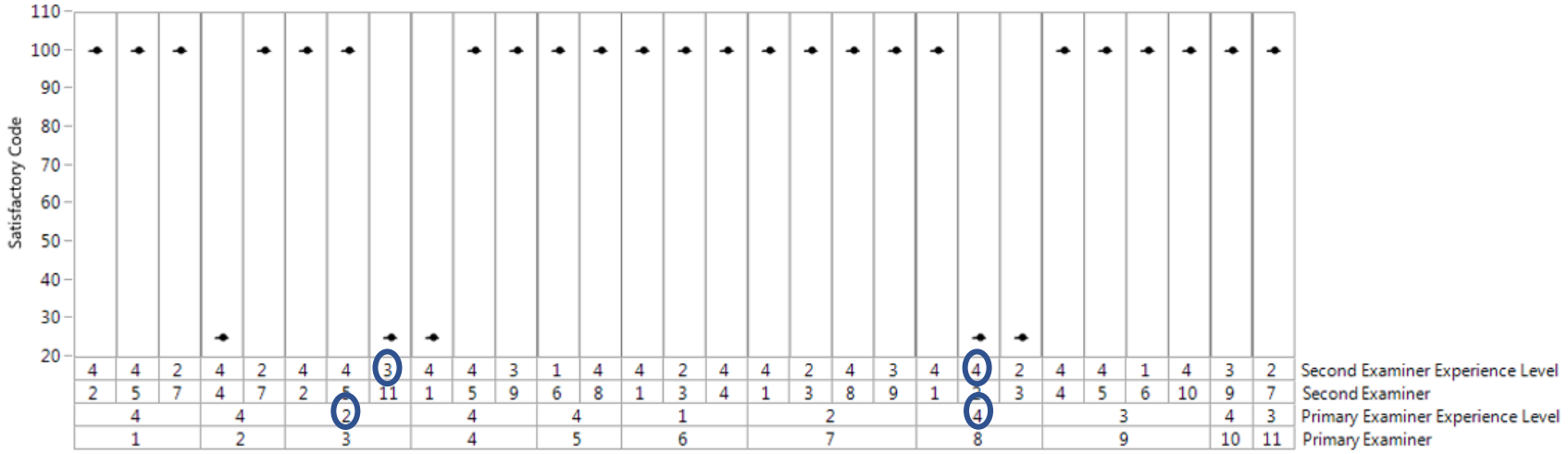
Evidence Items Compared: Items 1.2 - 1.6 to Item 1.1
Result of Comparison: Identification





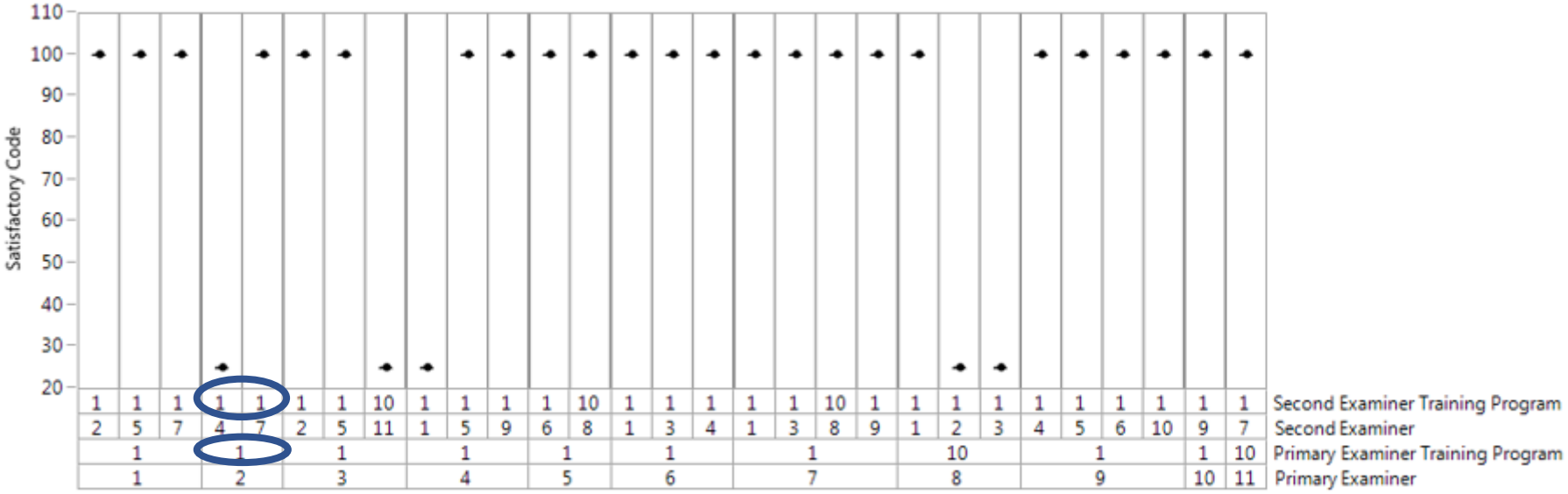
Item 1.2 to Item 1.1	Item 1.2 to Item 1.1
Evidence Index Identification: Mark at 6 o'clock (Both Photos)	*Photo Date: 11/01/2016*

Firearms: Consultation not due to experience level



Experience Level:
1 – Less than 2 years of experience
2 – 2-5 years of experience
3 – 5 years of experience
4 – 5+ years of experience

Firearms: Consultation not due to training program



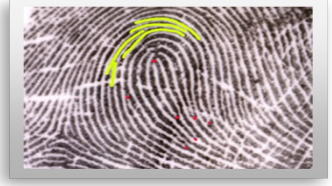
Training Program:
1 –Trained at HFSC
10 – Training obtained at laboratory other than HFSC

Firearms: What causes consultation

Complexity of examination

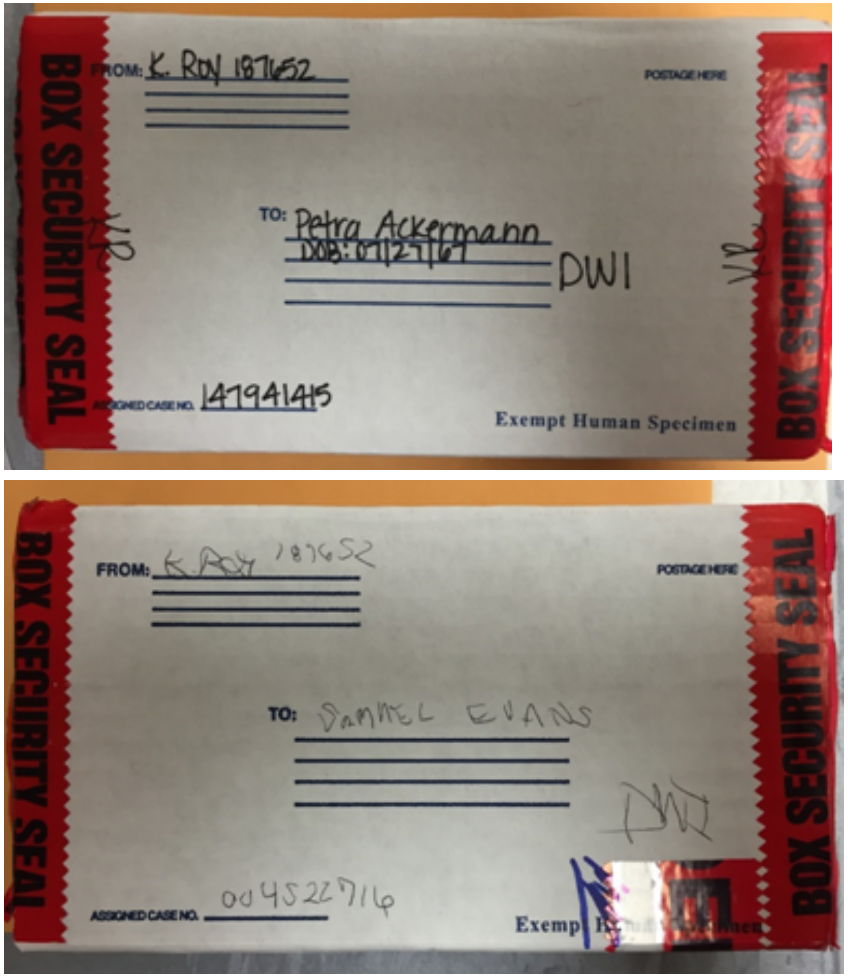
- Firearms that mark fired bullets and casings poorly
- Brand of ammunition

Challenges

Toxicology	Controlled Substances	Firearms	Biology	Latent Prints
				
• **Samples** • **BAC Kit**	• **Street Drugs** • **Customer Process**	• **Firearms** • **Request for Testing**	• **CODIS** • **SAKs** • **Section Size**	• **AFIS** • **Digital Comparison**

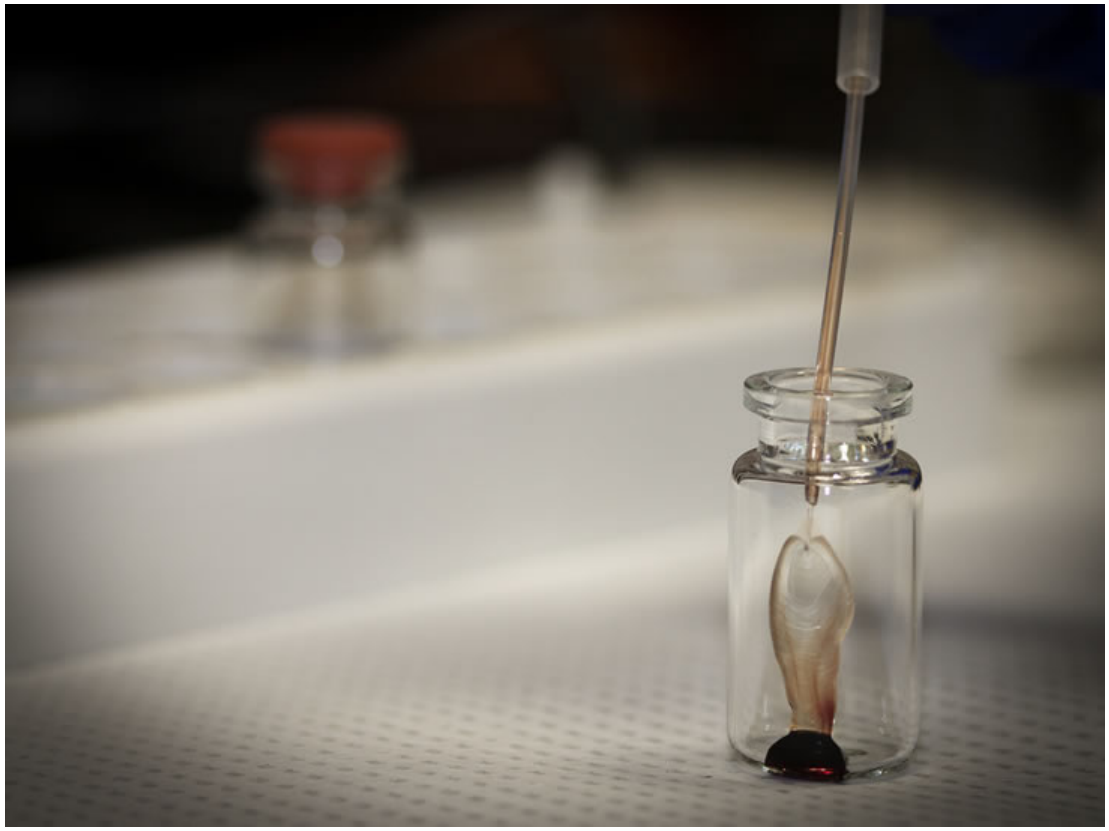
Challenges

- Obtaining Samples
- Create test that mimics casework
- Internal logistics
- Analyst detection incentive



Lessons Learned

- Champion for project
- Collaborators needed
- Not all will be “Blind”
- Integrated LIMS
- Test your system



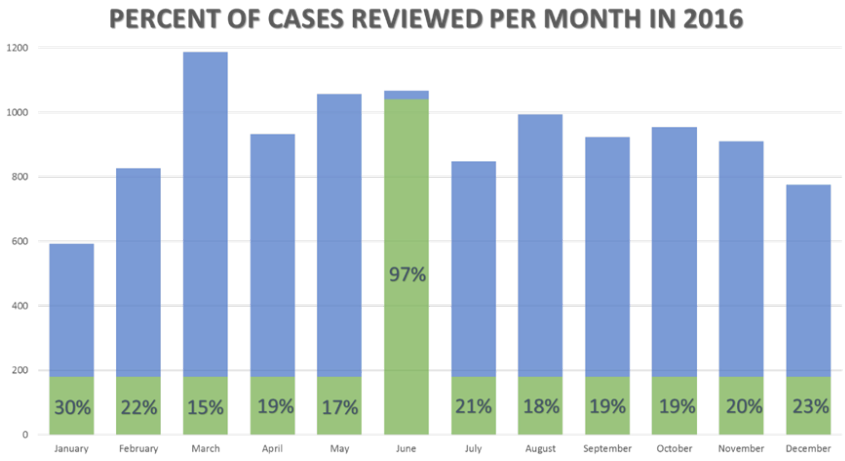
Statistical audit

Defect rate detection
Controlled Substances

Statistical audit

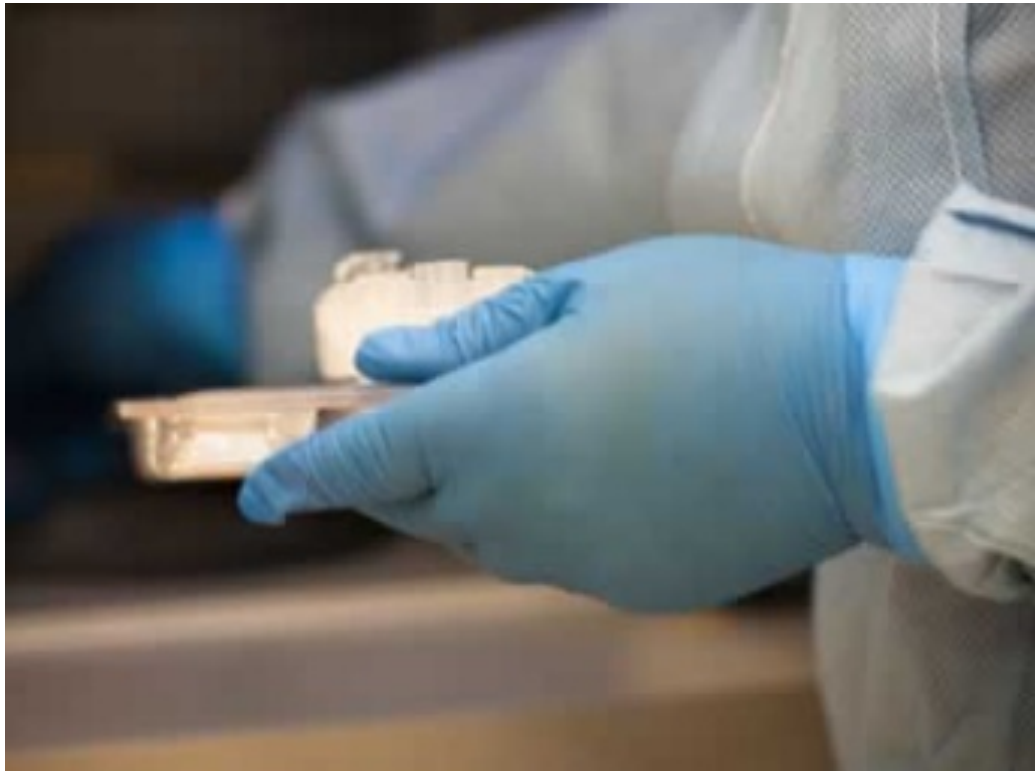
- Controlled substances record defect found on internal audit
- How often does this defect occur?
- Binomial power distribution analysis
  - 3000 records sampled allows for a 90%+ confidence the defect rate is < 0.4% (1 in 250)
- 3,061 records audited – 2 defects noted
  - 95% confidence that this defect occurs
    - >2 in 10,000
    - <2.4 in 1,000

- ~ 40 hours for audit or about $3,000



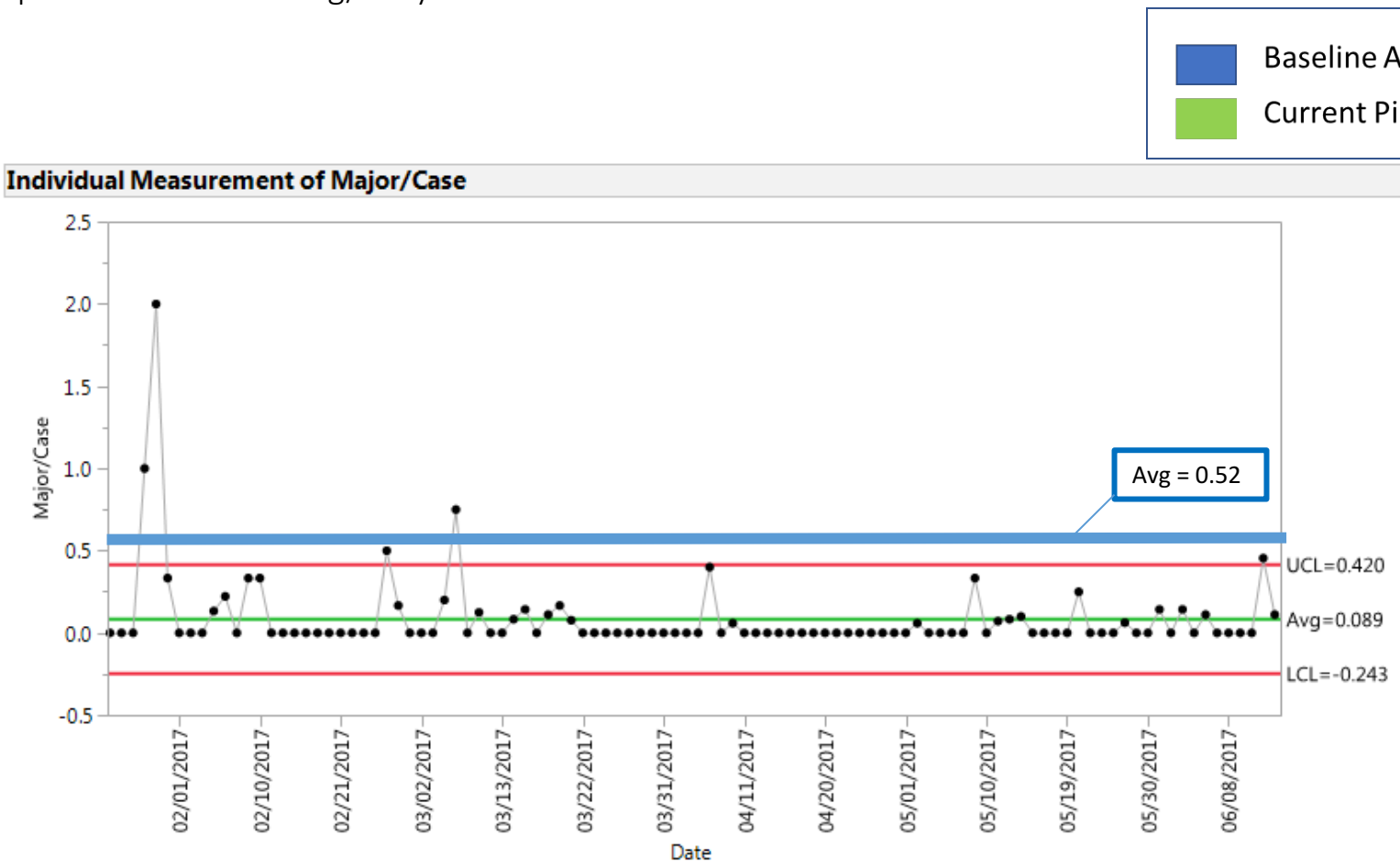
Defect analysis

Lean Six Sigma
Biology
Process Improvement



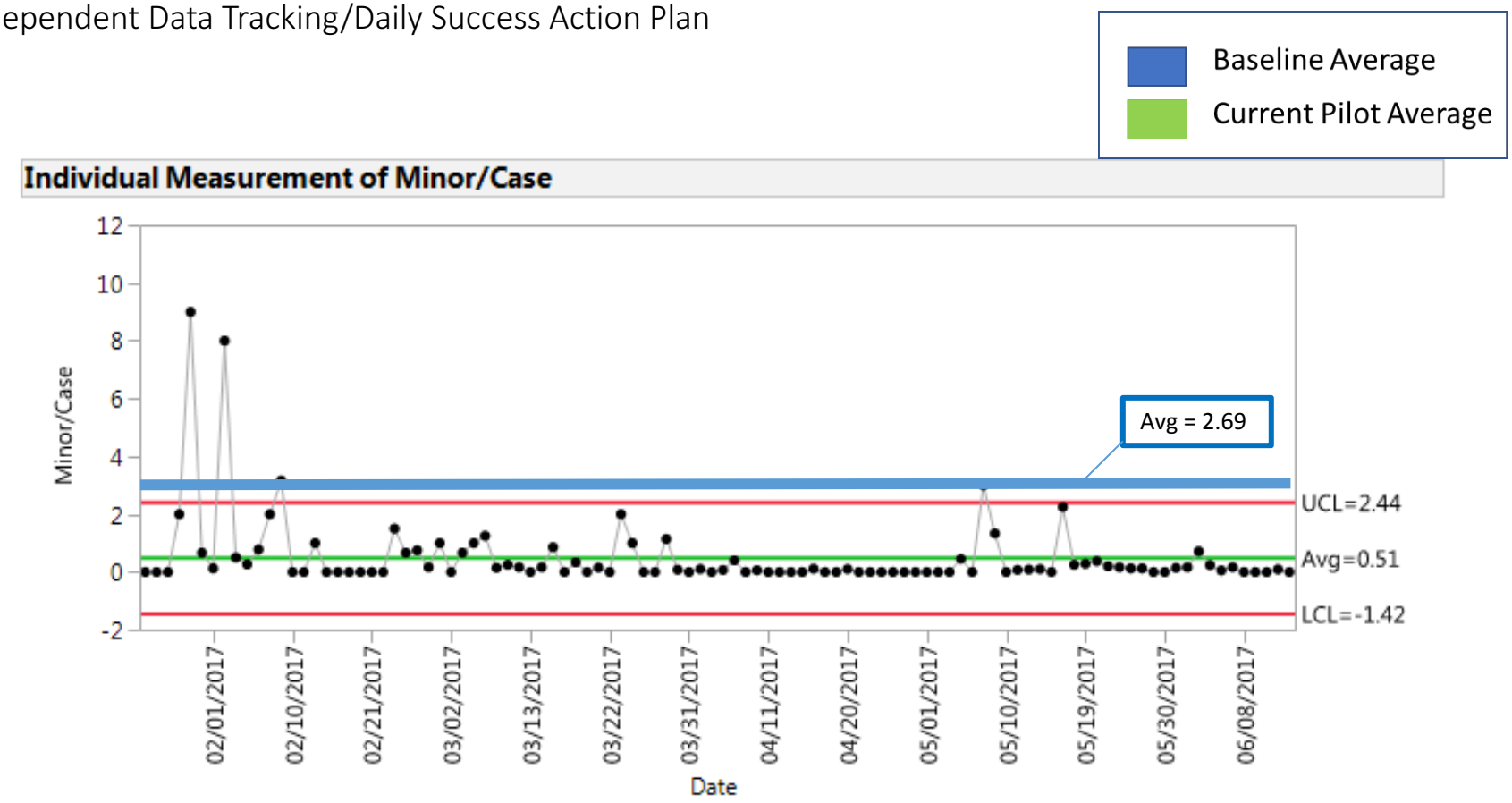
Control Chart: Major Number of Defects per Case Completed

Independent Data Tracking/Daily Success Action Plan



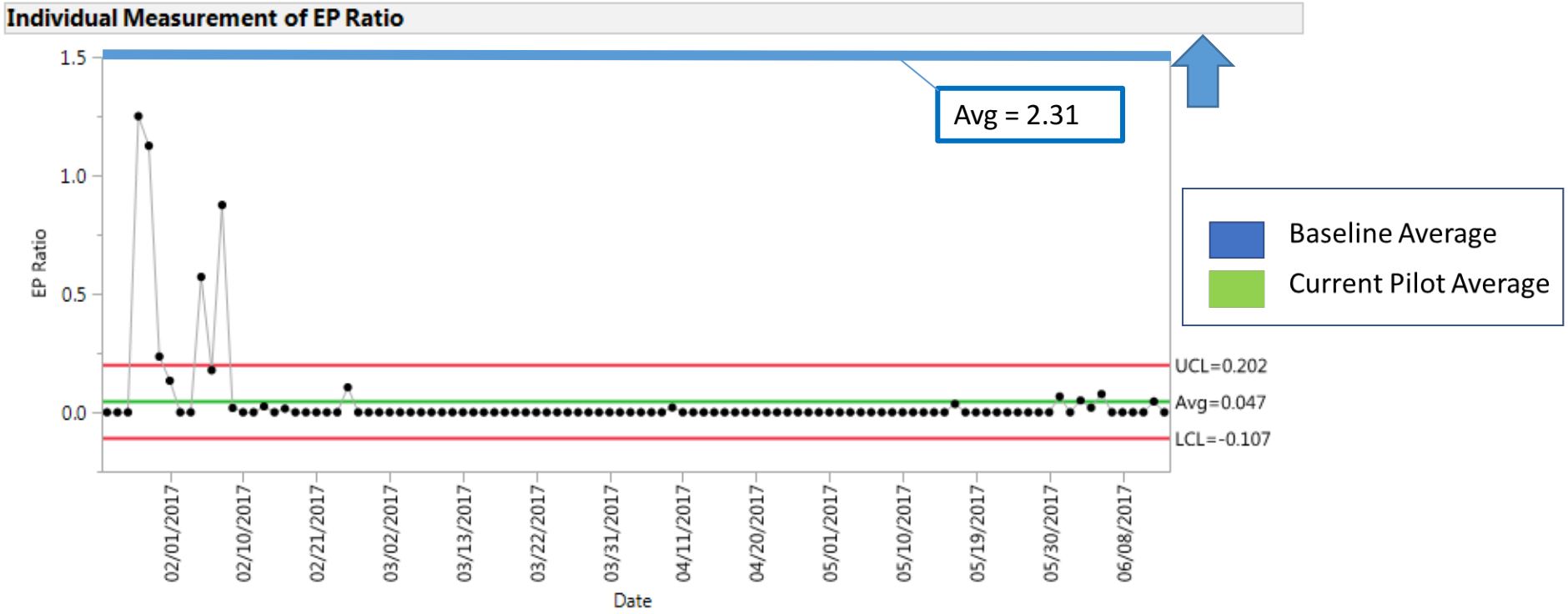
Control Chart: Minor Number of Defects per Case Completed

Independent Data Tracking/Daily Success Action Plan



Control Chart: Number of Evidence Processing Defects per Number of Items Processed

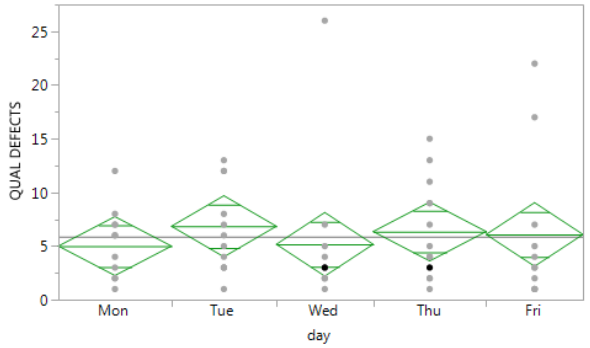
Independent Data Tracking/Daily Success Action Plan



Quality Defects by Day per Team

Reported Independently in Daily Success Action Plan

Oneway Analysis of QUAL DEFECTS By day TEAM=JL



Oneway Anova

Summary of Fit

Rsquare	0.020317
Adj Rsquare	-0.045
Root Mean Square Error	5.130773
Mean of Response	5.892308
Observations (or Sum Wgts)	65

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
day	4	32.7562	8.1891	0.3111	0.8695
Error	60	1579.4899	26.3248		
C. Total	64	1612.2462			

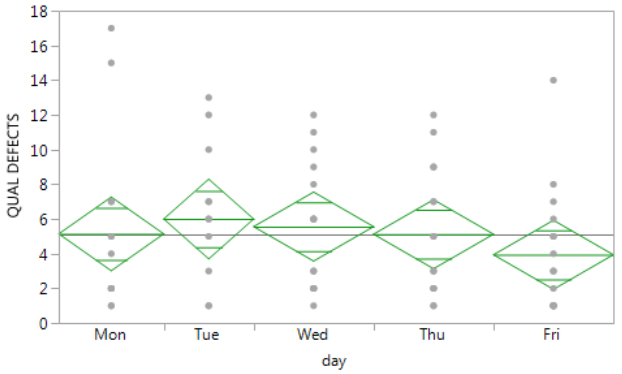
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Mon	14	5.00000	1.3713	2.2571	7.7429
Tue	13	6.84615	1.4230	3.9997	9.6926
Wed	12	5.16667	1.4811	2.2040	8.1294
Thu	14	6.35714	1.3713	3.6142	9.1001
Fri	12	6.08333	1.4811	3.1206	9.0460

Std Error uses a pooled estimate of error variance

Missing Rows 48

Oneway Analysis of QUAL DEFECTS By day TEAM=ST



Oneway Anova

Summary of Fit

Rsquare	0.030708
Adj Rsquare	-0.02548
Root Mean Square Error	3.989732
Mean of Response	5.108108
Observations (or Sum Wgts)	74

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
day	4	34.7958	8.6990	0.5465	0.7022
Error	69	1098.3393	15.9180		
C. Total	73	1133.1351			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Mon	14	5.14286	1.0663	3.0156	7.2701
Tue	12	6.00000	1.1517	3.7023	8.2977
Wed	16	5.56250	0.9974	3.5727	7.5523
Thu	16	5.12500	0.9974	3.1352	7.1148
Fri	16	3.93750	0.9974	1.9477	5.9273

Std Error uses a pooled estimate of error variance

Missing Rows 39


NOT
THE END OF
THE ROAD

It ain't what you don't know that gets you in trouble. It's what you know for sure that just ain't so.

-- Mark Twain

Cost of poor quality

Cost of "wrong"

- The cost of one mistake = George Rodriguez ~$9M

Homicide = $5M-$14M
Rape = $448K
Burglary = $41K

The cost of "late"

- 4 homicides (~300 homicides/year)
- 50 sexual assaults (~1200 kits / year)
- 580 burglaries (~11,000 calls to B&T/ month)

Murder by numbers: monetary costs imposed by a sample of homicide offenders, Matt DeLisi, Anna Kosloski, Molly Sween, Emily Hachmeister, Matt Moore and Alan Drury, The Journal of Forensic Psychiatry & Psychology Vol. 21, No. 4, August 2010, 501–513

Why should you care?

Cost of "wrong"

- 31,000 requests last CY
- Simple risk = **$279B/year**
- 1:10,000 is ~3 failures/year
  - $27M risk
- Statistically demonstrating a <1:5,000 error rate
  - Would require >150,000 tests to have a 95% power
  - ~$135M

2,000 blinds / year

- $500k - $1M
- 95% confidence that error rate is < 0.2%

Why should you care?

2,000 blinds / year

- $500k - $1M
- 95% confidence that error rate is < 0.2%