Frequency of EQA Schemes in Laboratory Medicine and Monitoring performance over time.

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What is the purpose of the EQA Scheme?

- Regulatory – US, Germany
  - Linked to licensing and or accreditation
  - Schemes have to respect current analytical performance and therefore have wide acceptability limits.
  - The fact that a laboratory may loose their license if they do not pass PT may influence the use of special practices for EQA samples
  - Tendency to maintain the quality at a certain level and they are unable to stimulate improvement of quality above this level.
  - Frequency tends to be low (2 to 3 times a year)

What is the purpose of the EQA Scheme?

- Quality improvement
  - Participant performance evaluation (which is not limited to analytical performance but can also include test interpretation, advice to the clinician on laboratory requests and diagnosis).
  - Method performance evaluation.
  - Vigilance of IVD's – EN 14136:2004.
  - Continuous education, training and help.
  - The primary intention of the activities of an EQA in laboratory medicine shall be to support quality improvement of the services provided by the participating laboratories for the benefit of the patient.
  - Acceptance limits often tighter - use of biological goals/ clinical decision.

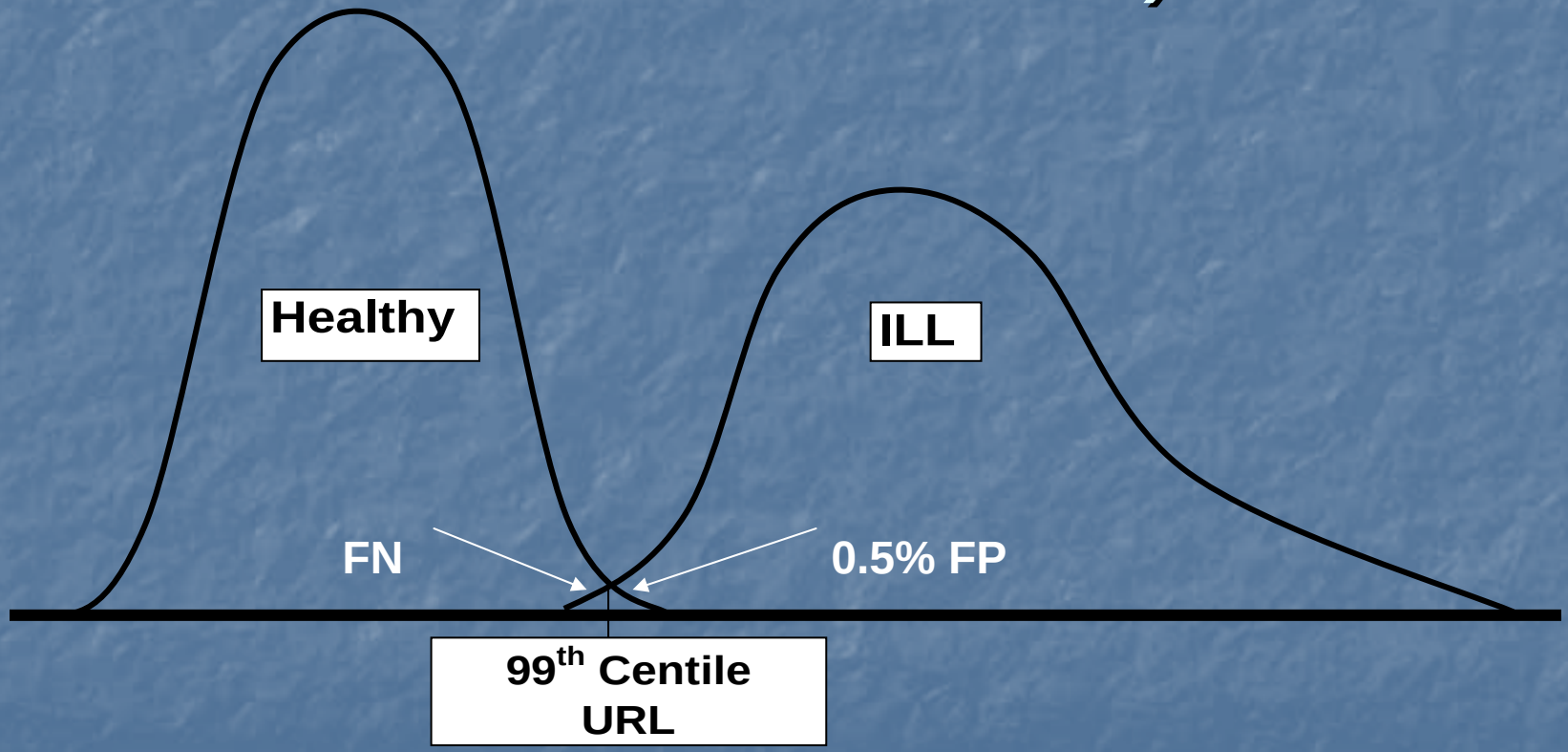
EQA in Laboratory Medicine

- EQA programmes should be designed to provide performance assessment that best meets the needs of the service.
- What laboratory service is being provided?
  - Diagnosis
  - Prognosis
  - Monitoring
  - Screening
- What population is being served?
  - Local
  - Regional / National
  - Specialist e.g. childrens' hospital
- How many requests per year?
  - Disease prevalence

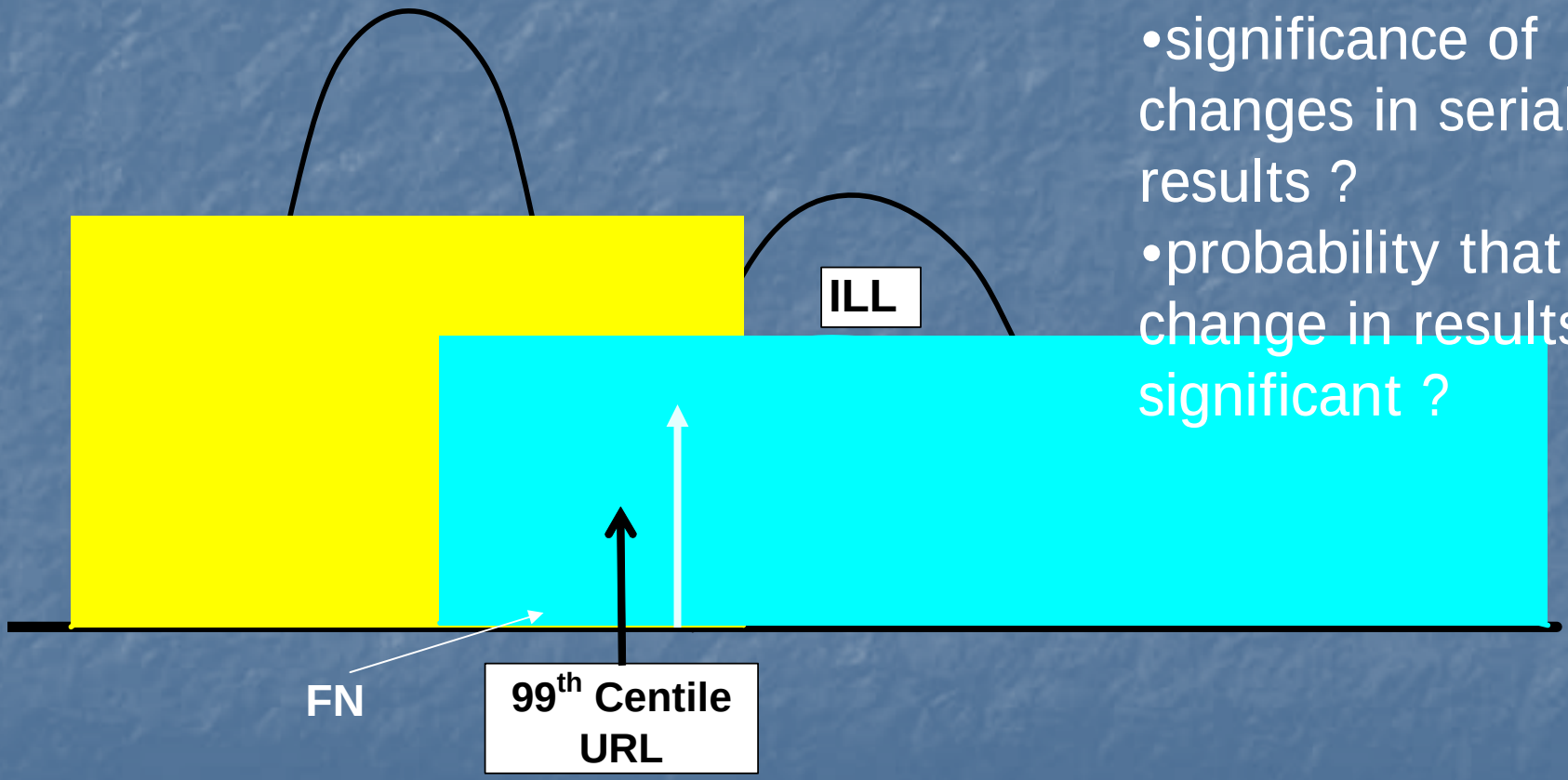
In Wales (pop 5m)

2.4m Clinical Chemistry requests were received in 2005

Diagnosis of ACS– is the disease present ? (is the Tn greater than the 99th centile?)

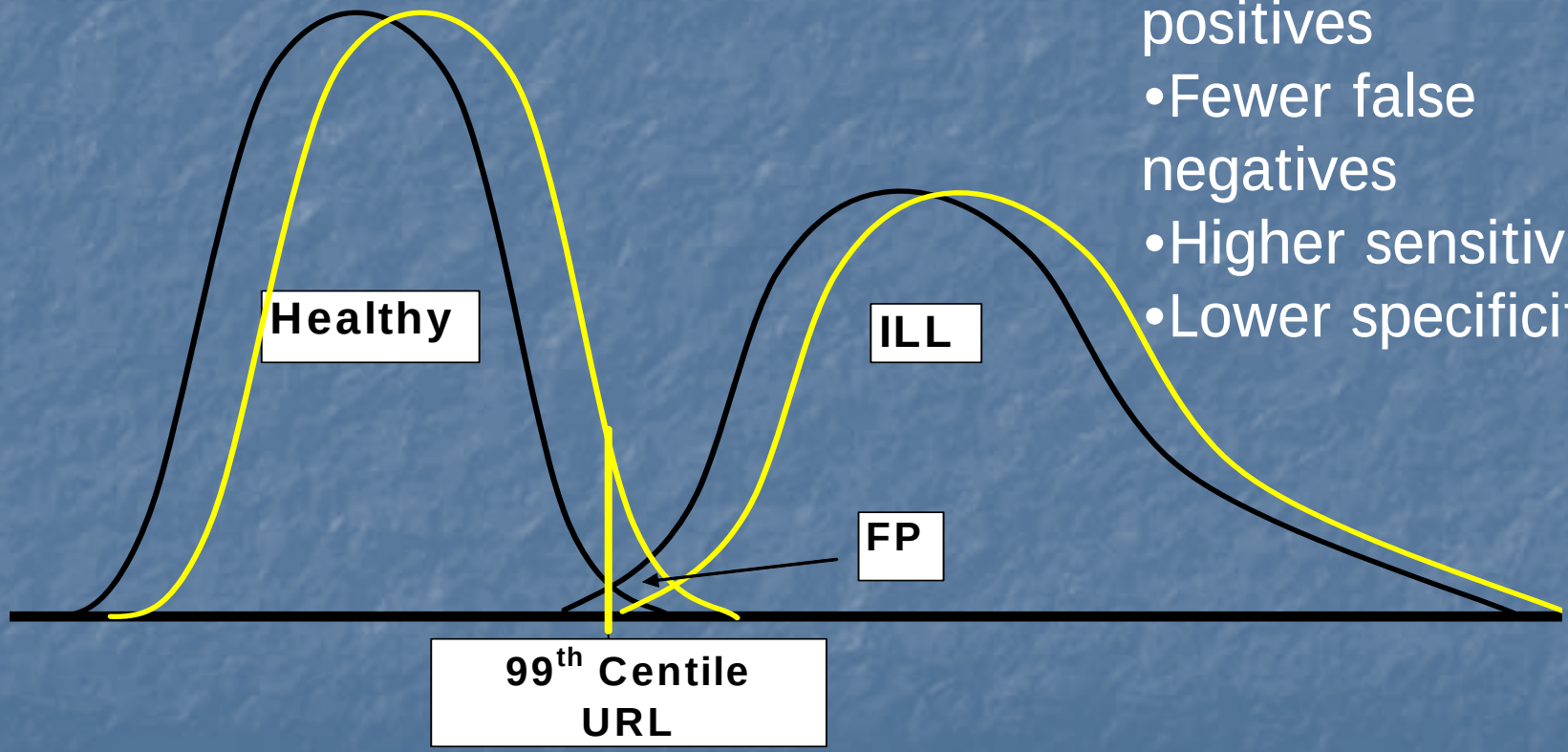


Effect of imprecision



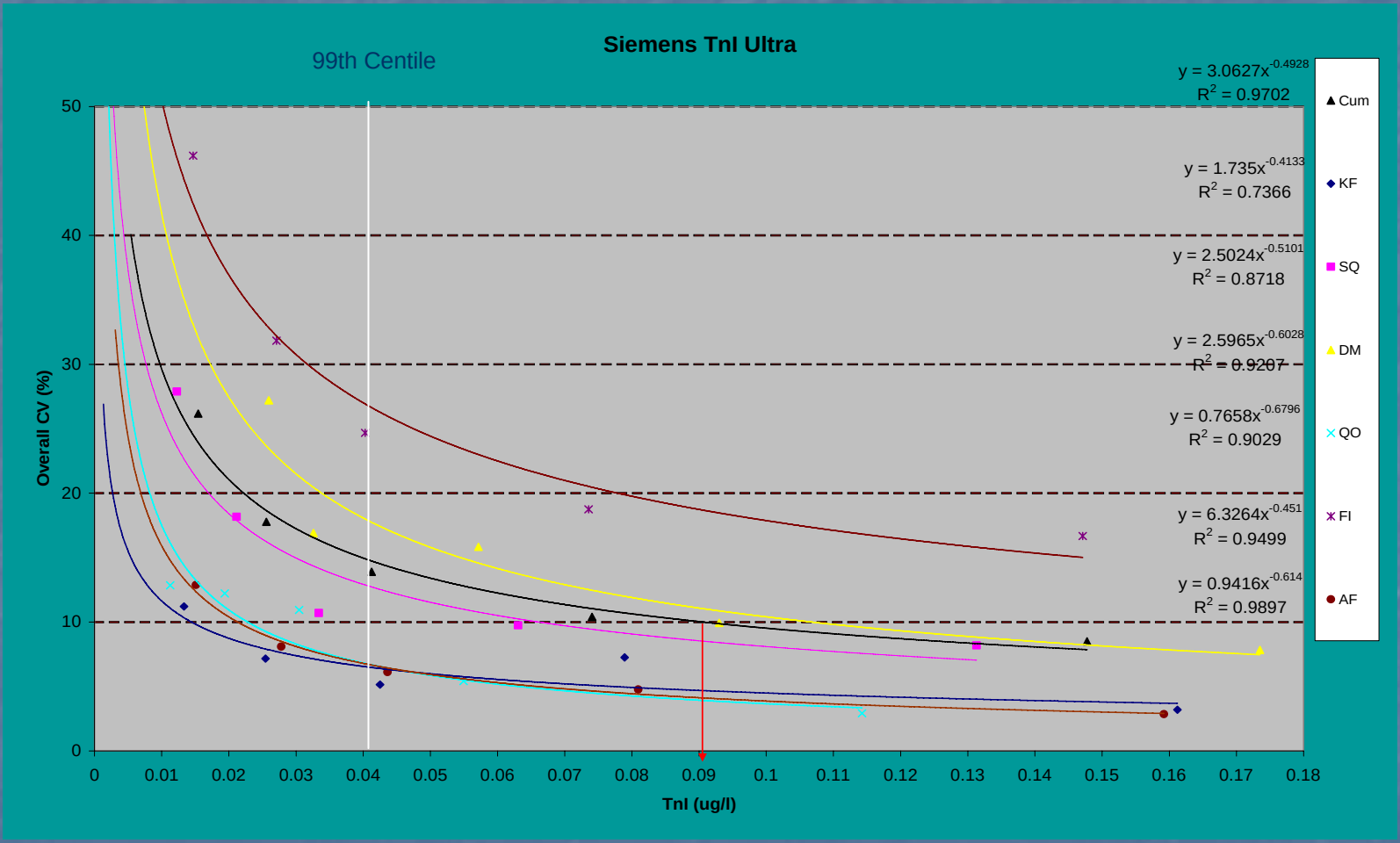
- Incorrect URL
- significance of changes in serial results ?
- probability that a change in results is significant ?

Effect of positive bias



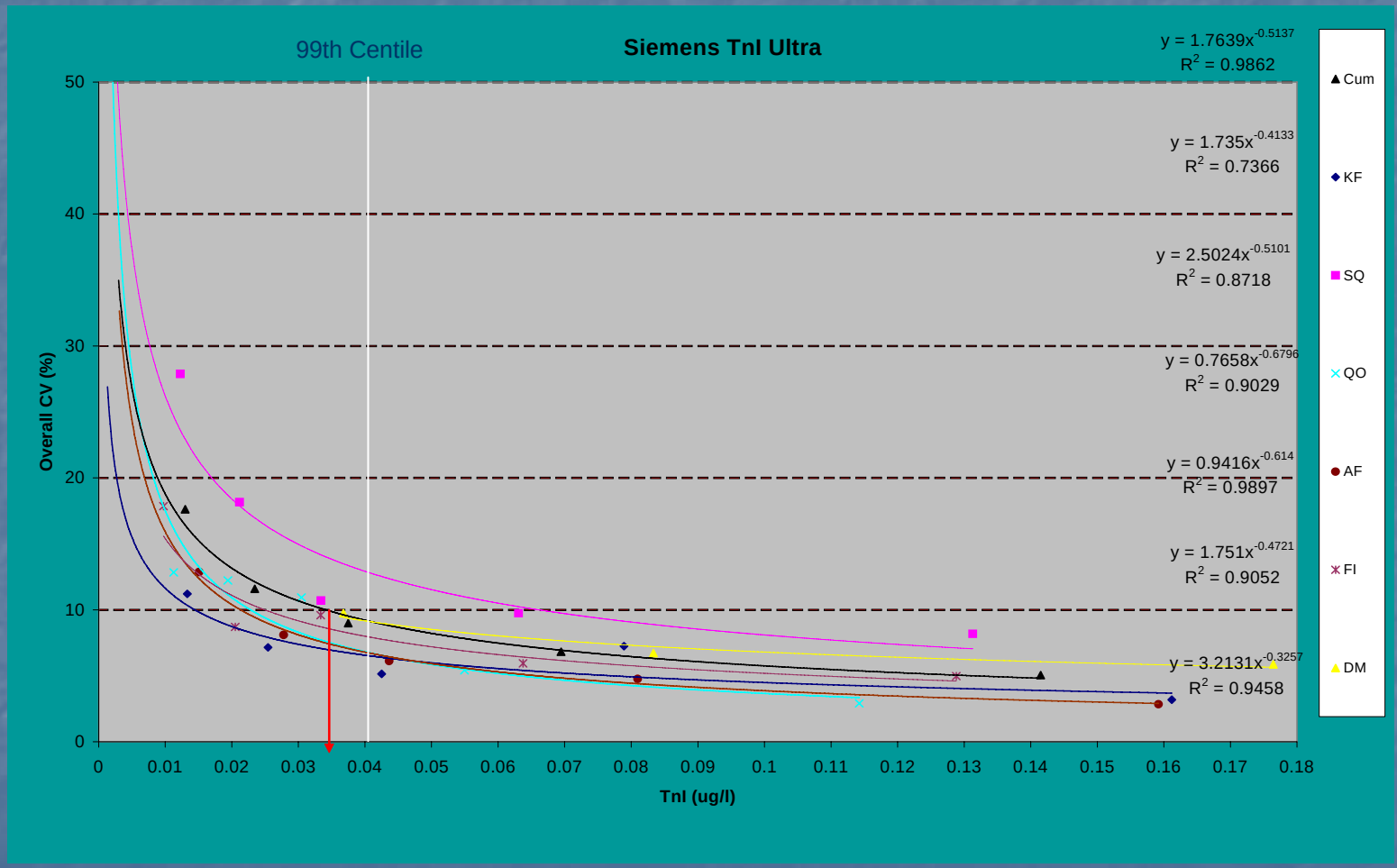
- More false positives
- Fewer false negatives
- Higher sensitivity
- Lower specificity

Intralaboratory variation TnI



6 labs measured TnI using the Siemens Ultra TnI method.

Intralaboratory variation



Data using Cal C1003 excluded, 10% Total CV = 0.034 ng/L CV @ 99th centile = 9%

Design for Cardiac marker Scheme

- Performance should be assessed at analyte concentration near “cut off limits”
- Frequency of Scheme should reflect diagnostic error rate - no. of false negatives c.f. no. of false positive.
  - High error rate – more frequent.
  - Low error rate - less frequent.
- Typically CM Schemes in UK frequency – monthly
- Typical Trust serving pop of 500,000 would undertake 1,700 Tn investigations per month.

Screening

- Population screening for healthcare promotion – Quality specification need not be as high as diagnosis, therefore frequency of EQA need not be as high?

Monitoring

- A major use of laboratory analysis is to follow the course of an illness and to monitor the effects of treatment.
  - Acute - ACS, ARF, hepatitis.
  - Chronic - CKD, TDM, cancer, pregnancy, diabetes, hepatitis.

Q. Is the result significantly different to last time?

Is the patient condition better or worse?

Should I change patient management ?

Diabetes monitoring – HbA1c

- For individual patient monitoring over time - analytical variance is by far the major contributor to the performance characteristic.
- Global goals - the bias becomes an essential characteristic.
- DCCT and UKPDS studies established the central role of HbA1c as the index for the long- term control of the glycaemic state.
- Specific treatment goals have been established based on HbA1c measurements. For HbA1c both strategies are therefore important factors.
- NICE guidelines – HbA1c target 6.5- 7.5% , patients monitored 2 – 6 monthly.

EQA Scheme design for HbA1c

- Need to reassure laboratory that method is stable over time. Intralaboratory variation.
- Need to reassure laboratory that global target goals are valid. Assessment of bias, interlaboratory variation.
- Panel of 6 samples assayed bimonthly and cf. DCCT/ IFCC target.
- Over 1 year , each sample will have been analysed 3 times (intralab variation).
- Typical Trust (pop 500,000) would carry out 48,000 HbA1c analyses per year, each patient monitored approx 4 times.

DCCT target

Performance criteria target ± 7.0%

Z Score

Lab Code: **AE** · Section: **GHb A** · Instrument: **G7 / G8**

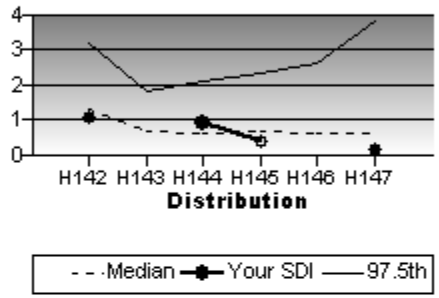
		Distribution Code : H148 Sent on: 19/08/08				
HbA1c (%GHb)		**1**	**2**	**3**	**4**	**Analyte SDI**
Reported Result		9.7	8.9	6.6	6.0	
Method Corrected Result		9.7	8.9	6.6	6.0	
DCCT corrected	Mean	9.61	8.84	6.60	5.91	
	SD	0.23	0.24	0.16	0.19	
	Number	132	134	132	137	
G7 / G8	Mean	9.75	8.98	6.70	6.01	
	SD	0.13	0.13	0.14	0.11	
	Number	43	43	45	42	
Overall	Mean	9.68	8.91	6.68	5.98	
	SD	0.30	0.29	0.23	0.23	
	Number	163	168	170	170	
Reference Values		9.50	8.80	6.60	5.90	
WeQas SD		0.34	0.31	0.23	0.21	
SDI		**.26**	**.21**	**-.02**	**.42**	**.23**

Total Error

SDI is a measurement of your total error and will include bo

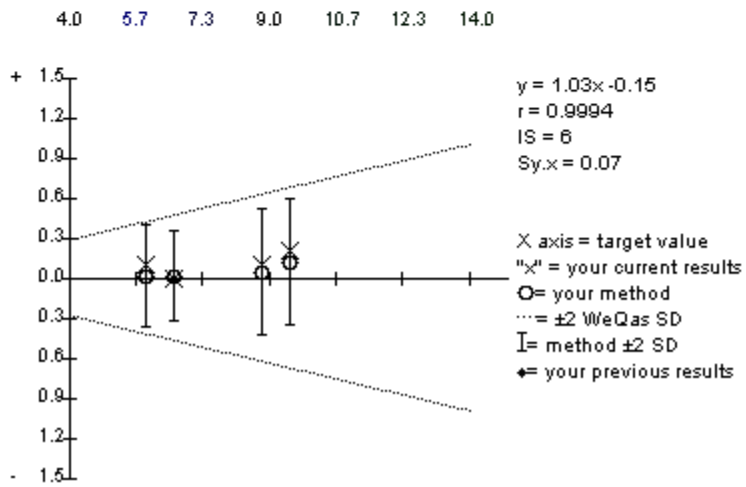
This Distribution H148
Your average analyte SDI for the 4 samples is .23

Previous SDI

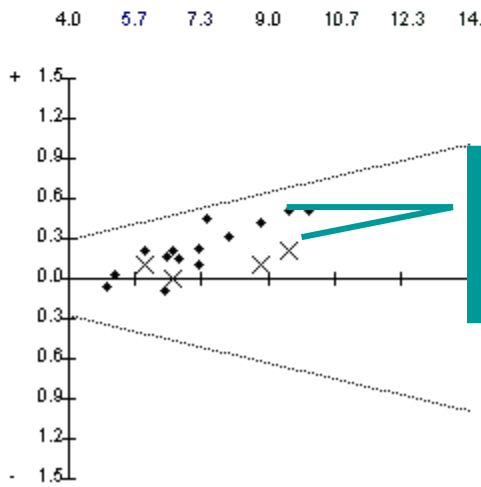


Please note: Linear regression uses CF corrected data.

This Distribution *H148*

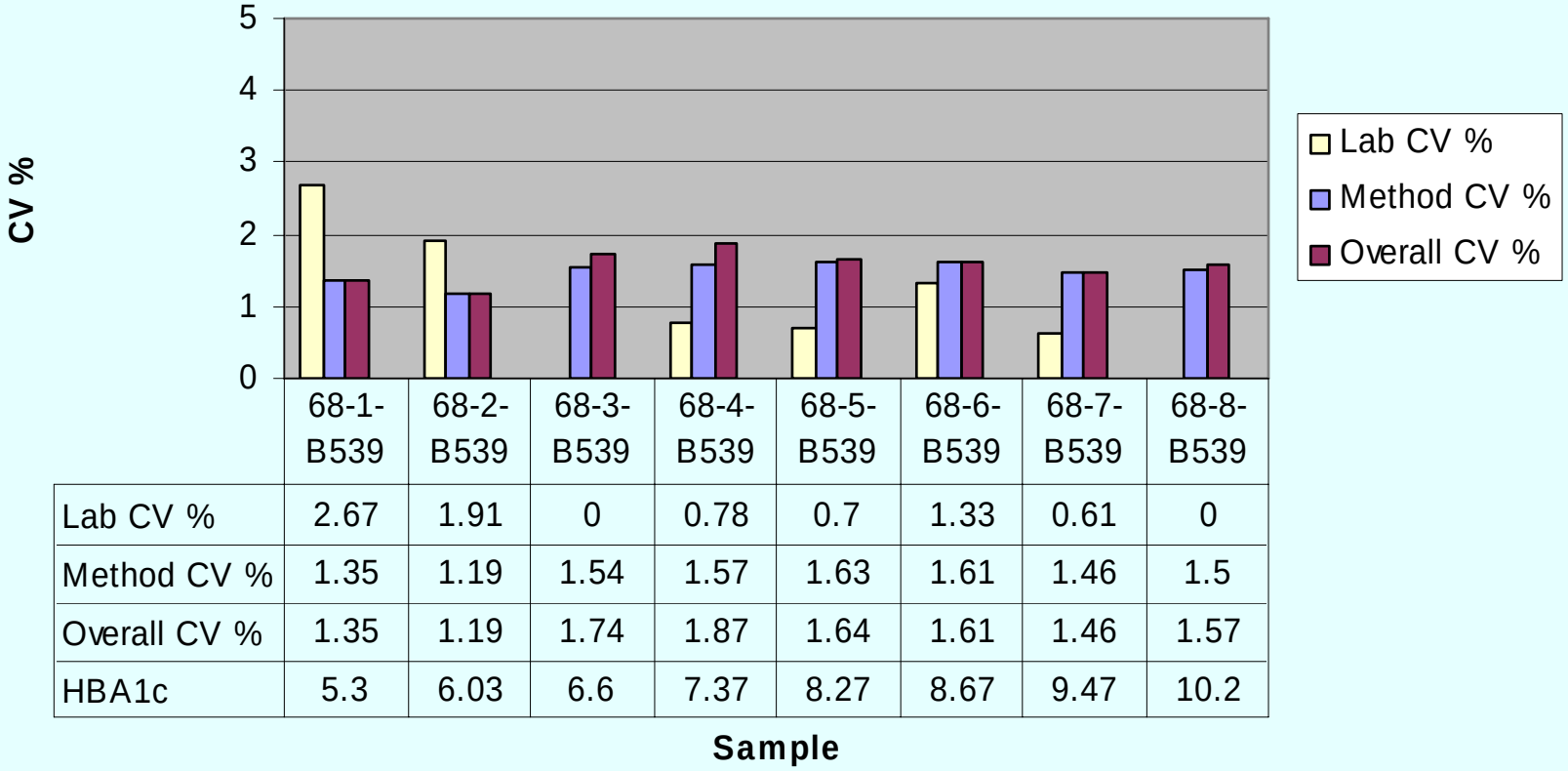


Previous Distributions



Between batch variability

End of batch report - Lab AE 01/06 to 12/06



	68-1-B539	68-2-B539	68-3-B539	68-4-B539	68-5-B539	68-6-B539	68-7-B539	68-8-B539
Lab CV %	2.67	1.91	0	0.78	0.7	1.33	0.61	0
Method CV %	1.35	1.19	1.54	1.57	1.63	1.61	1.46	1.5
Overall CV %	1.35	1.19	1.74	1.87	1.64	1.61	1.46	1.57
HBA1c	5.3	6.03	6.6	7.37	8.27	8.67	9.47	10.2

Target CV < 3 %

Frequency - what should we consider?

- Disease prevalence/ frequency of laboratory investigation.
- Error rate of investigation.
- Analytical complexity of the investigation.
- Clinical relevance of investigation to management of patient (clinical opinion).
- Professional opinion (scientific).

Error rate

- The frequency should be related to the stability of the process and its susceptibility to problems.
- more frequent EQA if a method / investigation is unstable.
- Susceptibility is often related to the level of automation of the analytical procedure. Manual methods are usually much more susceptible to problems than automated methods; early generations of automation are more susceptible to problems than later generations of automation.
- However, there is no quantitative methodology that tells you the frequency for EQA. It is a judgment that should be based on experience with the service requirements – the analyte / methods / the skills of your analysts, and the factors and variables that change in the laboratory.

Barriers

- Sample availability – patient samples with disease state ideal – not always available in sufficient quantities. e.g. Porphyrin Scheme uses faeces from PCT patients (rare) 1 Dist per year.
- Cost

Frequency of EQA Schemes- results of questionnaire

- Questionnaires were distributed by e-mail to 35 EQALM organisations.
- Results were returned from 22 member organisations

Aim of the survey

- Determine the frequency of EQA distributions (rounds) within Pathology
- Establish the views of our members on the concept of sub-disciplines.
  - A sub-discipline can be defined as an area of technical competence, which contains a minimum of one of each of a related measurement technique, property or product. A sub-discipline may contain more than one measurement technique, property or product as long as equivalence and comparability can be demonstrated

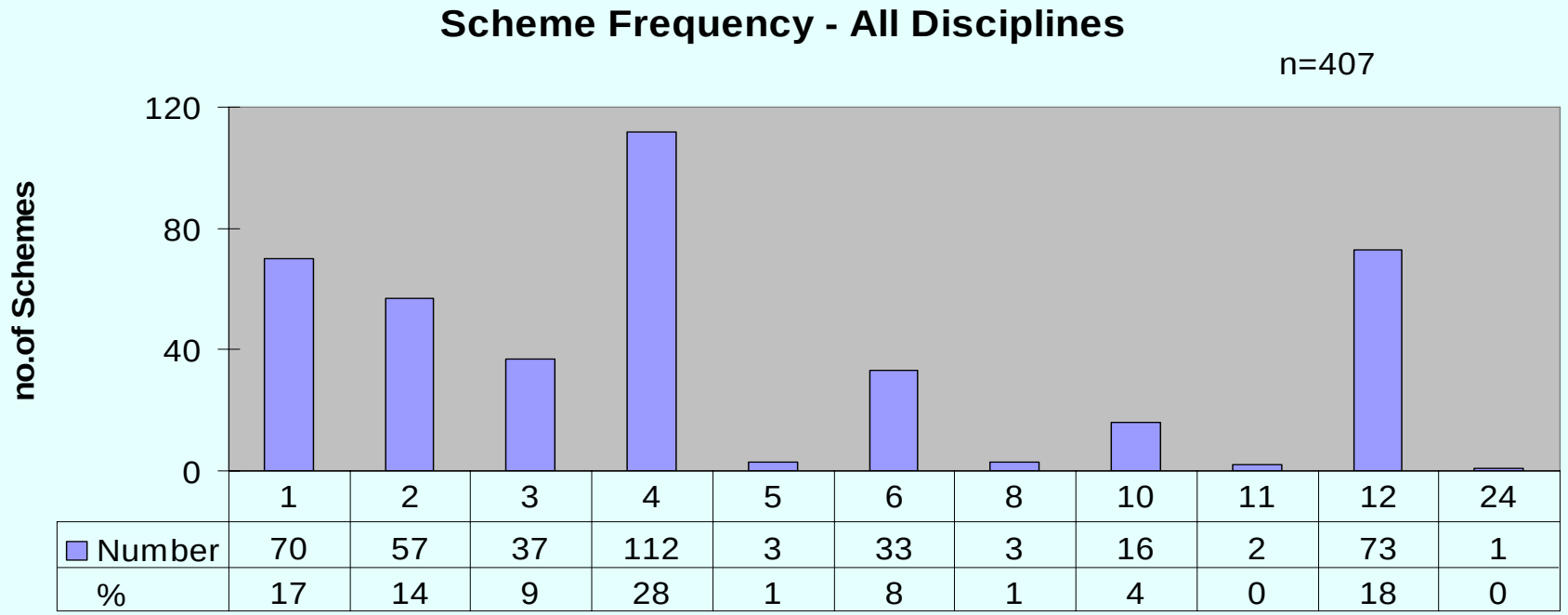
There is no difference between distributing a panel of 12 EQA samples in one annual survey and distributing the 12 samples as single samples 12 times a year?

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
1			5	

EQA frequency should reflect how well the test is performed. i.e. tests with low diagnostic error rates should be assessed less frequently than tests with high diagnostic error rates.

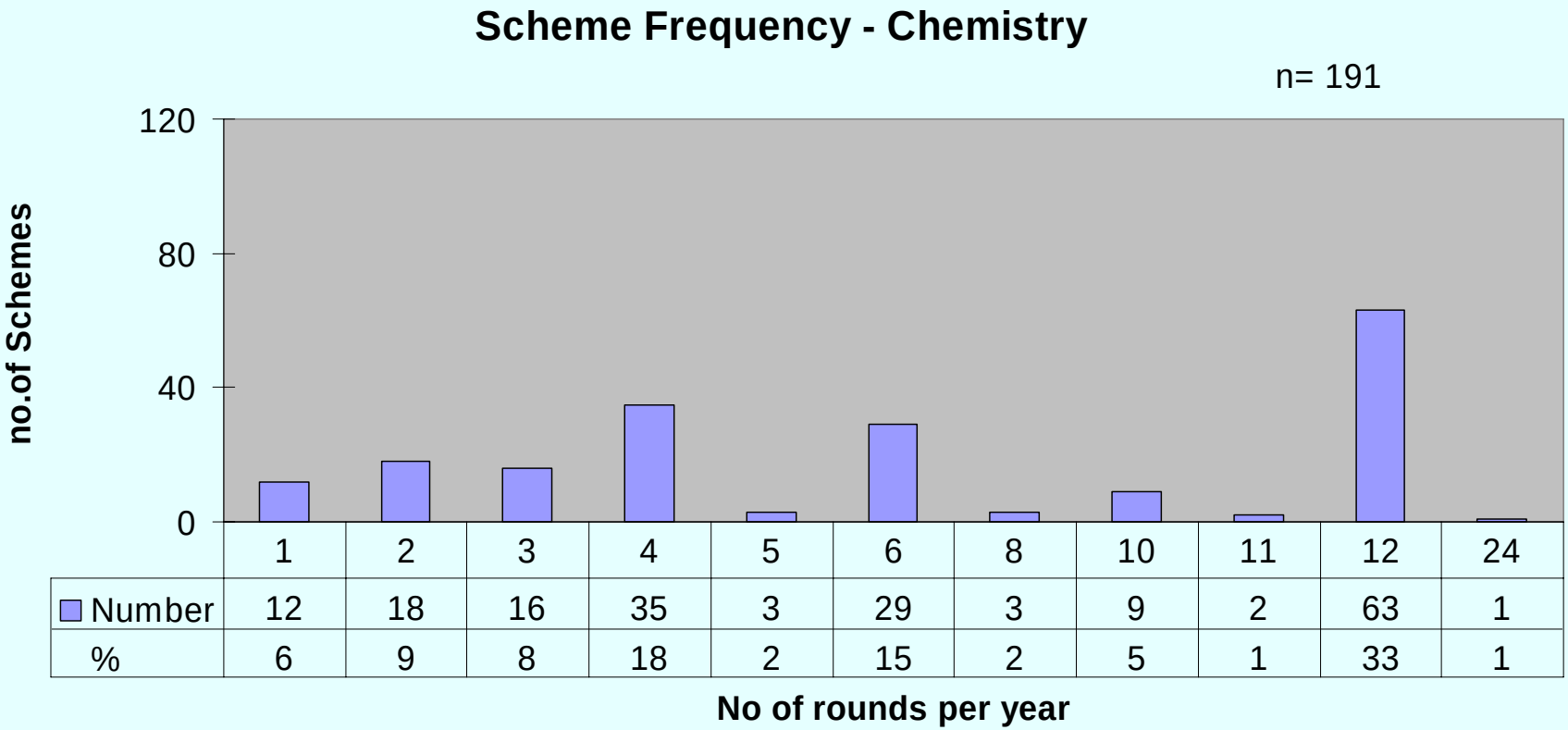
Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
3	**12**	**1**	**5**	

Scheme Frequency – All Disciplines



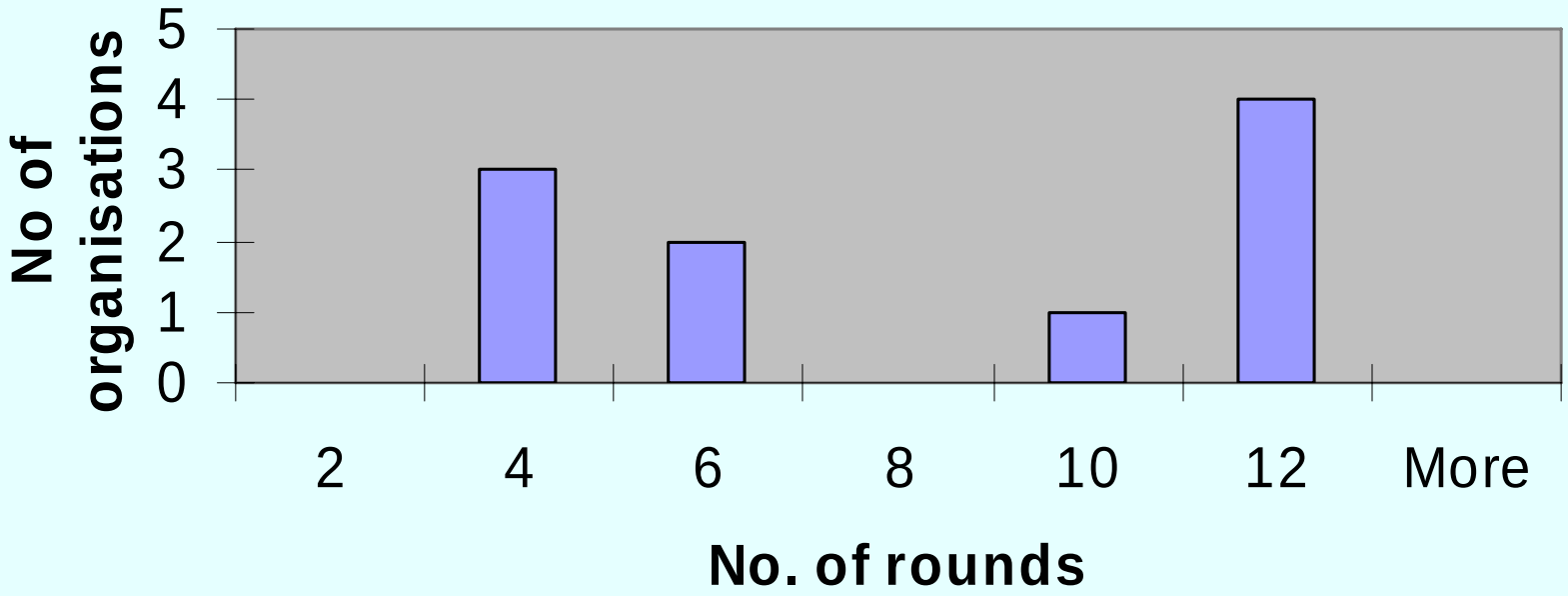
	1	2	3	4	5	6	8	10	11	12	24
Number	70	57	37	112	3	33	3	16	2	73	1
%	17	14	9	28	1	8	1	4	0	18	0

Chemistry

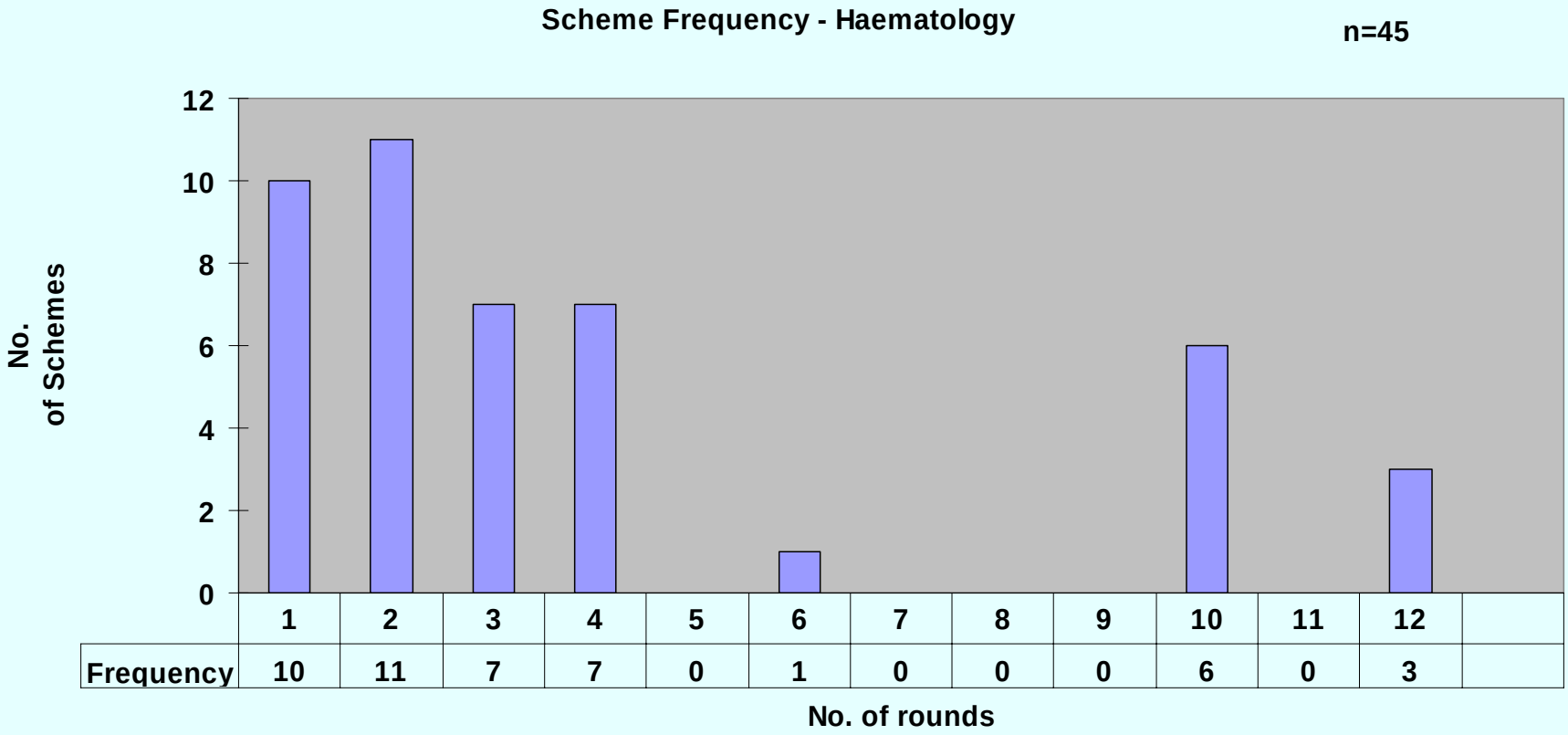


	1	2	3	4	5	6	8	10	11	12	24
Number	12	18	16	35	3	29	3	9	2	63	1
%	6	9	8	18	2	15	2	5	1	33	1

Frequency of HbA1c EQA Schemes in Europe

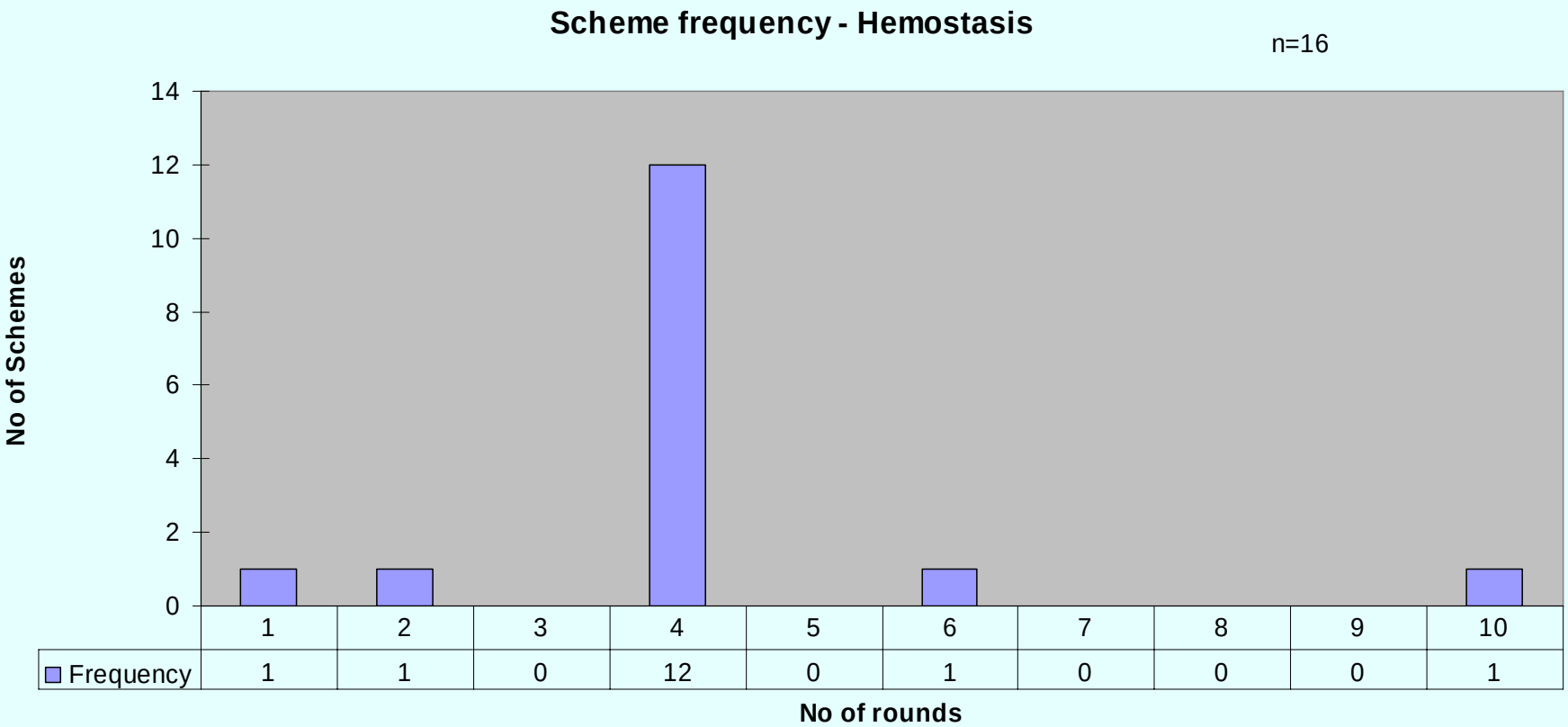


Haematology

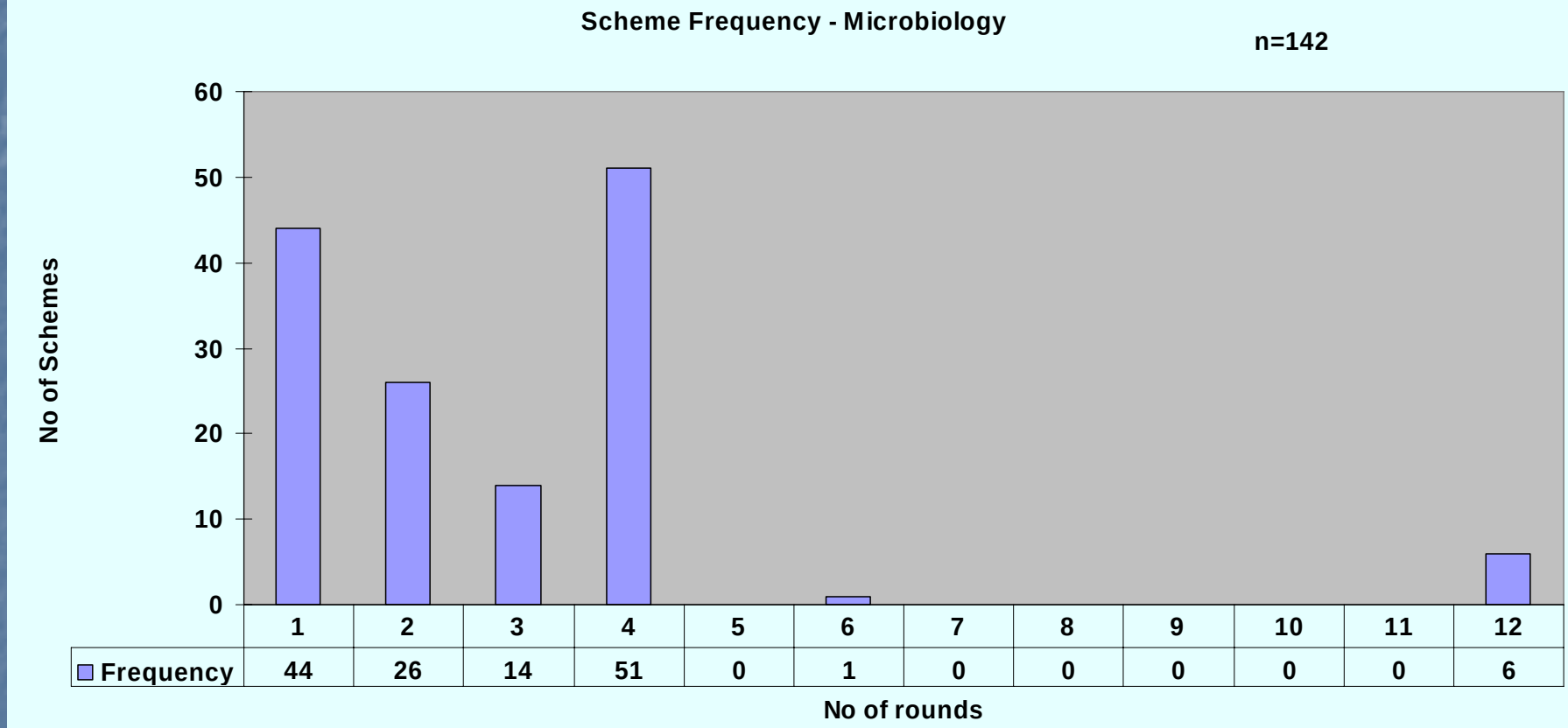


	1	2	3	4	5	6	7	8	9	10	11	12	
Frequency	10	11	7	7	0	1	0	0	0	6	0	3	

Hemostasis


Scheme frequency - Hemostasis
n=16
No of Schemes
14
12
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10
Frequency 1 1 0 12 0 1 0 0 0 1
No of rounds

Microbiology



	1	2	3	4	5	6	7	8	9	10	11	12
Frequency	44	26	14	51	0	1	0	0	0	0	0	6

3. A Laboratory identifies Plasma Glucose and Fasting Plasma Glucose as two different tests. The laboratory needs only to register in a plasma glucose EQA scheme, because the analyte ('glucose') and the matrix ('plasma') are the same.

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
13	7		2	

4 The Laboratory also undertakes measurement of glucose in whole blood and CSF using the same measurement technique. The Laboratory needs to have a separate registration for Blood Glucose as the matrix is very different.

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
7	12	1	2	

Serum/ urine/ blood/ CSF complex and different matrixes , therefore sub-discipline classification for EQA by matrix not usually undertaken in Pathology.

6 A Laboratory undertakes PCR testing: The laboratory needs only to register for each type of technique that they carry out. They do not need to register for each property that they test for.

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
	9	3	5	5

7 A laboratory undertakes Drugs of abuse testing in Urine using GC-MS analysis. They have registered for Tetrahydrocannabinol (THC) using this technique. They do not need to register for the other THC metabolites and drugs which are identified using the same procedure.

Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
	3	2	11	6

Genetics EQA– a case for sub-discipline for?

- Over 1000 Mendelian single gene mutations identified , therefore not practical to design 1000 individual EQA Schemes for each single gene mutation.
- Schemes developed for DNA Sequencing which encompasses a number of single gene investigations.

Thank you for listening