

# ACR Dose Index Registry: Early Results

NAS Beebe Symposium

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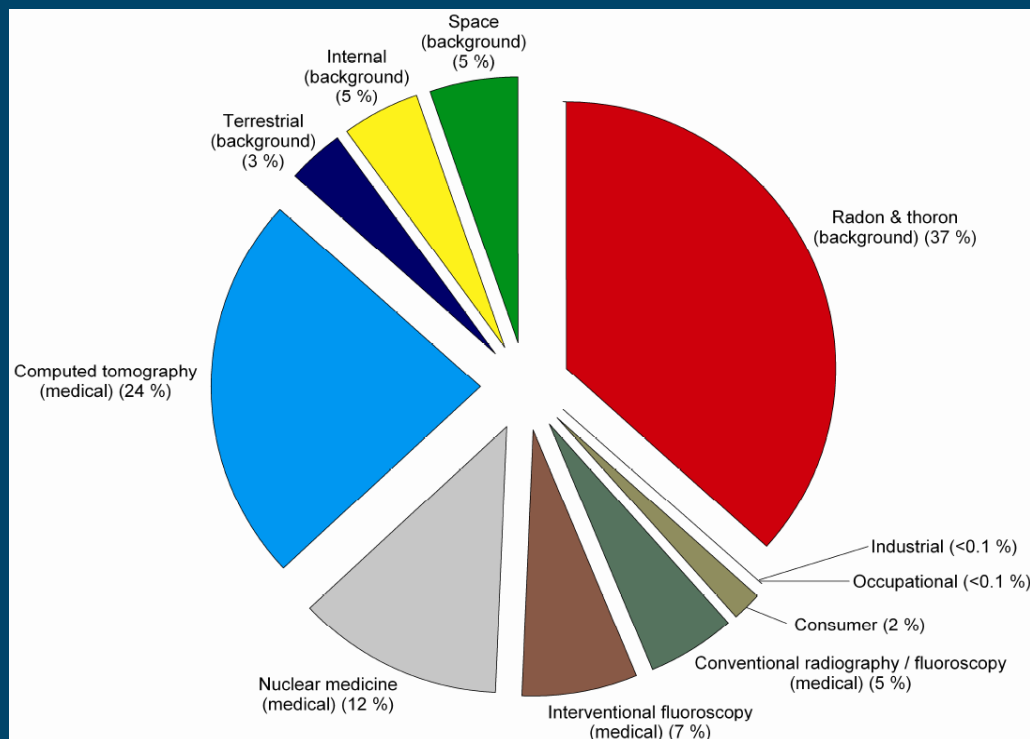
# Disclosures

- Chair, ACR Dose Index Registry
- Co-Chair Image Wisely
- AIM Advisory Board

# Acknowledgements

- *Laura Coombs, PhD*
- *Mythreyi Chatfield, PhD*

## CT scans contribute 25% of radiation



From NCRP Report No. 160, "Ionizing Radiation Exposure  
of the Population of the United States" (2009)

What is the national average level of radiation administered by imaging facilities for a CT of the head?

- One component of the National Radiology Data Registry
- Collects and compares dose index information across facilities
- Uses standard methods of data collection
  - DICOM SR, IHE REM Profile
- Establishes national benchmarks and practice patterns in dose indices

Facility and  
physicians submit  
data

Receive periodic  
national  
benchmarking  
reports

Develop and implement  
improvement plan

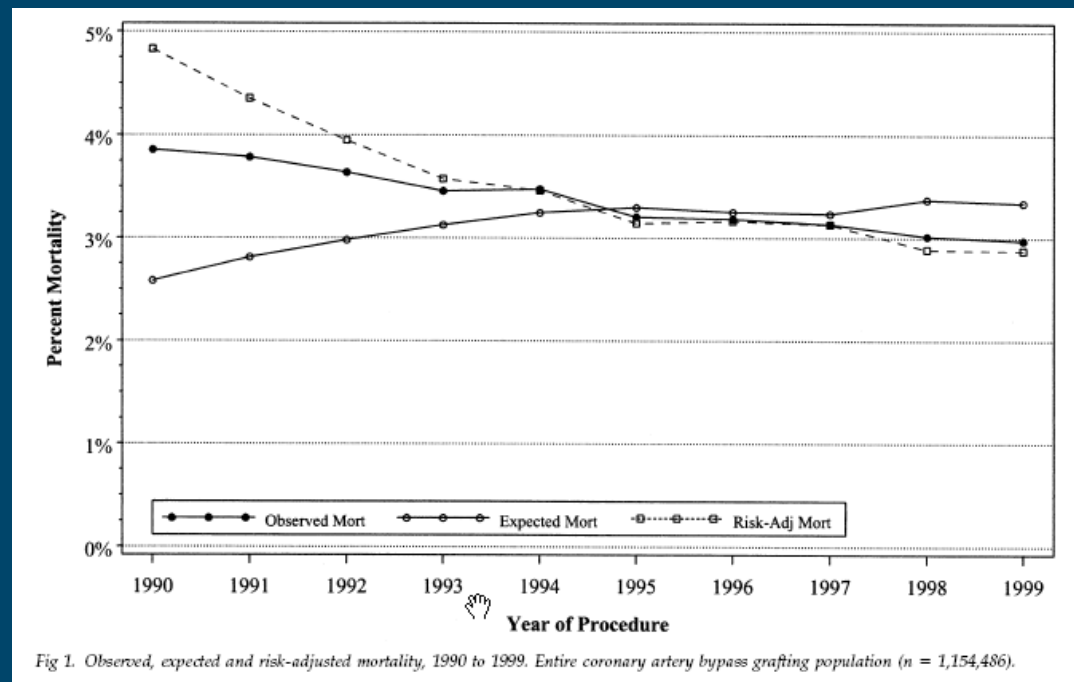
Analyze results

*Cyclic, Data-  
Driven  
Improvement  
Process*

- Evidence of data-driven improvement in performance from:
  - Medicine in general (outside radiology)
  - CT dose (for CCTA)
  - ACR registries (for recent registries)

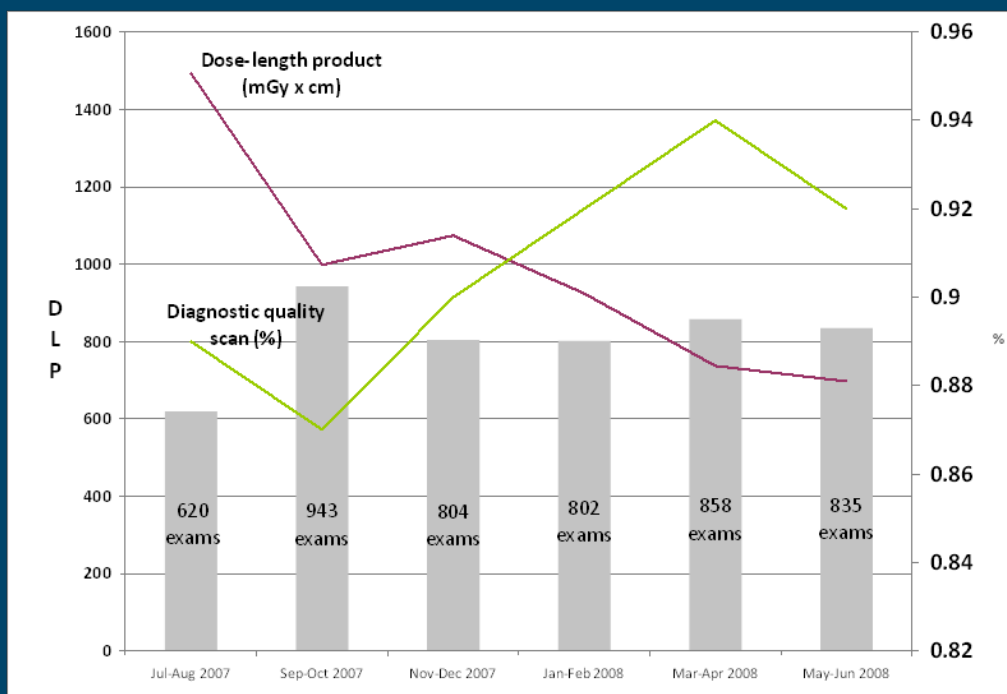


## Evidence on CABG mortality from the Society of Thoracic Surgeons National Adult Cardiac Database



Ferguson TB Jr, Hammill BG, Peterson ED, DeLong ER, Grover FL; STS National Database Committee. A decade of change--risk profiles and outcomes for isolated coronary artery bypass grafting procedures, 1990-1999: a report from the STS National Database Committee and the Duke Clinical Research Institute. Society of Thoracic Surgeons. *Annals of Thoracic Surgery* 2002 February;73(2):480-9.

## Evidence on CCTA From Michigan Registry



Raff GL, Chinnaiyan KM, Share DA, et al., "Radiation Dose From Cardiac Computed Tomography Before and After Implementation of Radiation Dose-Reduction Techniques," *Journal of the American Medical Association*, June 2009, Vol. 301, No. 22, pp. 2340-2348.



**CTC**  
CT COLONOGRAPHY REGISTRY



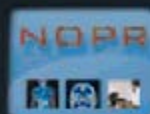
**GRID**  
GENERAL RADIOLOGY  
IMPROVEMENT DATABASE



**ICE**  
IV CONTRAST EXTRAVASATION



**DIR**  
DOSE INDEX REGISTRY

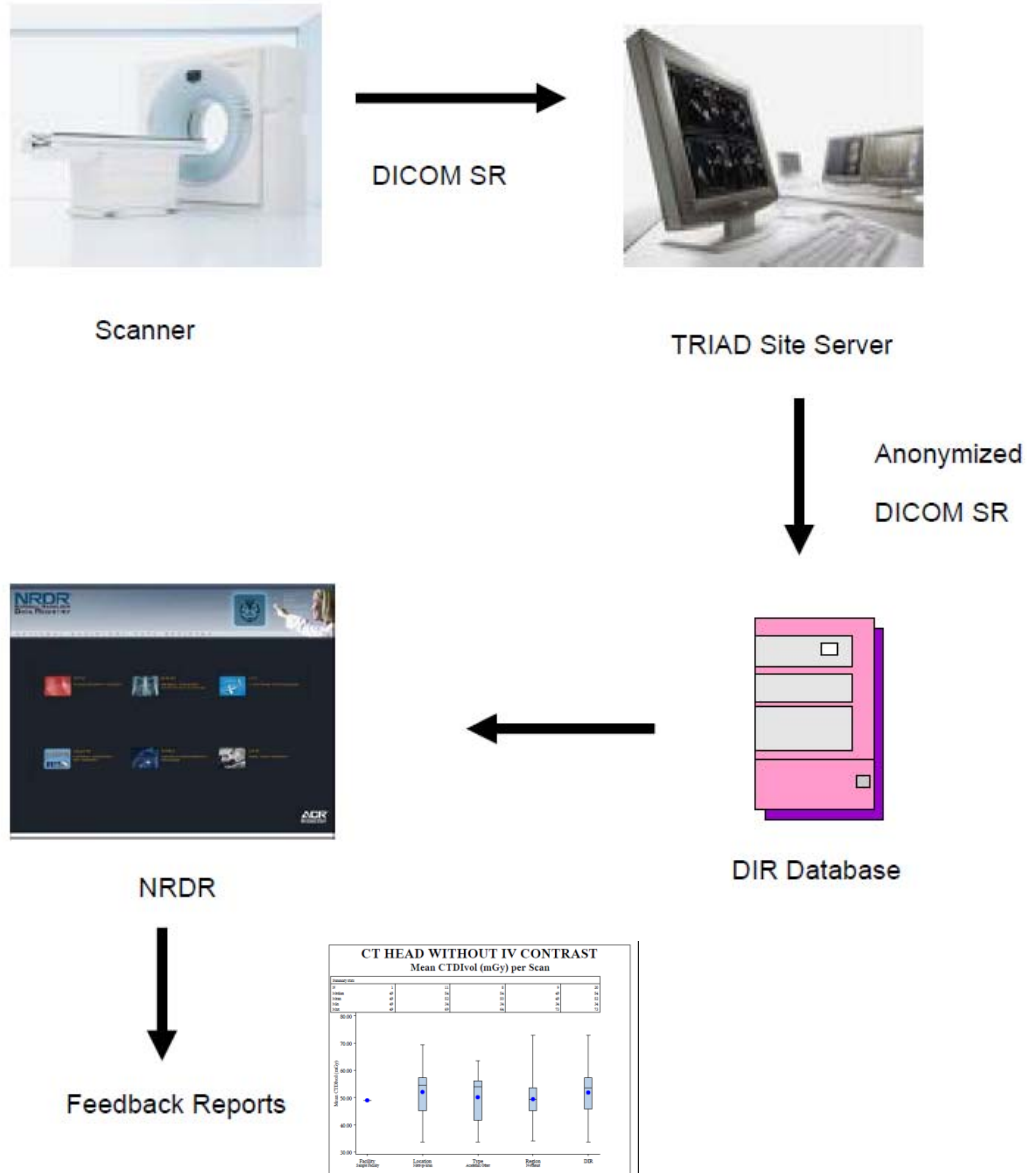


**NOPR**  
NATIONAL ONCOLOGIC  
PET REGISTRY



**NMD**  
NATIONAL MAMMOGRAPHY  
DATABASE

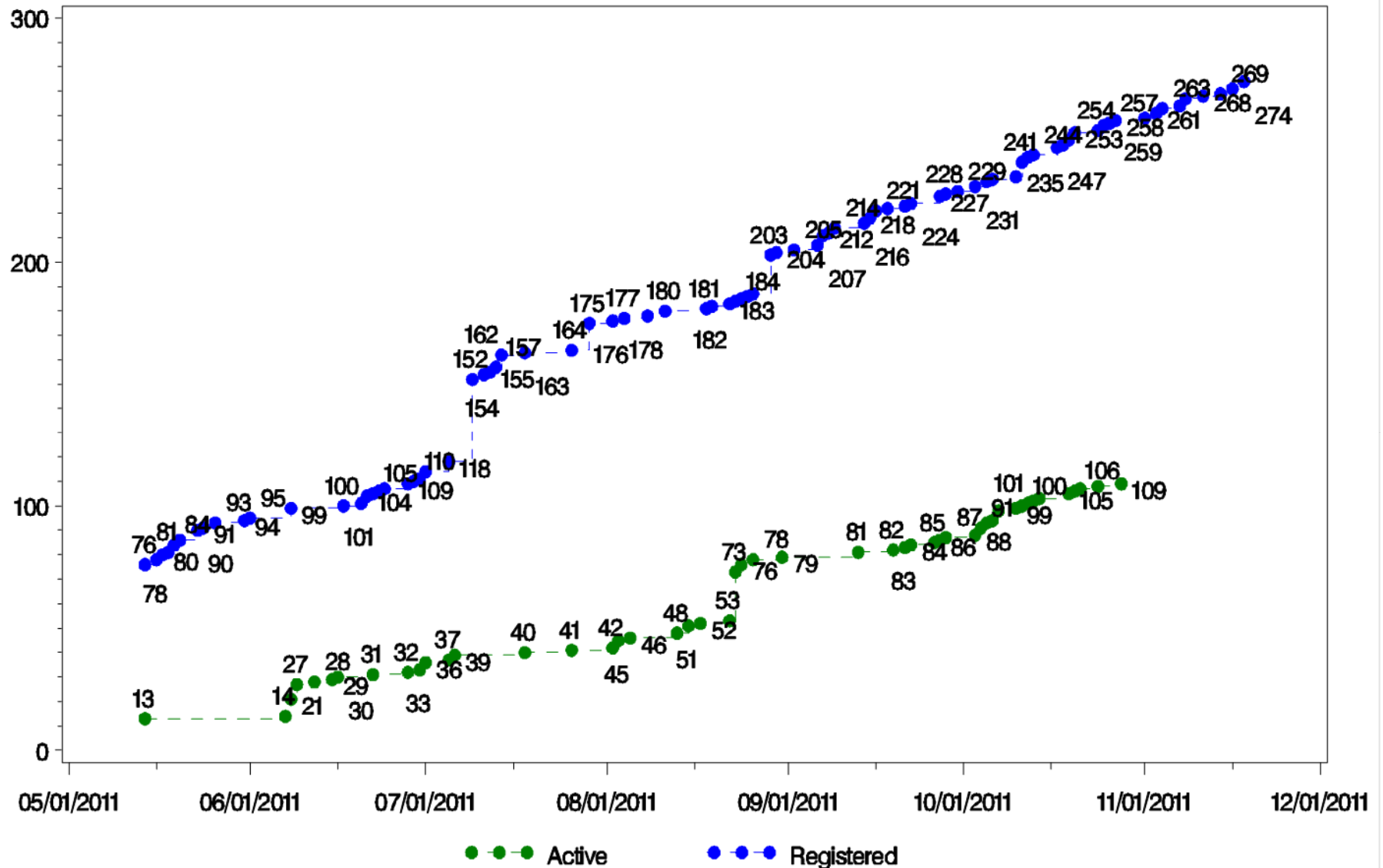
# How does it work?



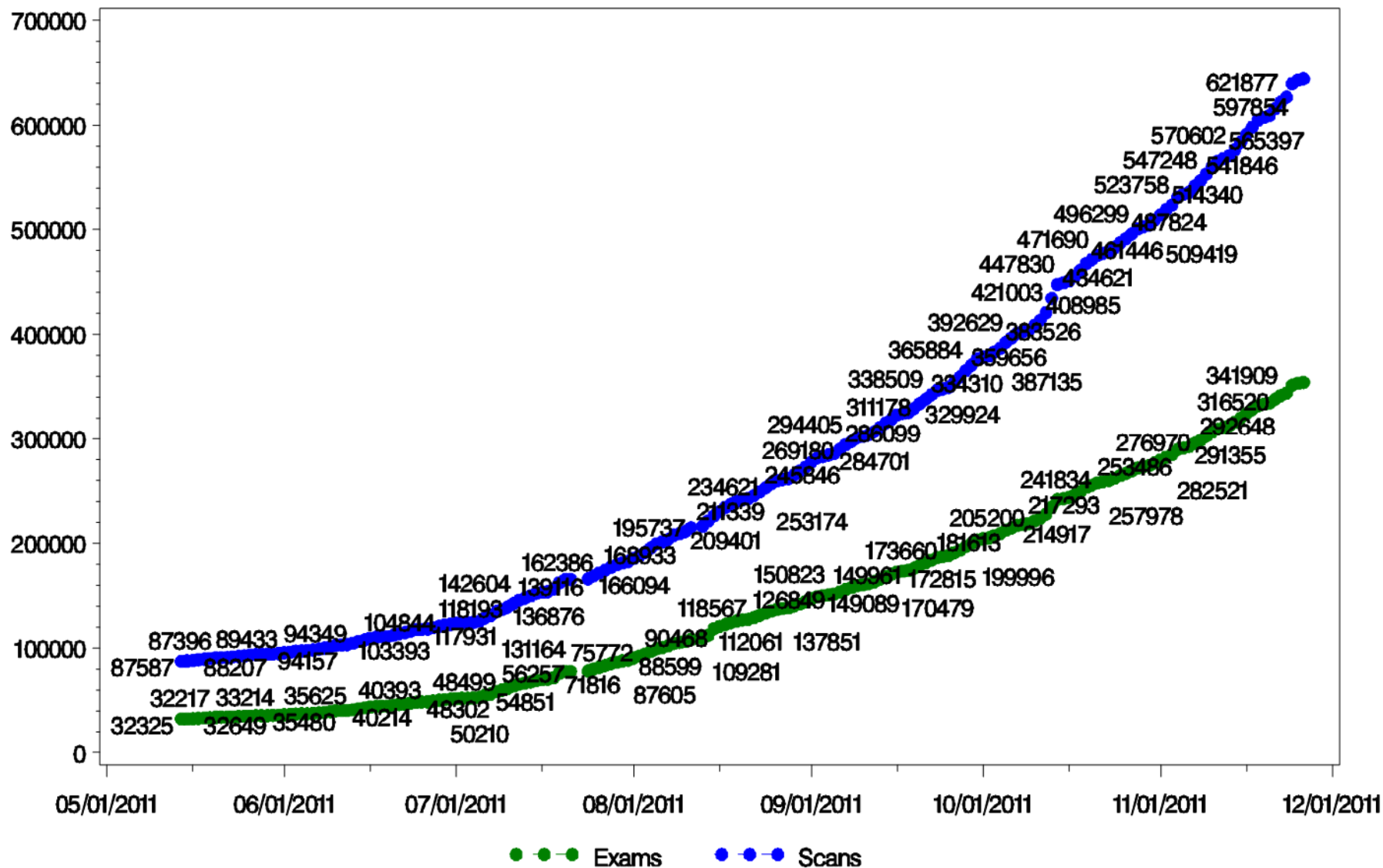
# Registration Process

- Sign Participation Agreement
- Register on NRDR website
- Download software to transmit data
  - We will contact you and walk you through the installation
- Configure scanners (or PACs)
- Data transmission to NRDR is **completely automated** – no personnel required beyond initial setup

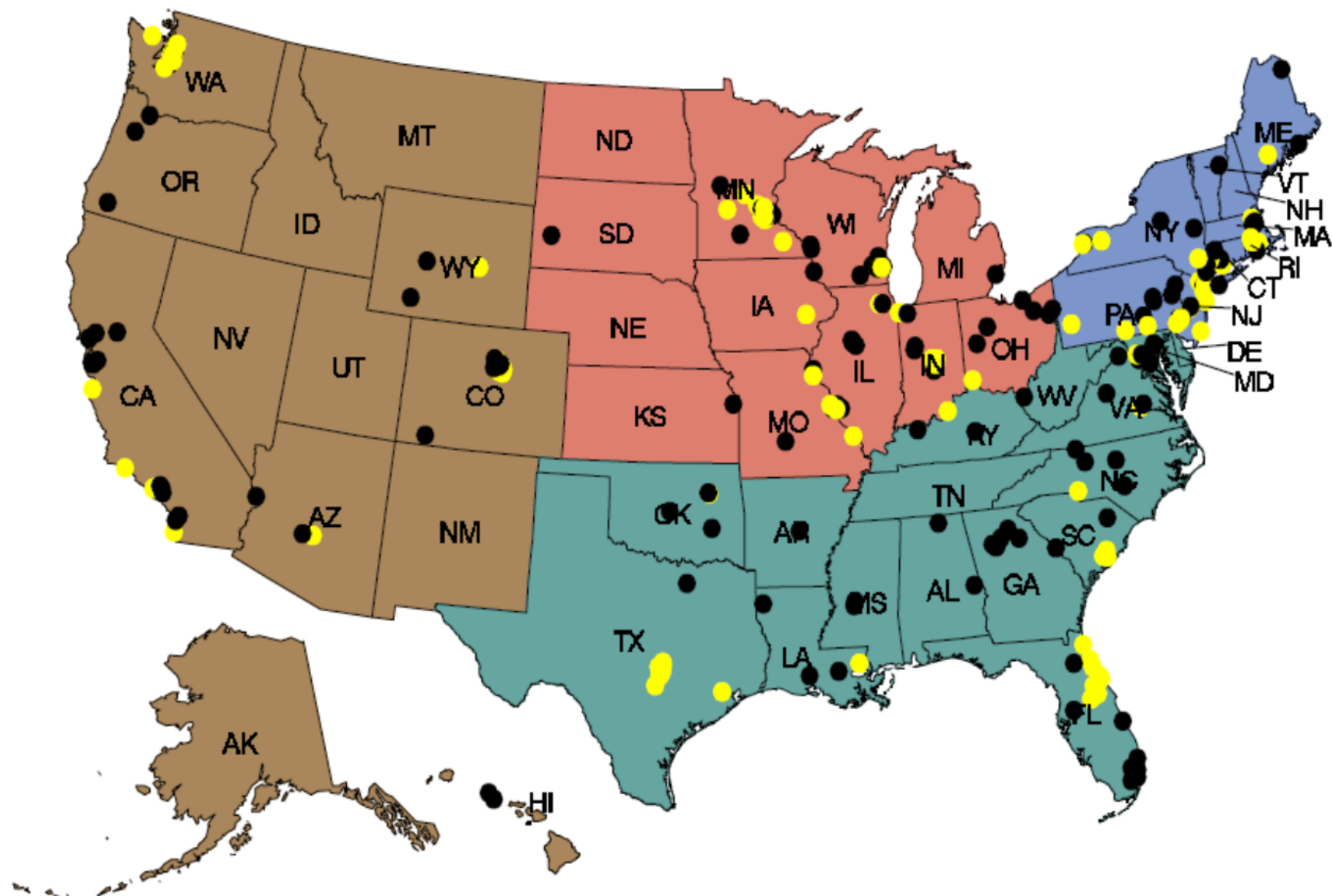
# DIR Registration Tracking



# DIR Tracking



DIR Facilities  
As of November 26, 2011



Yellow dots indicate DIR facilities registered and contributing data.  
Black dots indicate DIR facilities registered but not yet contributing.



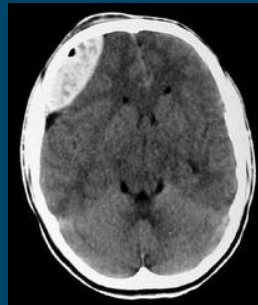
# International Participation

Country	Registered	Interested
Brazil	2	2
Spain	1	0
UK (Ireland)	1	0
Canada	0	4
Argentina	0	1
Switzerland	0	1
New Zealand	0	1



# Mapping Exam Names

- 1,410 names related to “Head” or “Brain”
- CT Head Without contrast
  - 224 different names from 60 facilities
  - 20,677 exams
- Brain Perfusion
  - 20 different names from 7 facilities
  - 103 exams



# Examples of Names

- Head^HEAD\_WO (Adult)
- Head^RoutineHead (Adult)
- BRAIN WO CT
- BRAIN CT
- BRAIN NO IV CT
- BRAIN WO CT
- HEAD OR BRAIN W/O C CY
- BRAIN WO CT HEAD WITHOUT CNTRST
- HEAD WITHOUT

- BRAIN
- BRAIN W/O IVC
- BRAIN W/OUT
- BRAIN W/VO
- BRAIN W/WOUT
- BRAIN/W/O
- BRAIN/WO CC CT
- BRAIN W/O CT SCAN
- HEAD W O CONTR
- BRAIN WITHOUT

- CT SCAIN BRAIN
- CT SCAN BRAIN
- CT SCAN BRAIN WITHOUT
- HEAD CT
- HEAD/ BRAIN C-
- HEAD C- CT
- HEAD NO CONTRAST
- CT HEAD NW CONTRAST
- CT HEAD WO CONT

# Summary of Dose Indices

Exam	N	Mean	Med	Std Dev	Coeff of Var	Min	Max
CT HEAD WITHOUT IV CONTRAST	20,677	72	60	36	50	2.7	702
CT HEAD PERFUSION	103	525	184	732	139	34.3	2860

## ACR CT Accreditation Dose Pass/Fail Criteria and Reference Levels

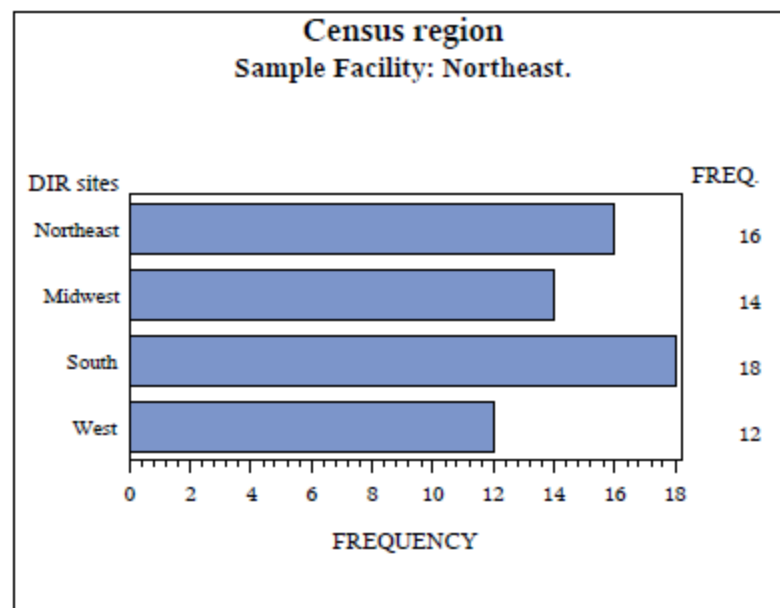
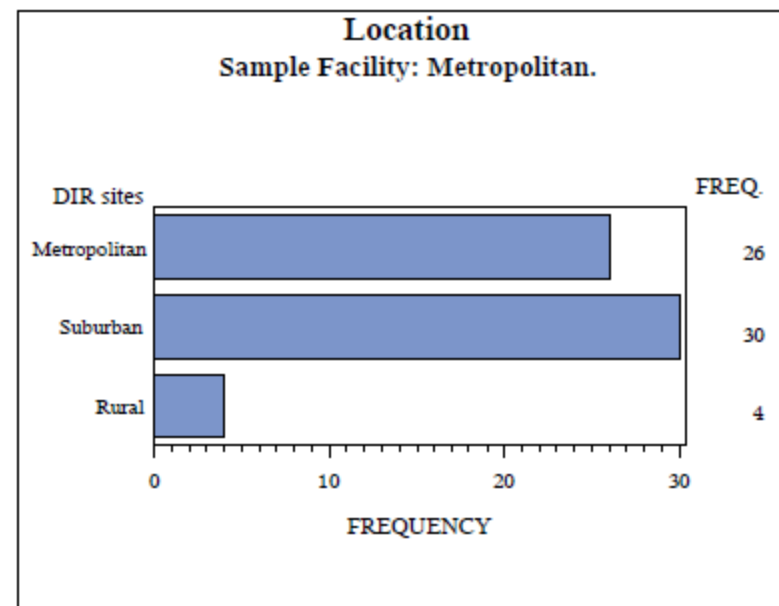
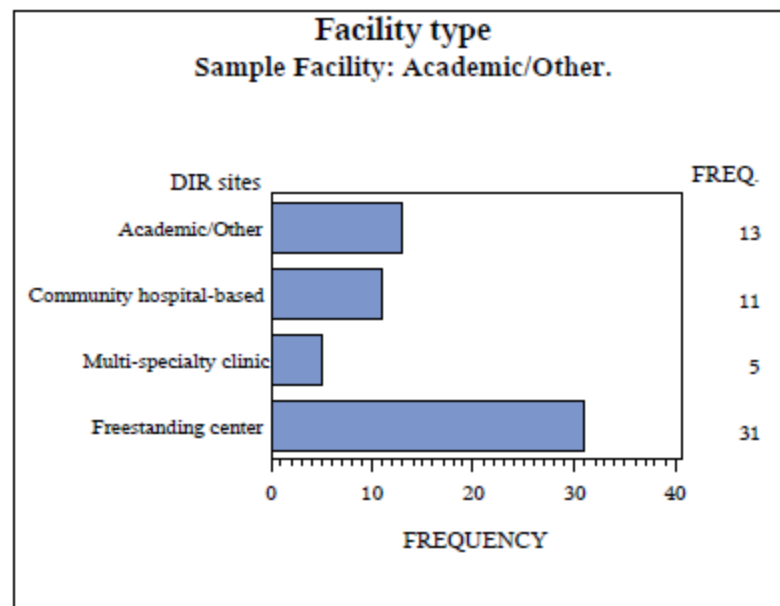
Examination	Pass/Fail Criteria	Reference Levels
	CTDI <sub>vol</sub> (mGy)	CTDI <sub>vol</sub> (mGy)
Adult Head	80	75
Adult Abdomen	30	25
Pediatric Abdomen (5 year old)	25	20

# Outlier

CT Head Scan wo Contrast	Mean CTDIvol
Scan 1	59
Scan 2	546
Scan 3	37
Scan 4	60
<b>Total:</b>	<b>702</b>



# *DIR Facility Characteristics* *Fall 2011*

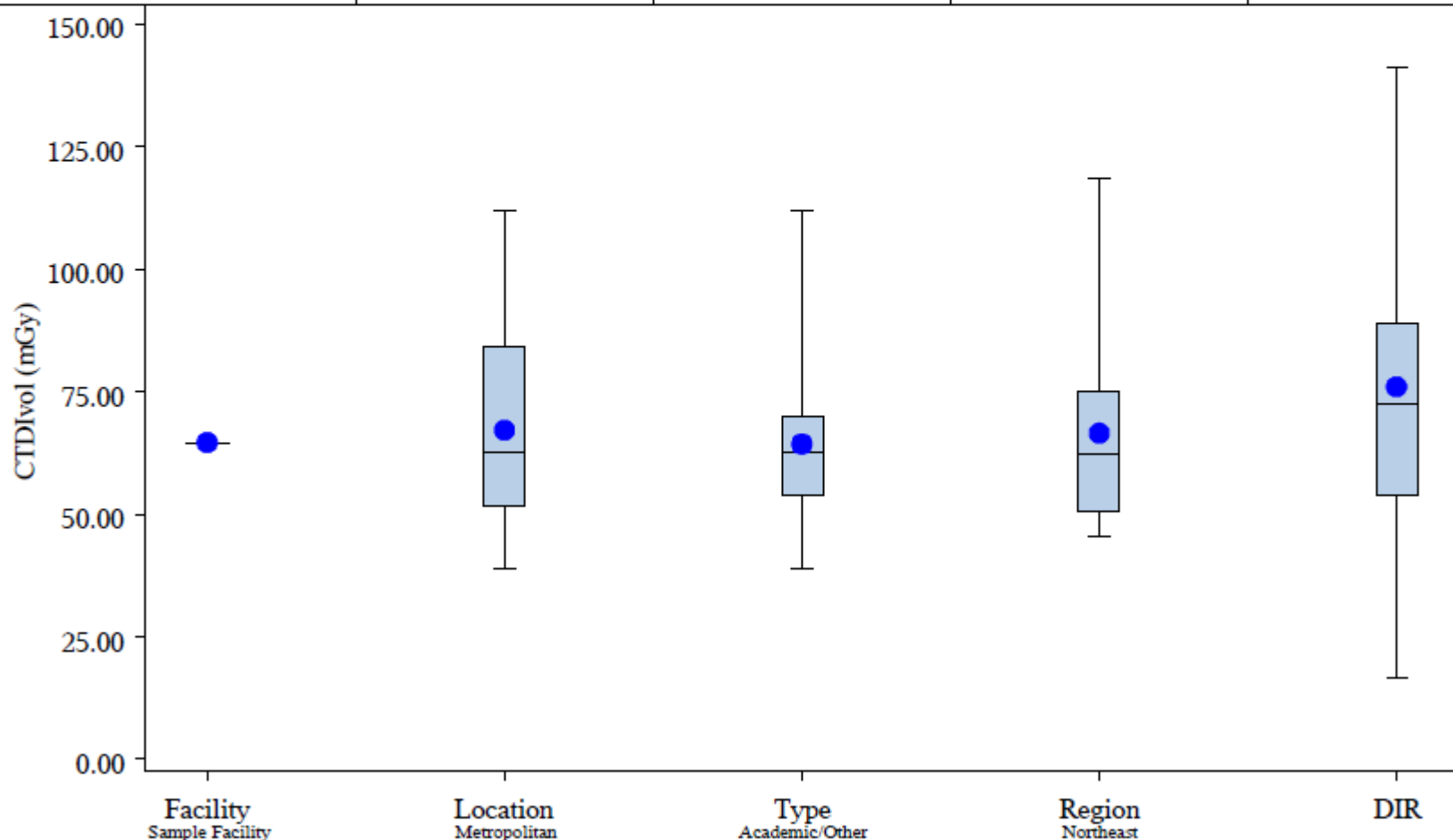


# CT HEAD WITHOUT IV CONTRAST

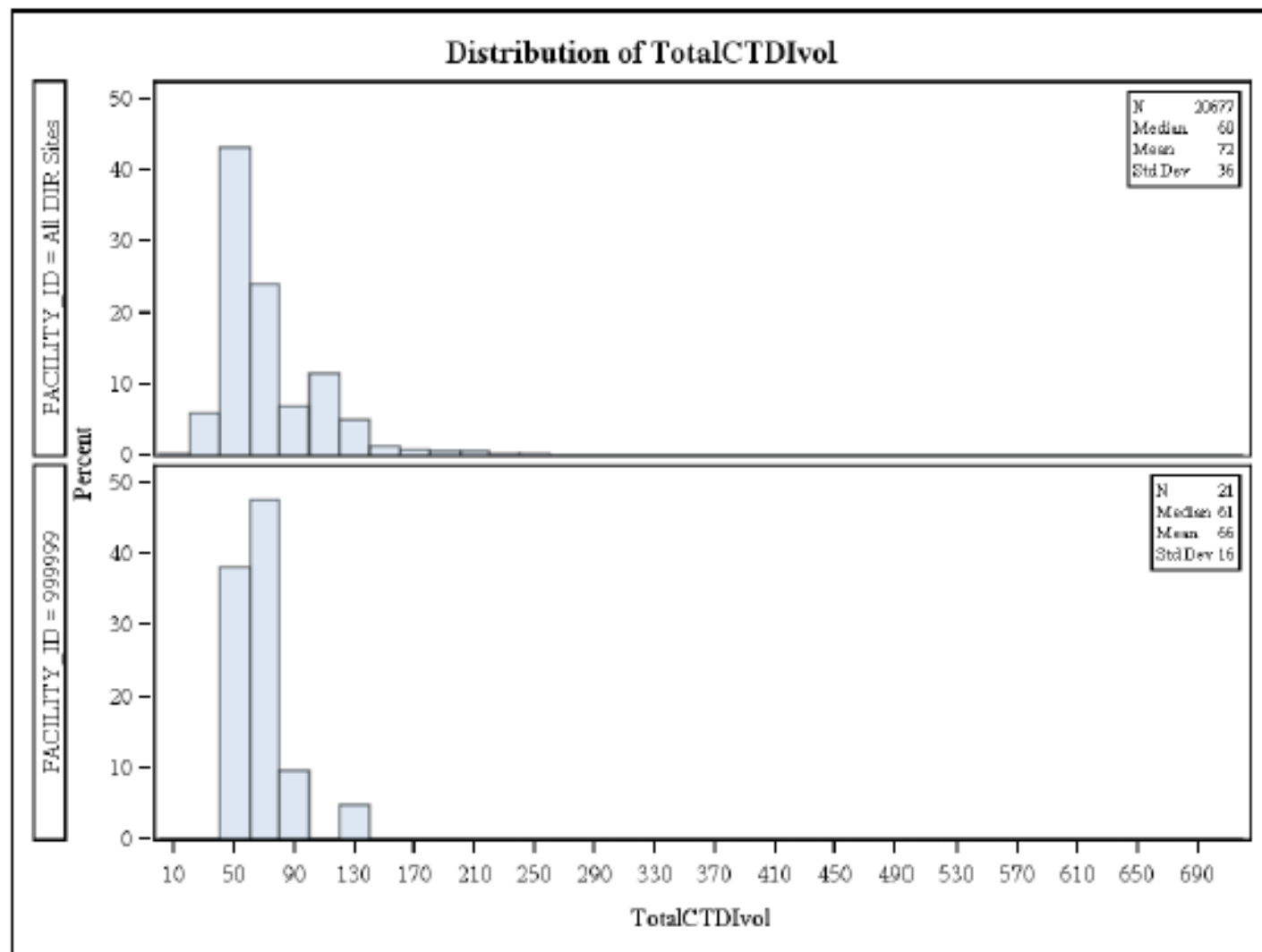
## CTDIvol (mGy) per Exam

Summary stats

N	1	25	13	16	59
Median	65	62	62	62	73
Mean	65	67	64	67	76
Min	65	39	39	45	17
Max	65	112	112	118	141



***CT HEAD WITHOUT IV CONTRAST***  
***Per Exam***

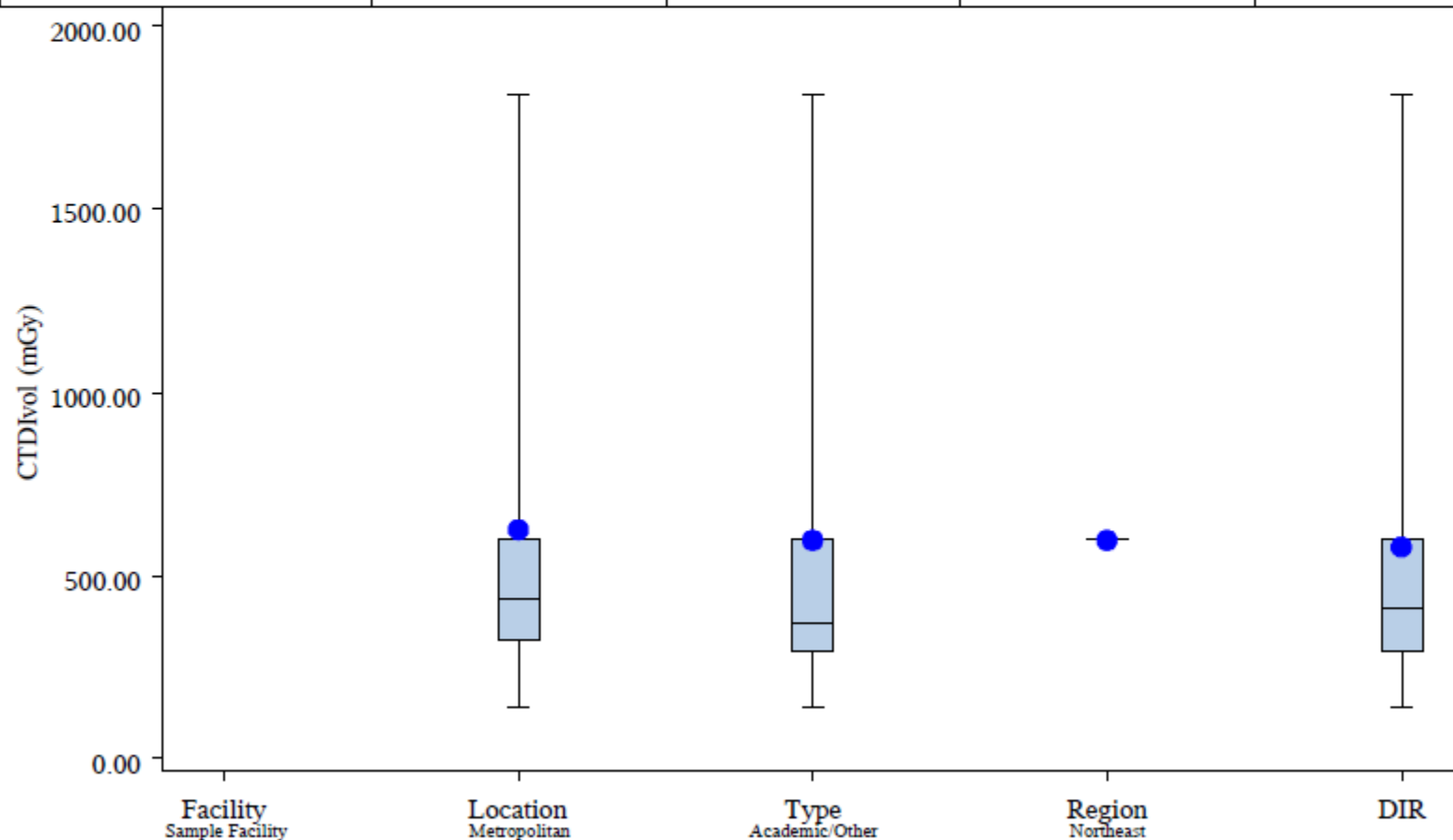


# CT HEAD PERFUSION

## CTDIvol (mGy) per Exam

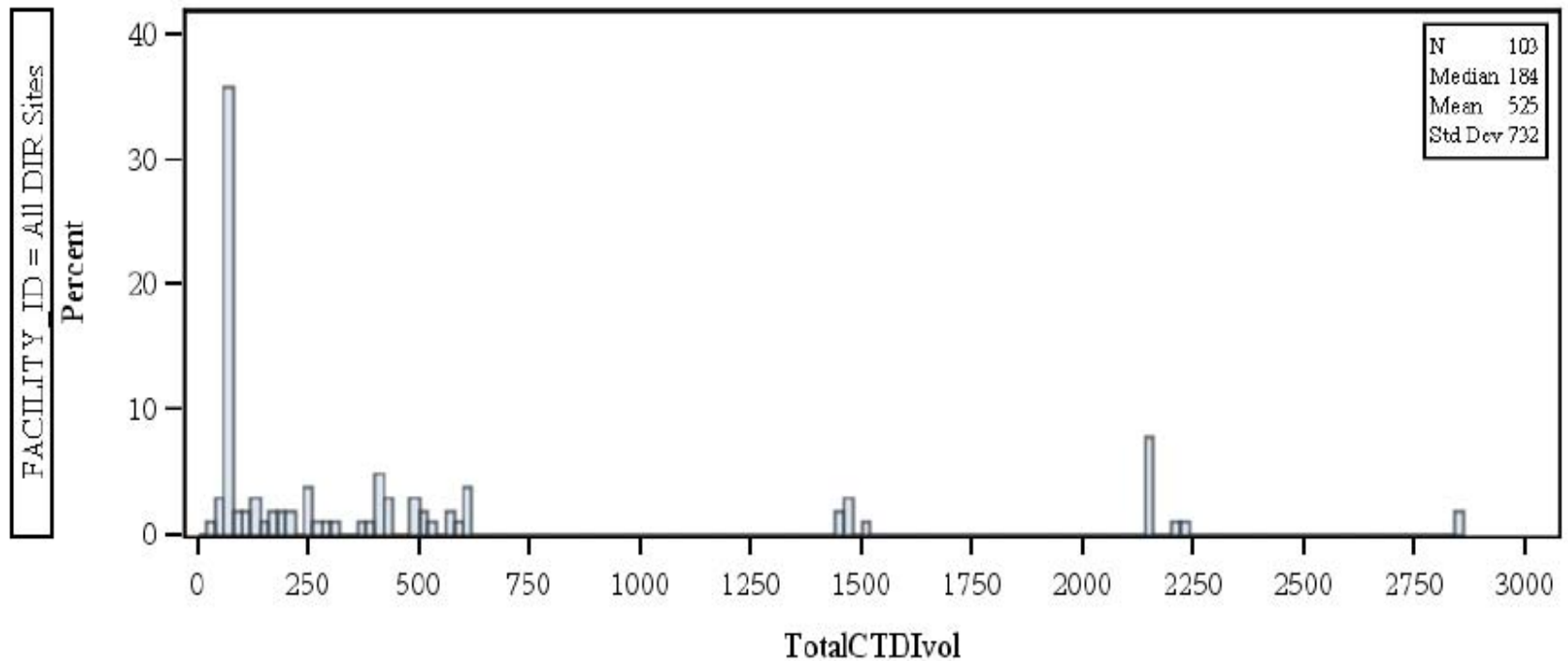
Summary stats

N	0	6	6	1	7
Median	.	439	368	598	411
Mean	.	626	597	598	579
Min	.	140	140	598	140
Max	.	1816	1816	598	1816



***CT HEAD PERFUSION  
Per Exam***

**Distribution of TotalCTDIvol**



# Summary

- Average is used to summarize “typical” value at the facility and is compared using box-plots
- Outlier records at your facility can be identified using the overall distribution chart
- Look at your own facility’s data periodically
- Examine protocol names before exploring the protocols

# Conclusions

- New facilities every week
- Exam name standardization is needed
- Reference levels are coming
- Adjustment for patient size is coming

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