

Lumbar Imaging with Reporting of Epidemiology (LIRE): Preliminary Results of a Secondary Aim

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NIH Health Systems Collaboratory Grand Rounds 1/26/18

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Disclosures (Jarvik)

- **Physiosonix:** ultrasound company, Founder/stockholder
- **Healthhelp:** utilization review, consultant
- **UpToDate:** Section Editor
- **Evidence Based Neuroimaging Diagnosis and Treatment:** Springer, Co-Editor

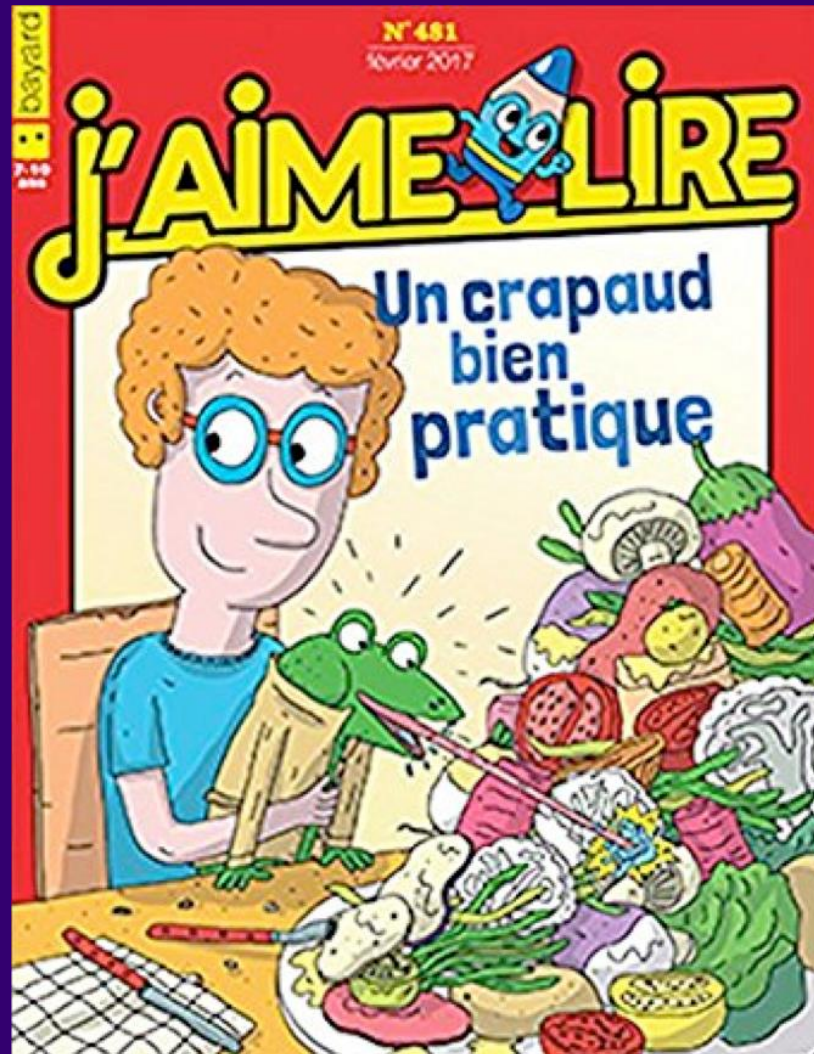


Talk Outline

- Brief review of study goals/design
- Progress to date
- Subsequent MR/CT imaging through 90 days
- Next steps



LIRE (pronounced *leer*)
from the French verb, 'to read'.

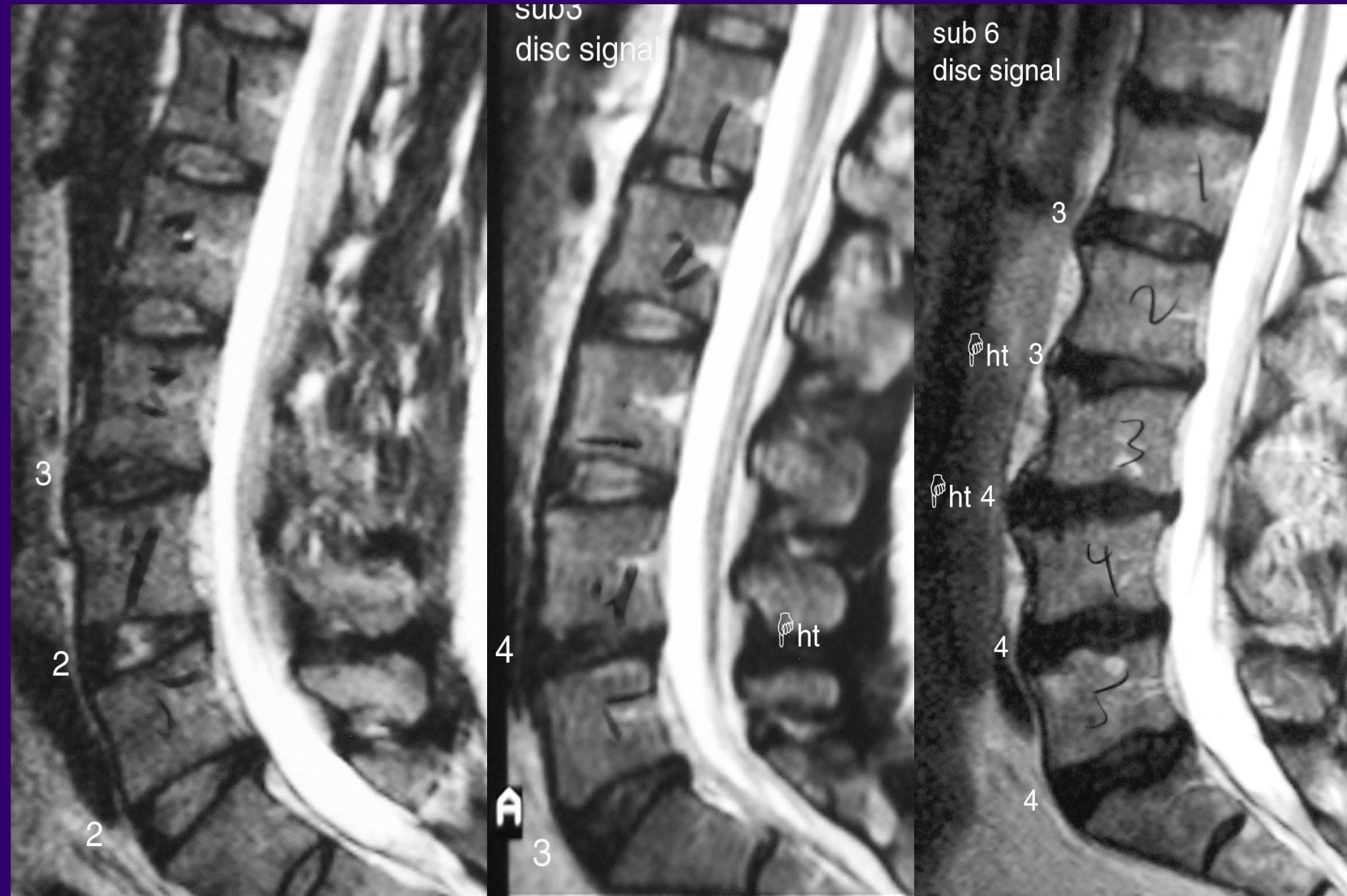


Background and Rationale

- Lumbar spine imaging frequently reveals incidental findings
- These findings may have an adverse effect on:
 - Subsequent healthcare utilization
 - Patient health related quality of life



Disc Degeneration in Asx



Primary Hypothesis

- For patients referred from primary care, inserting prevalence benchmark data in lumbar spine imaging reports will reduce overall spine-related healthcare utilization as measured by spine-related relative value units (RVUs)

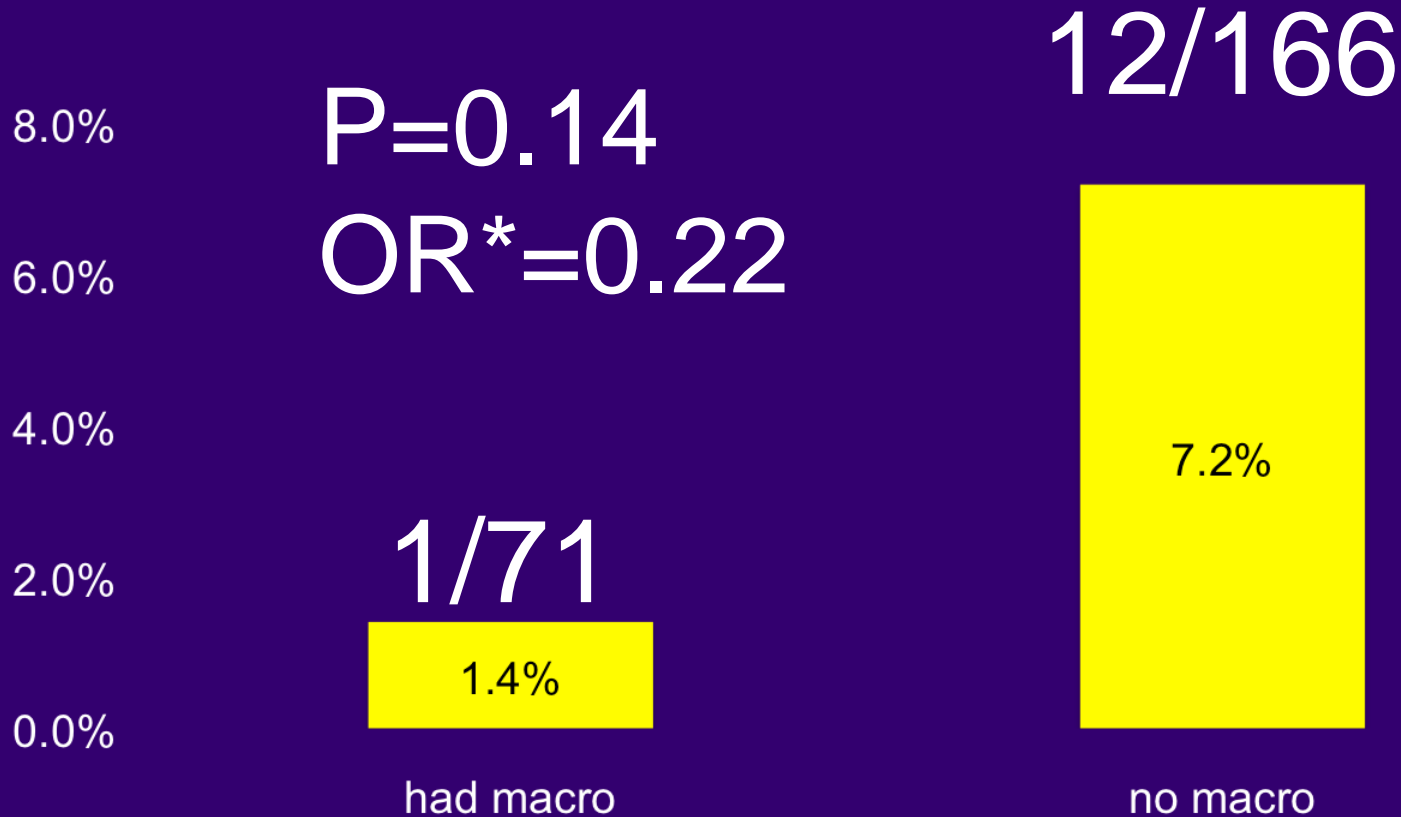


Secondary Hypotheses

- We also hypothesized that the intervention would decrease:
 - Subsequent cross-sectional imaging (MR/CT)
 - Opioid prescriptions
 - Spinal injections
 - Surgery



Retrospective Pilot Results: Subsequent Imaging Within 1 Yr



* Adjusted for imaging severity



Published this week...

Radiology

Jessica G. Fried, MD
Angeline S. Andrew, PhD
Natalie Y. Ring, BS
David A. Pastel, MD

Changes in Primary Care Health Care Utilization after Inclusion of Epidemiologic Data in Lumbar Spine MR Imaging Reports for Uncomplicated Low Back Pain¹

Results:

Patients in the statement group were 12% less likely to be referred to a spine specialist (137 of 187 [73%] vs 159 of 188 [85%]; $P = .007$) and were 7% less likely to undergo repeat imaging (seven of 187 [4%] vs 20 of 188 [11%], $P = .01$) compared with patients in the nonstatement group. The intervention was not associated with any change in narcotic prescription (53 of 188 [28%] vs 54 of 187 [29%]; $P = .88$) or with the rate of low back surgery (24 of 188 [13%] vs 16 of 187 [9%]; $P = .19$).

Conclusion:

In this study, inclusion of a simple epidemiologic statement in lumbar MR imaging reports was associated with decreased utilization in high-cost domains of low back pain management.



Intervention Text

The following findings are so common in normal, pain-free volunteers, that while we report their presence, they must be interpreted with caution and in the context of the clinical situation. Among people between the age of 40 and 60 years, who do not have back pain, a plain film x-ray will find that about:

- 8 in 10 have disk degeneration
- 6 in 10 have disk height loss

Note that even 3 in 10 means that the finding is quite common in people without back pain.



Randomization

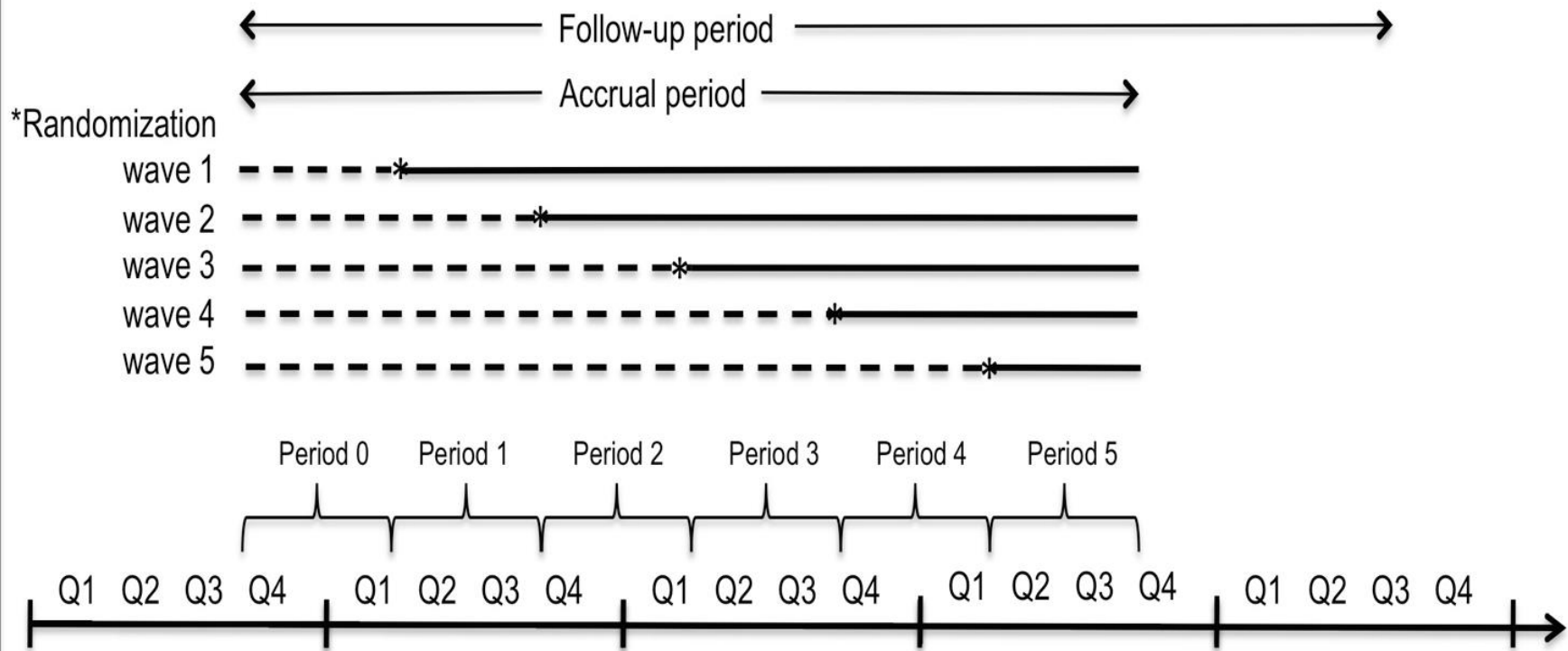
- Cluster (clinic)
- Stepped wedge (one way crossover)



Stepped Wedge RCT

— Exposed to LIRE intervention

- - - Unexposed to LIRE intervention



Participating Systems

Name	# Primary Care Clinics (Randomized)	# PCPs (Randomized)
Kaiser Perm. N. California	21	2,349
Henry Ford Health System, MI	26	187
Kaiser Permanente of Washington	19	365
Mayo Health System	34	400
Total	100	3,301



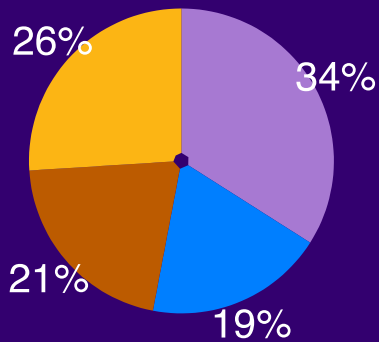
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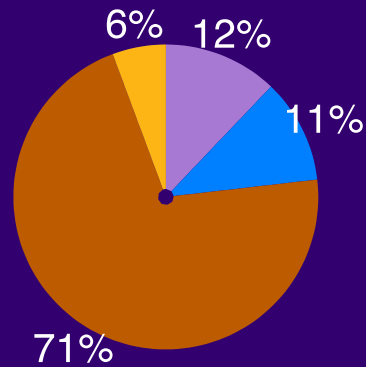


LIRE: Enrollment

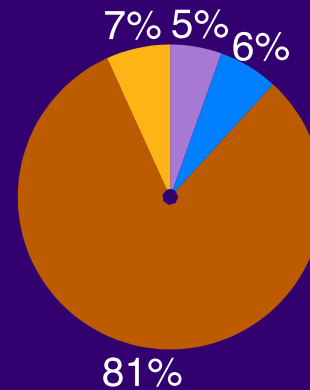
Clinics (n = 100)



Providers (n = 3,301)



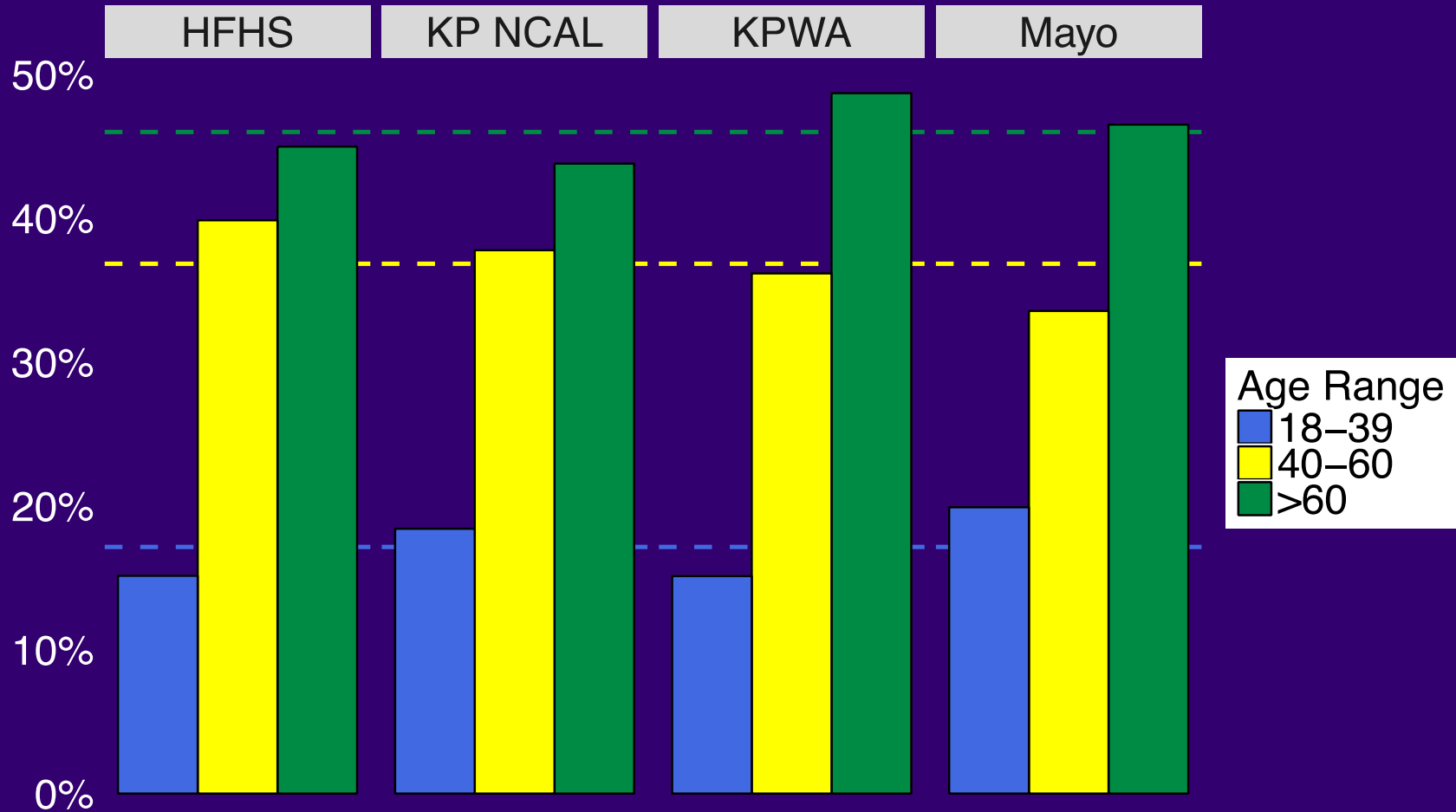
Patients (n = 246,289)



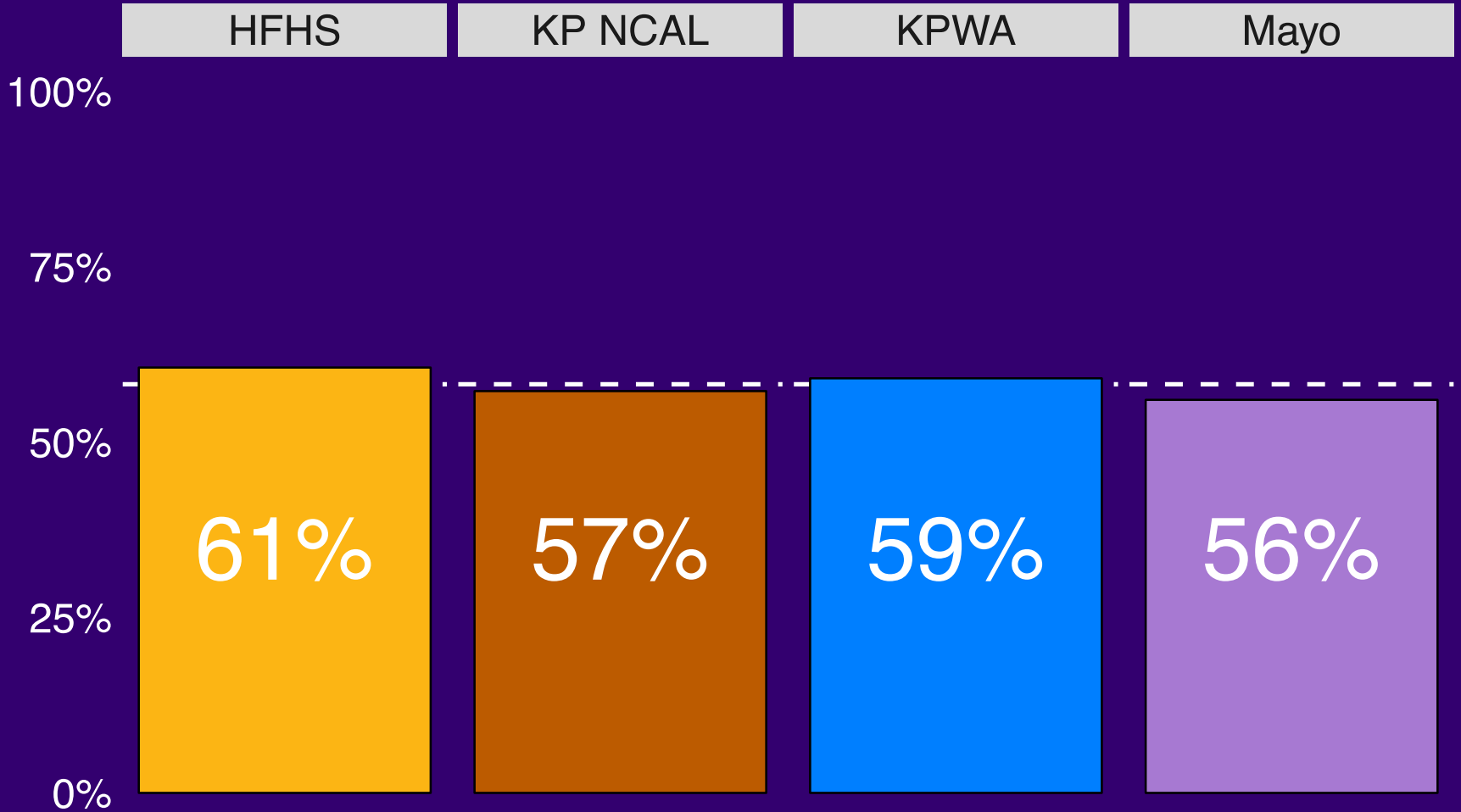
Demographics



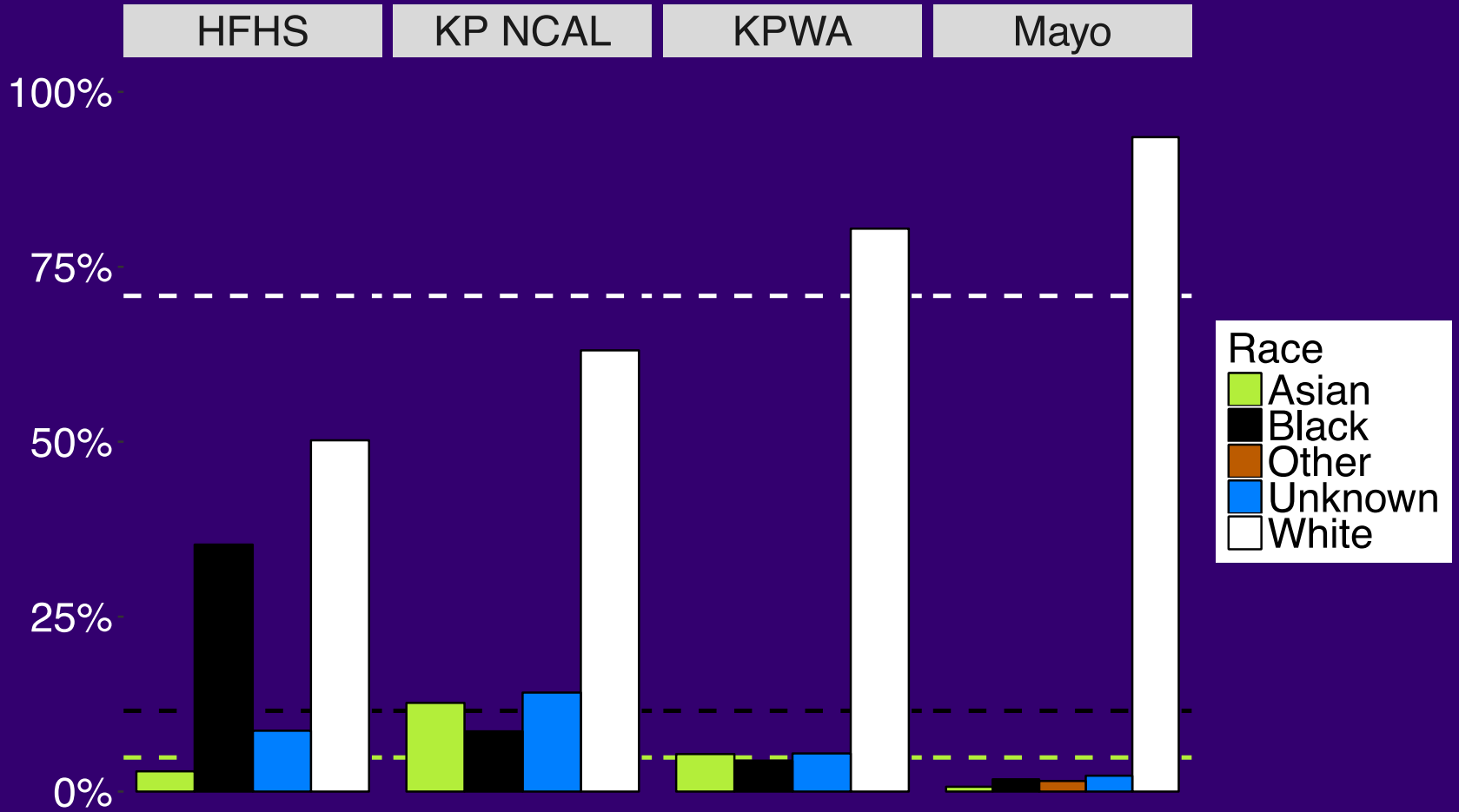
Patient age at index image



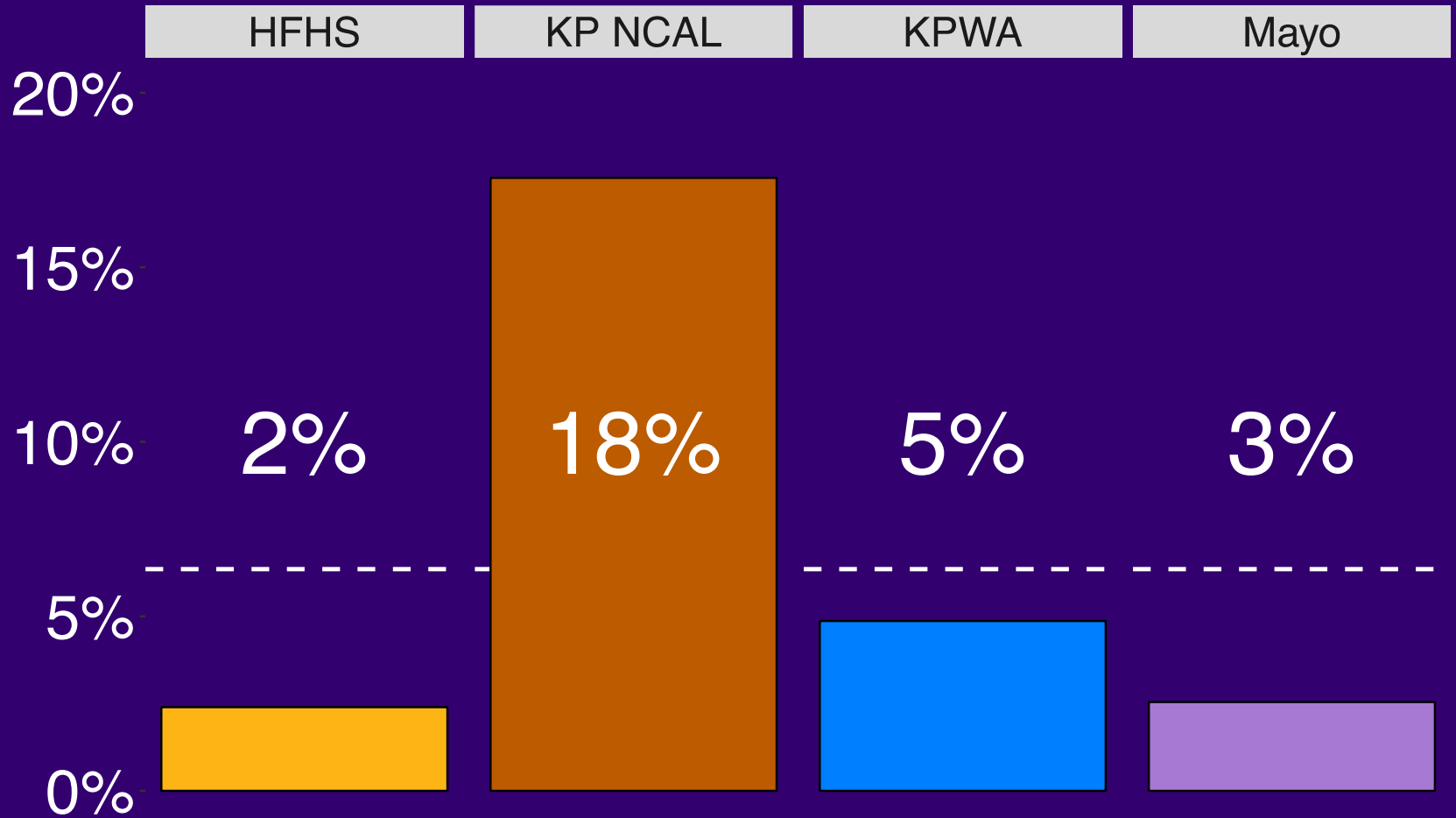
Female



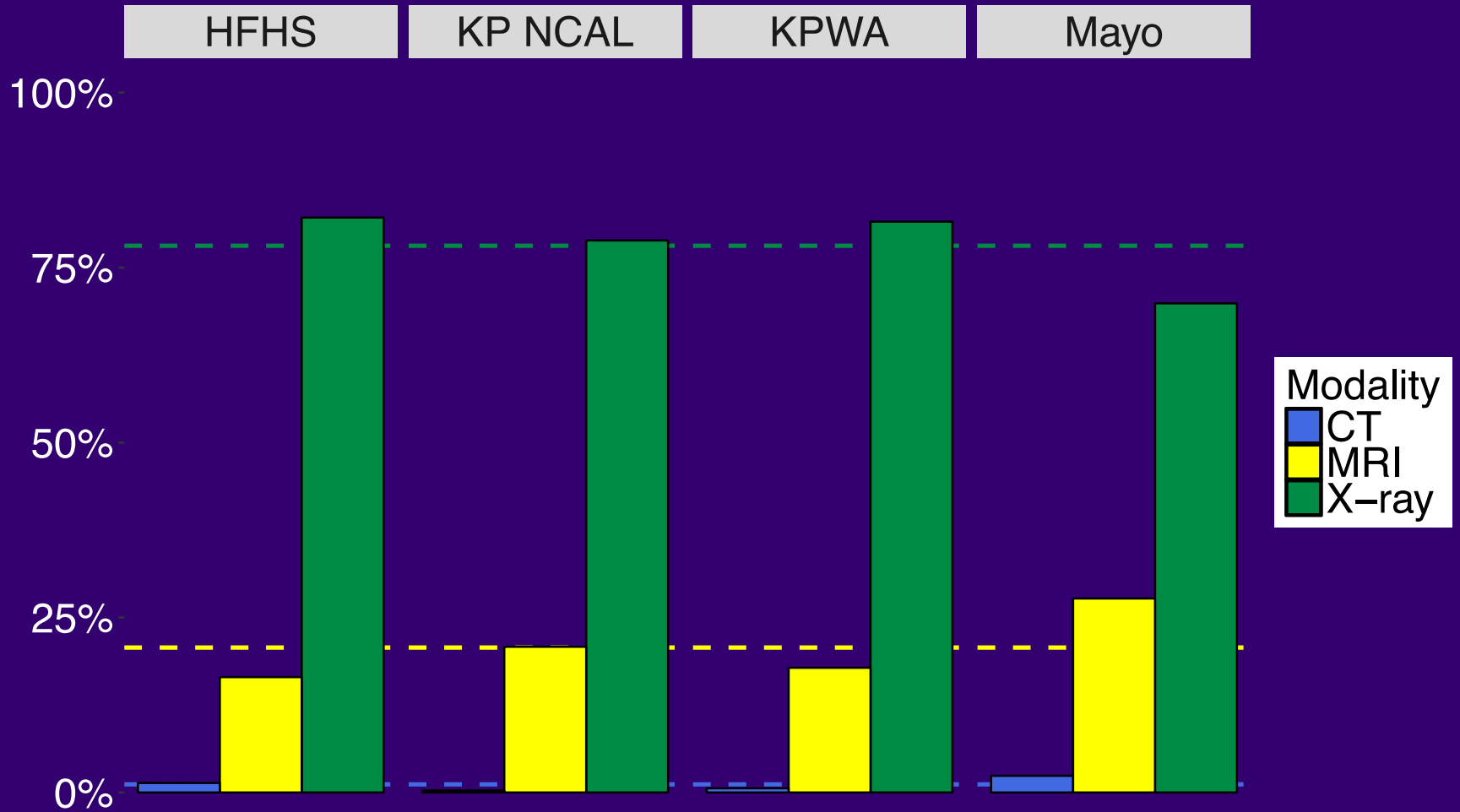
Race



Hispanic Ethnicity



Imaging Modality



Dealing with Complexities: Timing

O

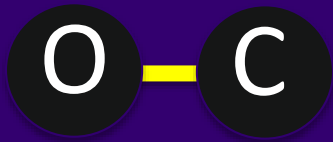
O = Ordered



Time

W

Dealing with Complexities: Timing



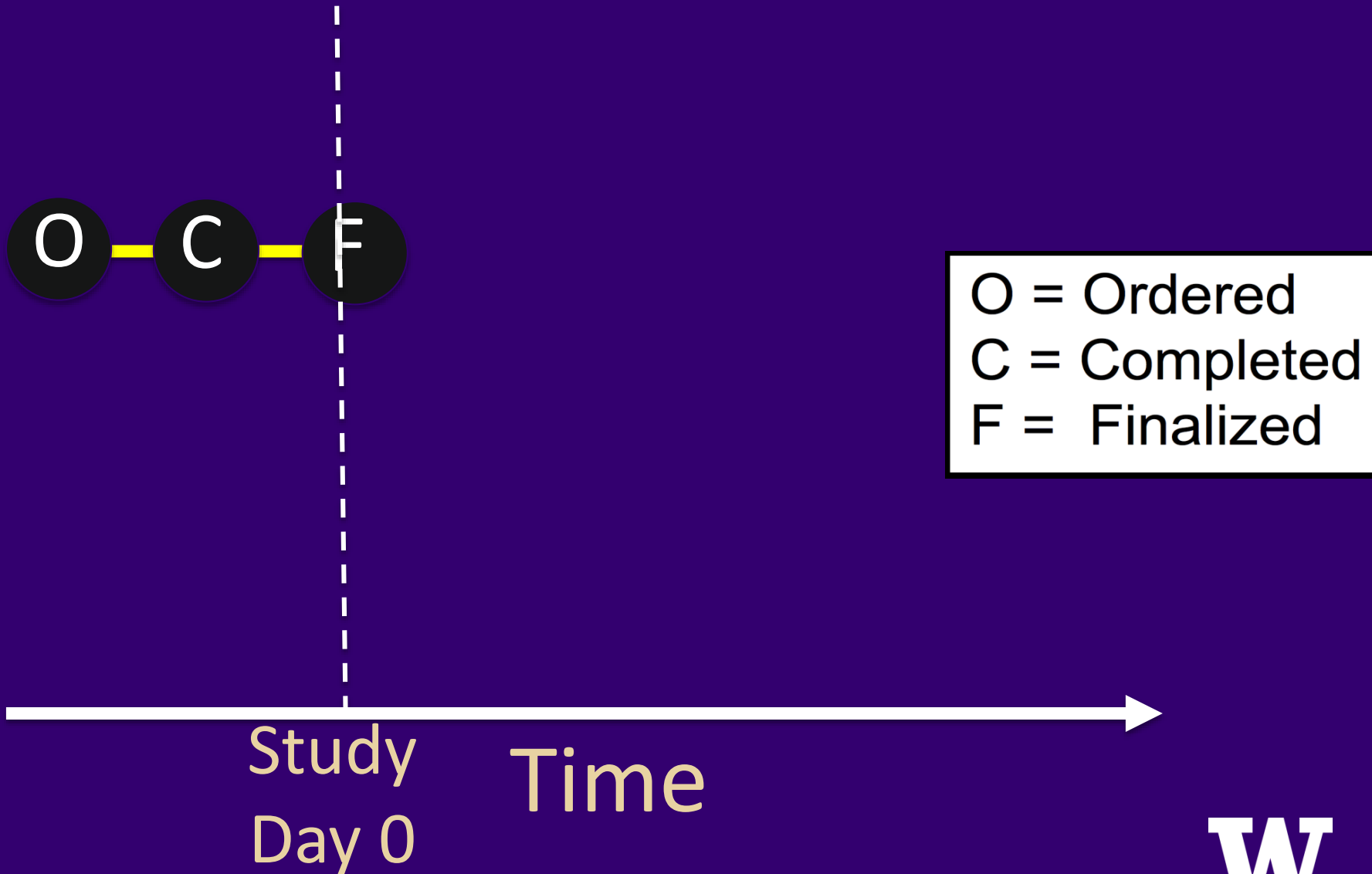
O = Ordered
C = Completed



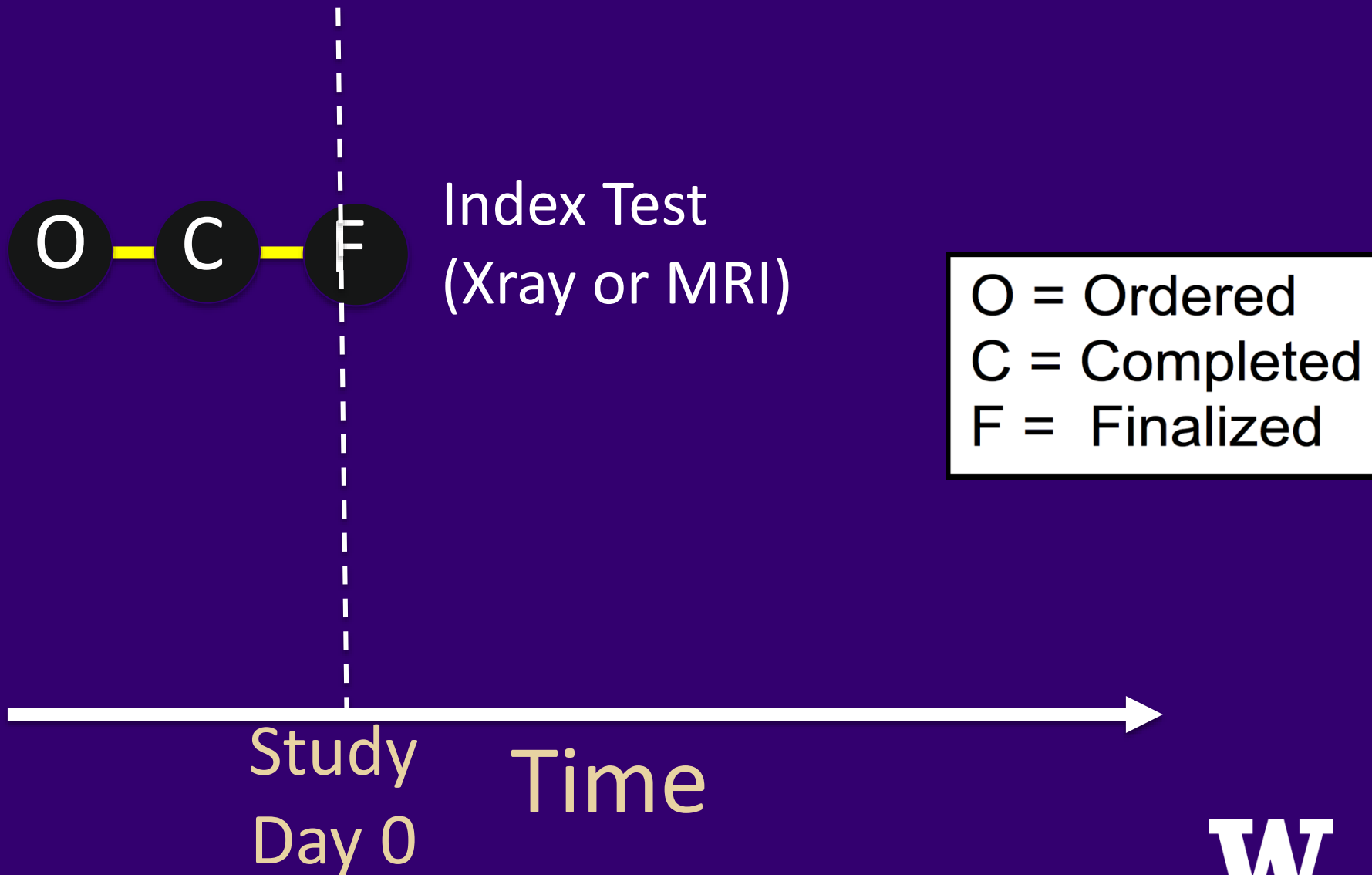
Time

W

Dealing with Complexities: Timing

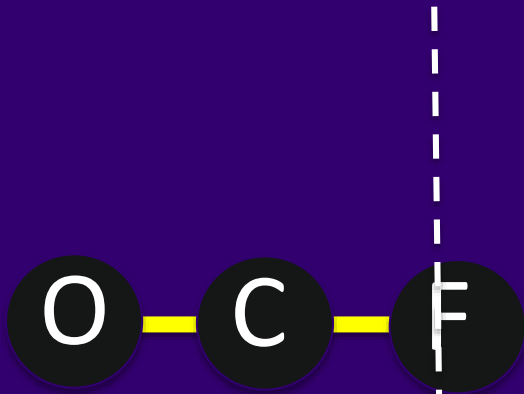


Dealing with Complexities: Timing



Outcome Definition (MR/CT)

O = Ordered
C = Completed
F = Finalized



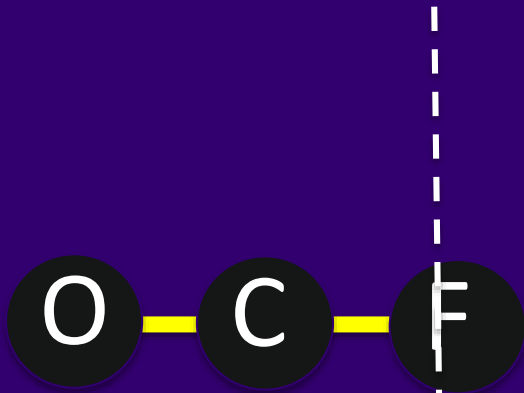
Study
Day 0

Study
Day 90



Outcome Definition (MR/CT)

O = Ordered
C = Completed
F = Finalized



Study
Day 0

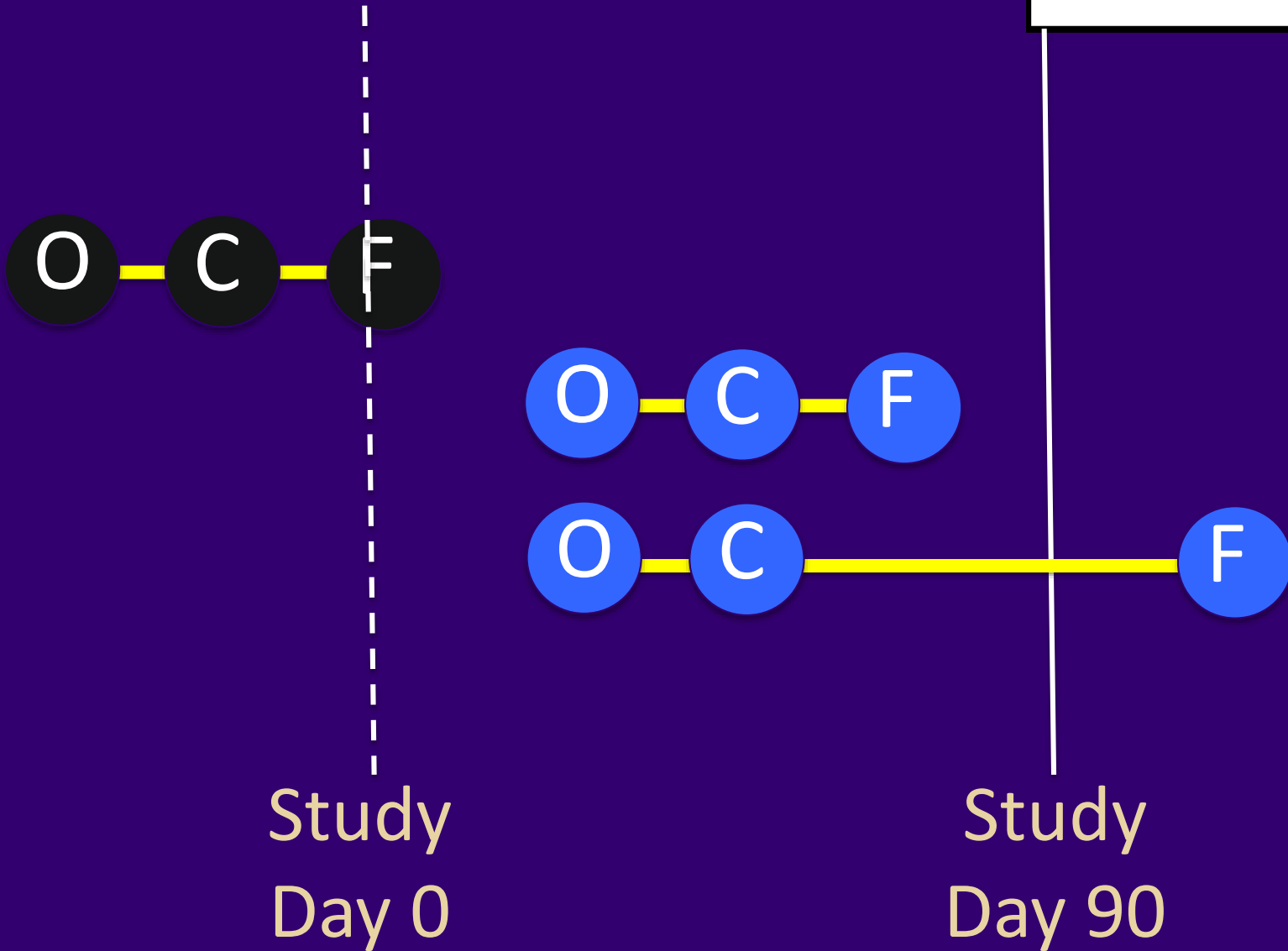


Study
Day 90



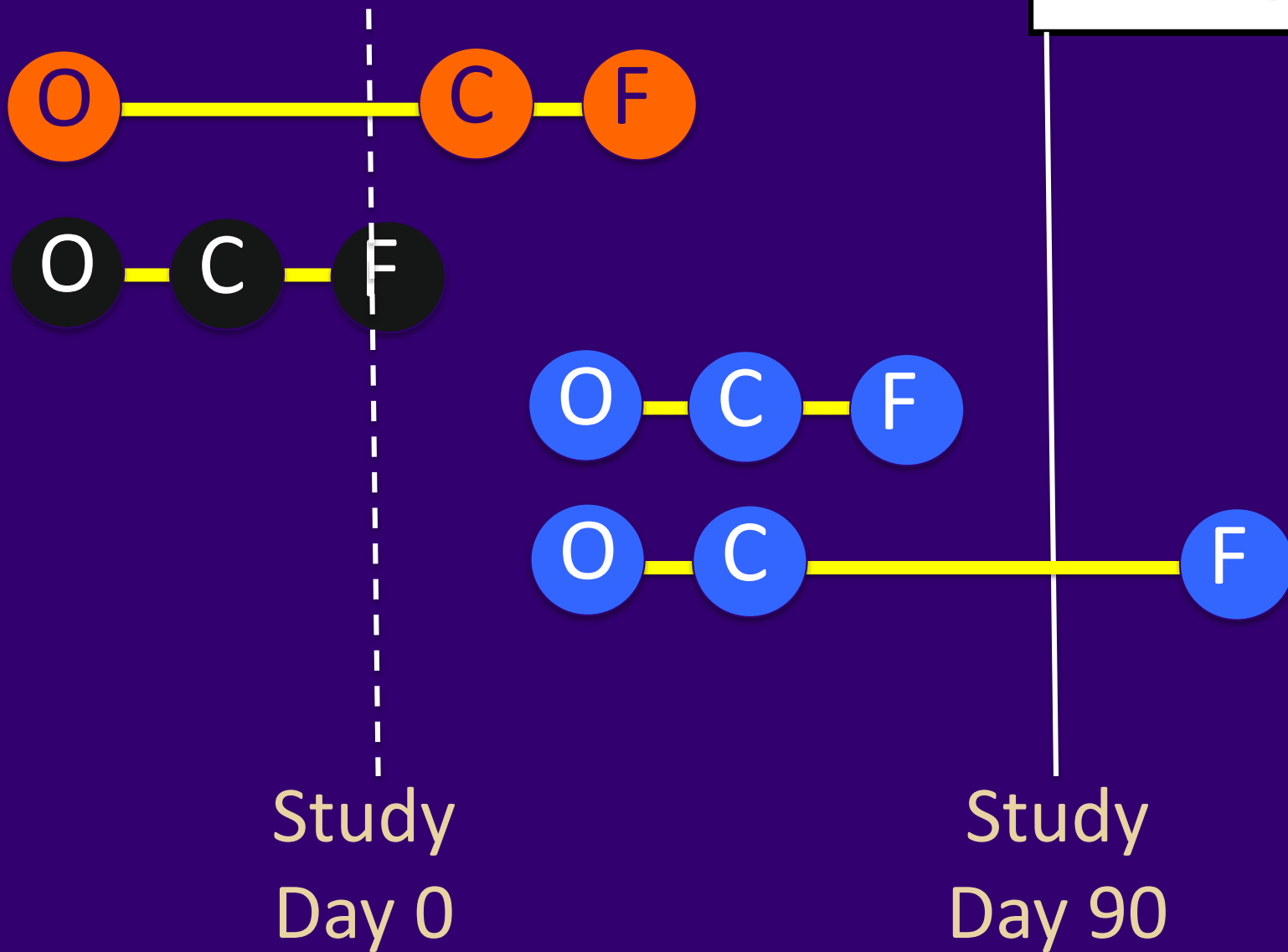
Outcome Definition (MR/CT)

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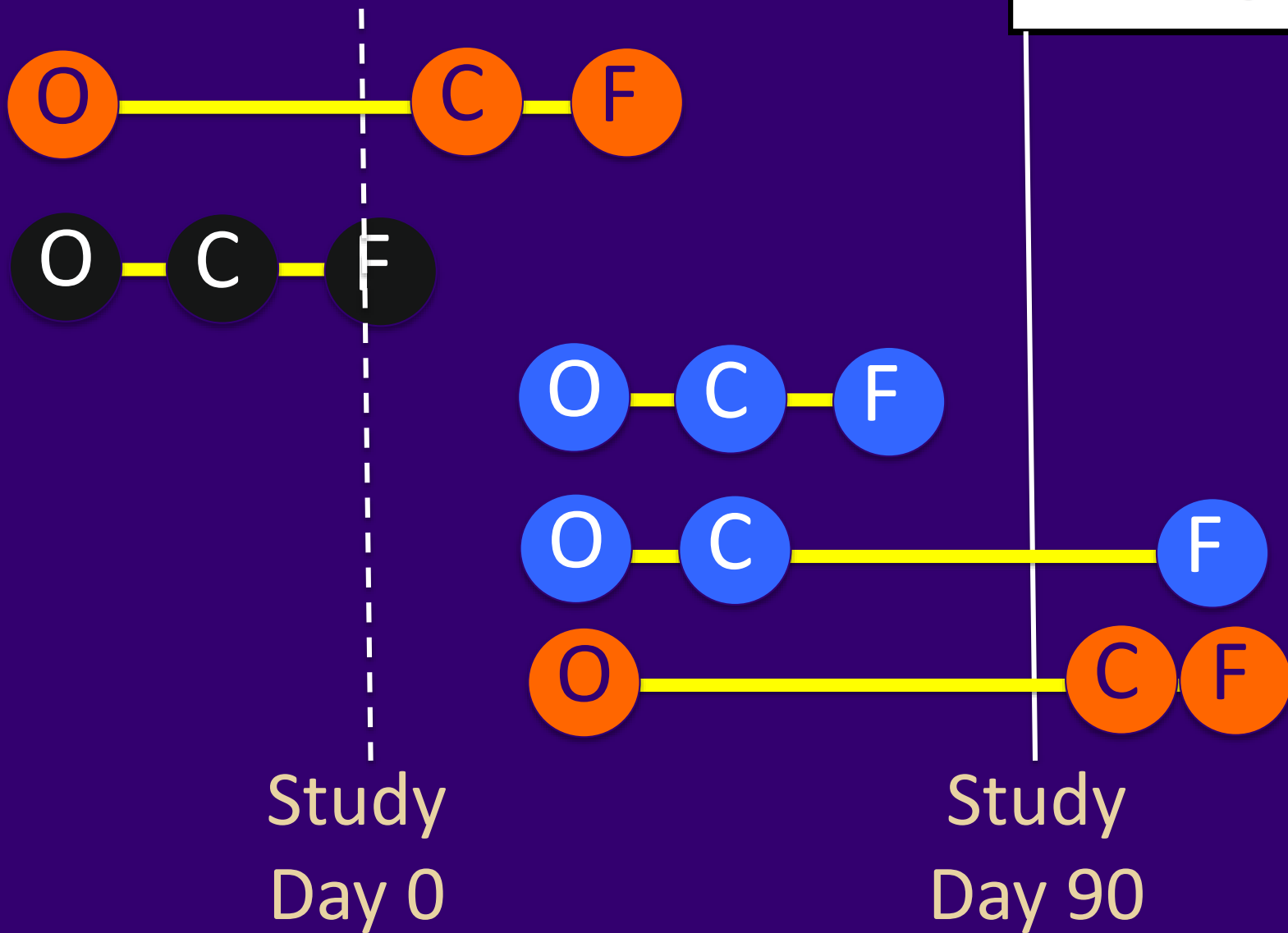
Outcome Definition (MR/CT)

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Outcome Definition (MR/CT)

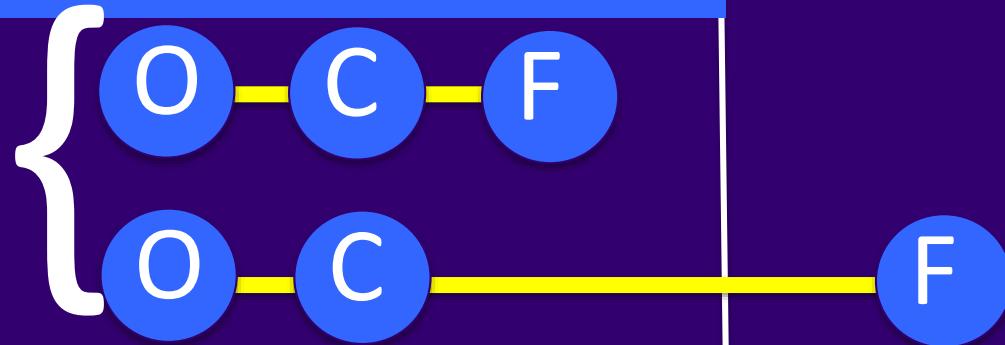
O = Ordered
C = Completed
F = Finalized



Ordered after index and completed within 90 days



	<u>Site A</u>	<u>Site B</u>
Xray	12.6%	13.5%
MR	1.9%	3.2%

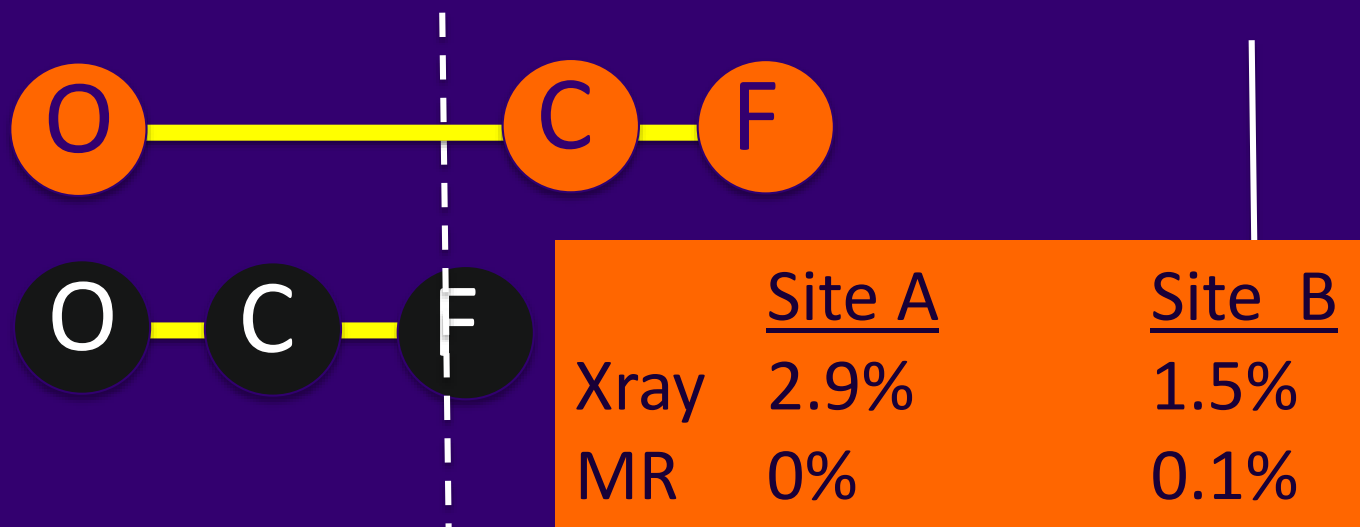


O = Ordered
C = Completed
F = Finalized

Study
Day 0

Study
Day 90

Ordered before index and completed between 0-90 days



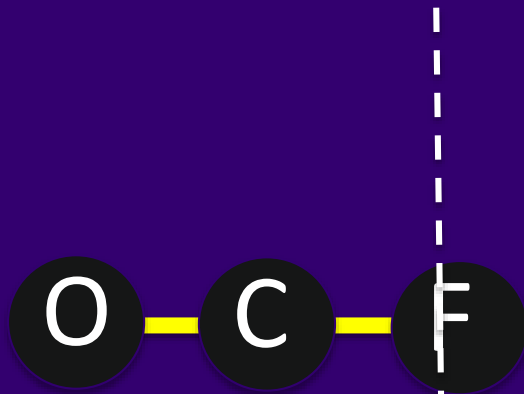
Study
Day 0

Study
Day 90

O = Ordered
C = Completed
F = Finalized



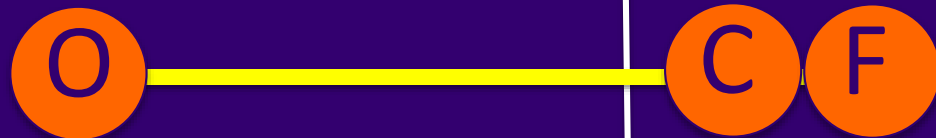
Ordered 0-90 days after index but finalized after 90 days



O = Ordered
C = Completed
F = Finalized

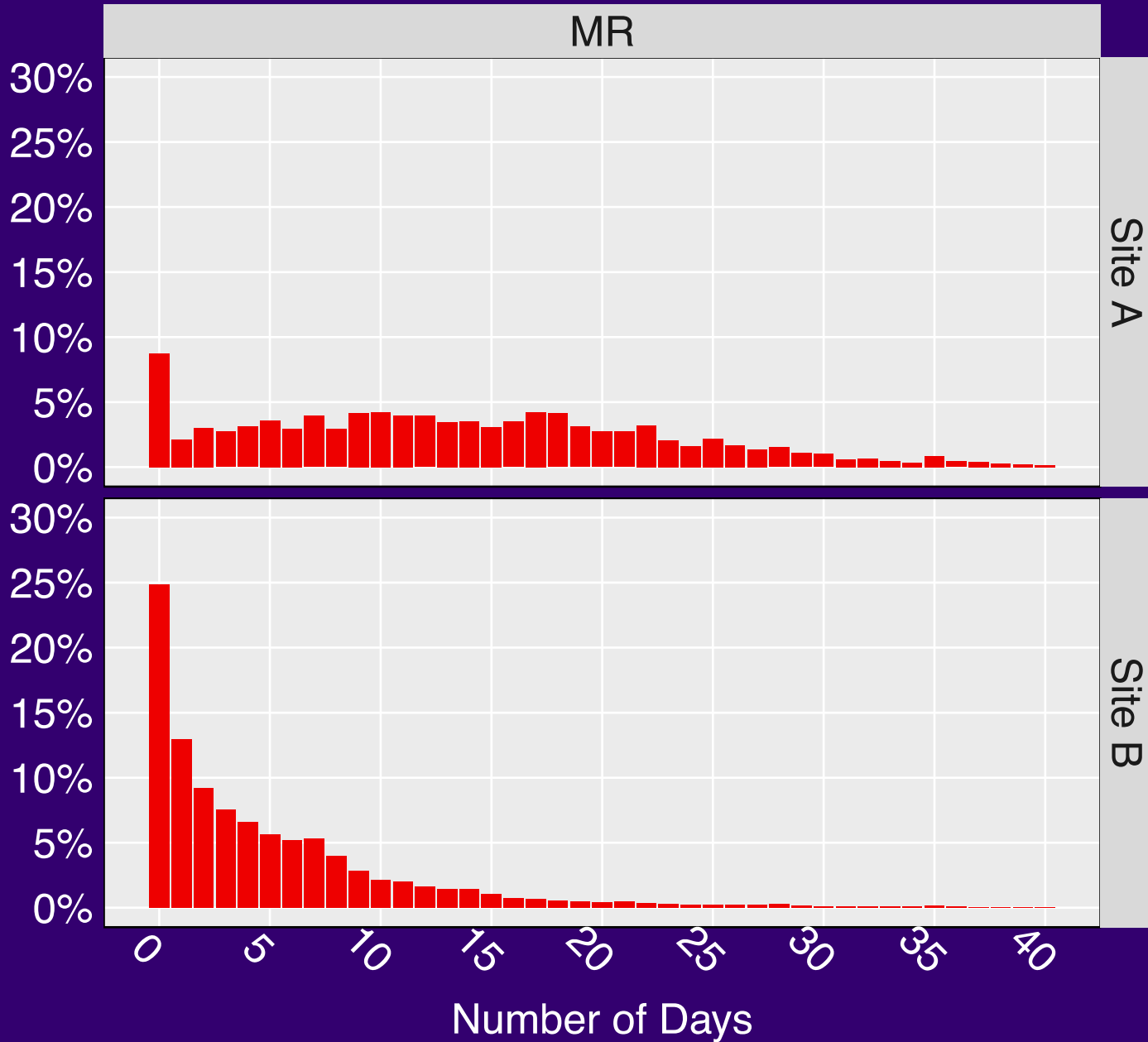
Study
Day 0

	<u>Site A</u>	<u>Site B</u>
Xray	0.7%	0.3%
MR	0.2%	0.2%

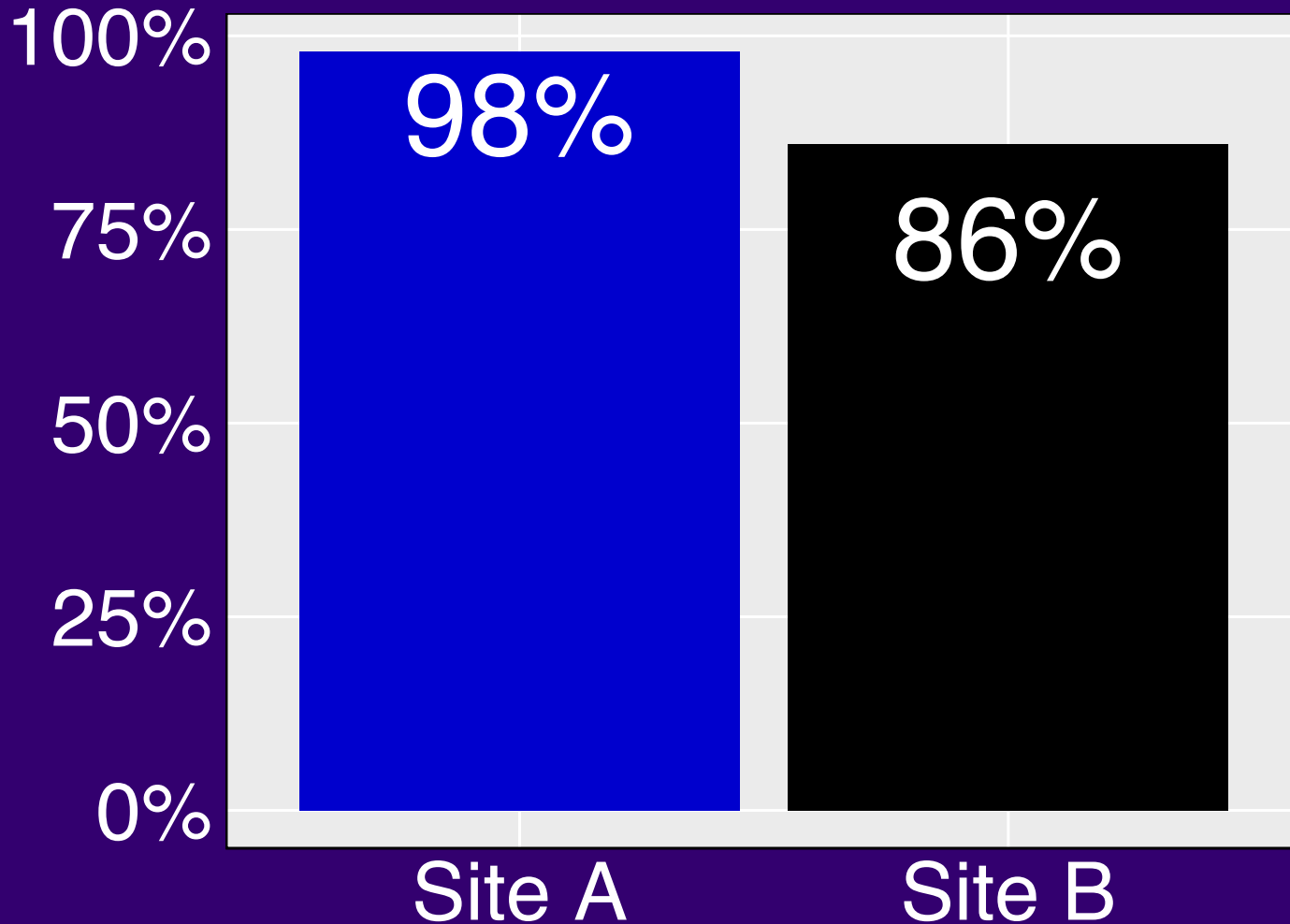


Study
Day 90

Time between MR Order and Completion



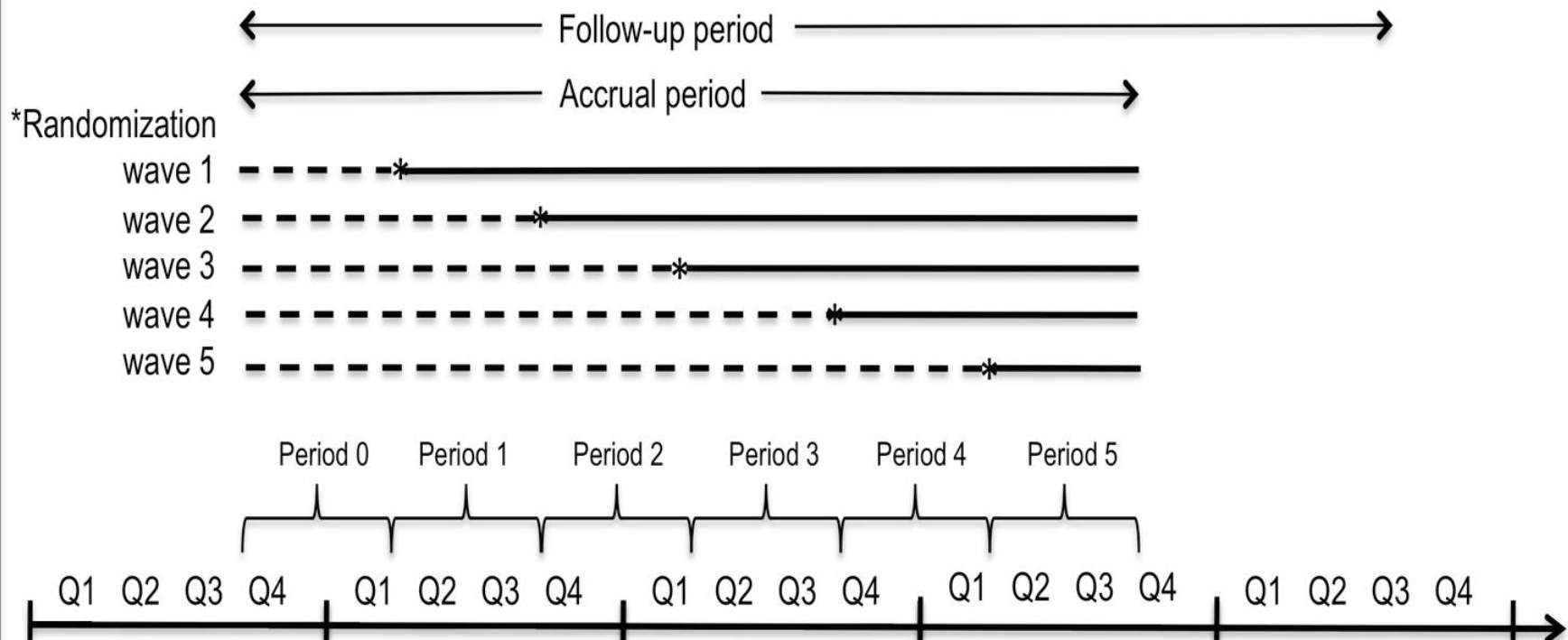
Intervention Adherence



Stepped Wedge RCT

— Exposed to LIRE intervention

- - - Unexposed to LIRE intervention



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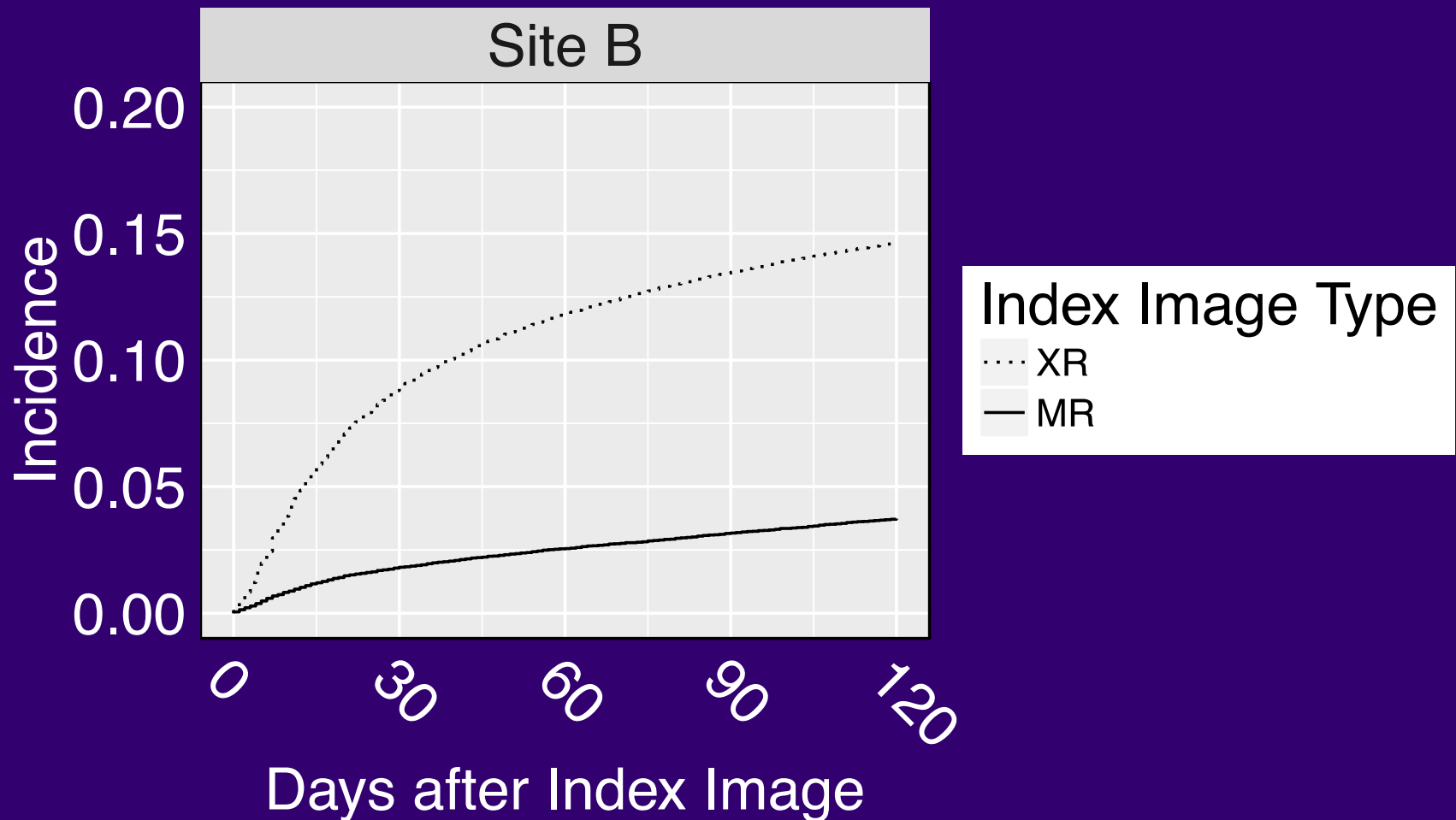


These Are Preliminary Results

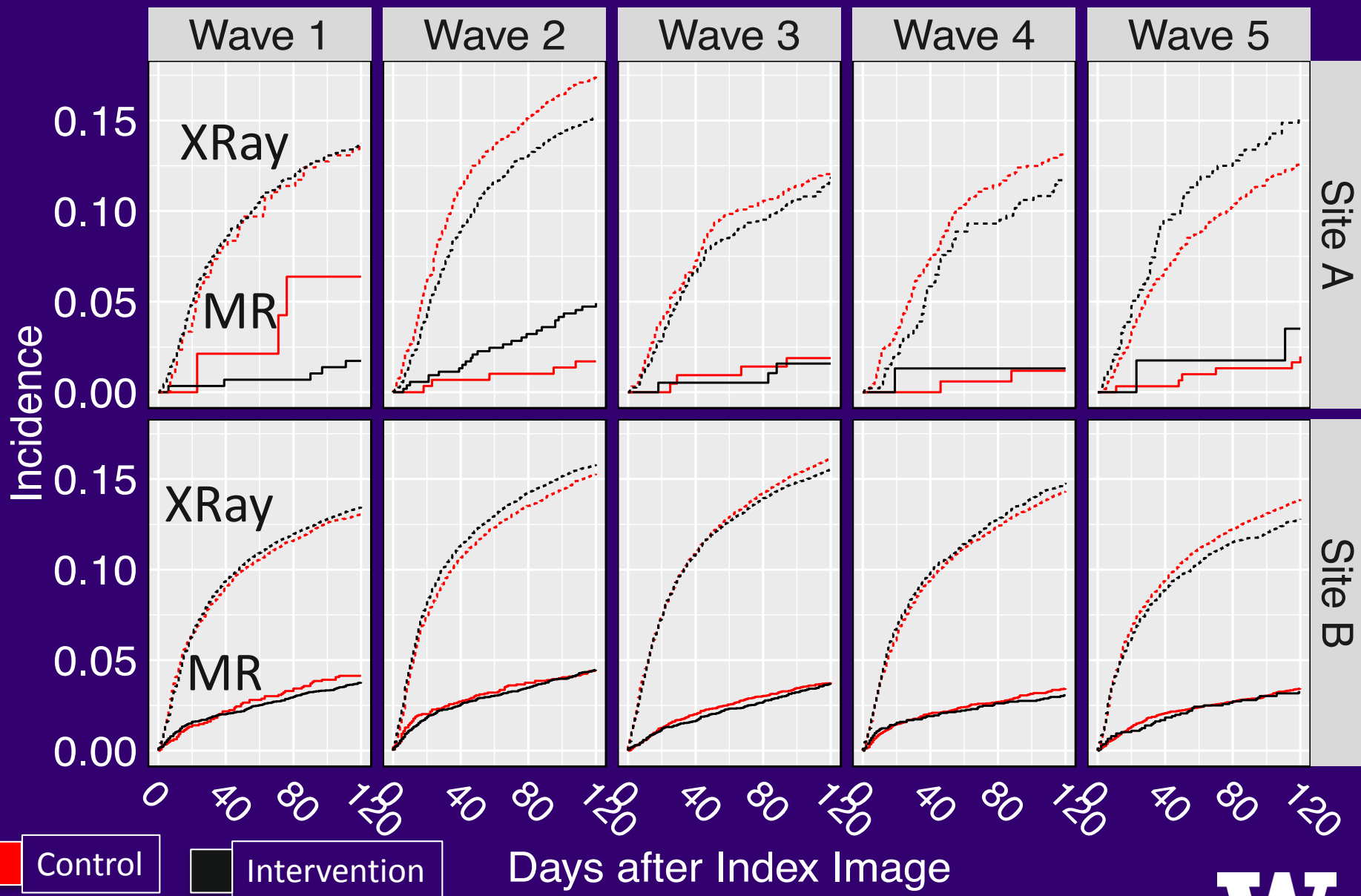
- Results are preliminary since we continue careful and deliberate data cleaning, an iterative process
- Have completed this process for 2 of 4 sites for secondary outcome: subsequent CT or MR by 90 days



Cumulative Incidence of MR/CT Imaging Over All Waves



Cumulative Incidence of MR/CT by Intervention/Control Group



X-ray Cohort

Site	Clinic Wave	Control			Intervention			Difference (I-C)
		N	90-day MR/CT		N	90-day MR/CT		
			#	%		#	%	
A	1	296	37	12.5%	1,555	197	12.7%	0.2%
	2	1,568	251	16.0%	2,717	376	13.8%	-2.2%
	3	1,231	134	10.9%	1,172	118	10.1%	-0.8%
	4	1,118	136	12.2%	460	47	10.2%	-1.9%
	5	1,710	189	11.1%	336	45	13.4%	2.3%
	All	5,923	747	12.6%	6,240	783	12.5%	-0.1%
B	1	7,786	946	12.2%	28,891	3,579	12.4%	0.2%
	2	9,689	1,358	14.0%	20,196	2,969	14.7%	0.7%
	3	20,343	3,015	14.8%	21,549	3,118	14.5%	-0.4%
	4	12,359	1,608	13.0%	5,908	807	13.7%	0.6%
	5	25,486	3,245	12.7%	5,086	599	11.8%	-1.0%
	All	75,663	10,172	13.4%	81,630	11,072	13.6%	0.1%



MR Cohort

Site	Clinic Wave	Control			Intervention			Difference (I-C)
		N	90-day MR/CT		N	90-day MR/CT		
			#	%		#	%	
A	1	47	3	6.4%	289	3	1.0%	-5.3%
	2	294	3	1.0%	529	19	3.6%	2.6%
	3	212	3	1.4%	190	3	1.6%	0.2%
	4	168	2	1.2%	76	1	1.3%	0.1%
	5	303	4	1.3%	57	1	1.8%	0.4%
	All	1,024	15	1.5%	1,141	27	2.4%	0.9%
B	1	1,425	53	3.7%	5,664	184	3.2%	-0.5%
	2	2,020	78	3.9%	4,624	174	3.8%	-0.1%
	3	5,050	164	3.2%	4,894	145	3.0%	-0.3%
	4	4,584	134	2.9%	2,257	61	2.7%	-0.2%
	5	7,198	206	2.9%	1,357	38	2.8%	-0.1%
	All	20,277	635	3.1%	18,796	602	3.2%	0.1%



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Analysis in Progress

- Fixed effects: age, gender, site, 6-month time point, clinic size, and baseline comorbidity
- GEE and NLMIXED
- Separate models for XR and MR



Lessons Learned



“Now! ... *That* should clear up a few things around here!”

Some Key Lessons Learned

- Prior
 - Keep intervention as simple as possible
 - Minimize burden on system partners
- Current
 - Big data sets are complex
 - Understanding complexities iterative process that takes time



Key People

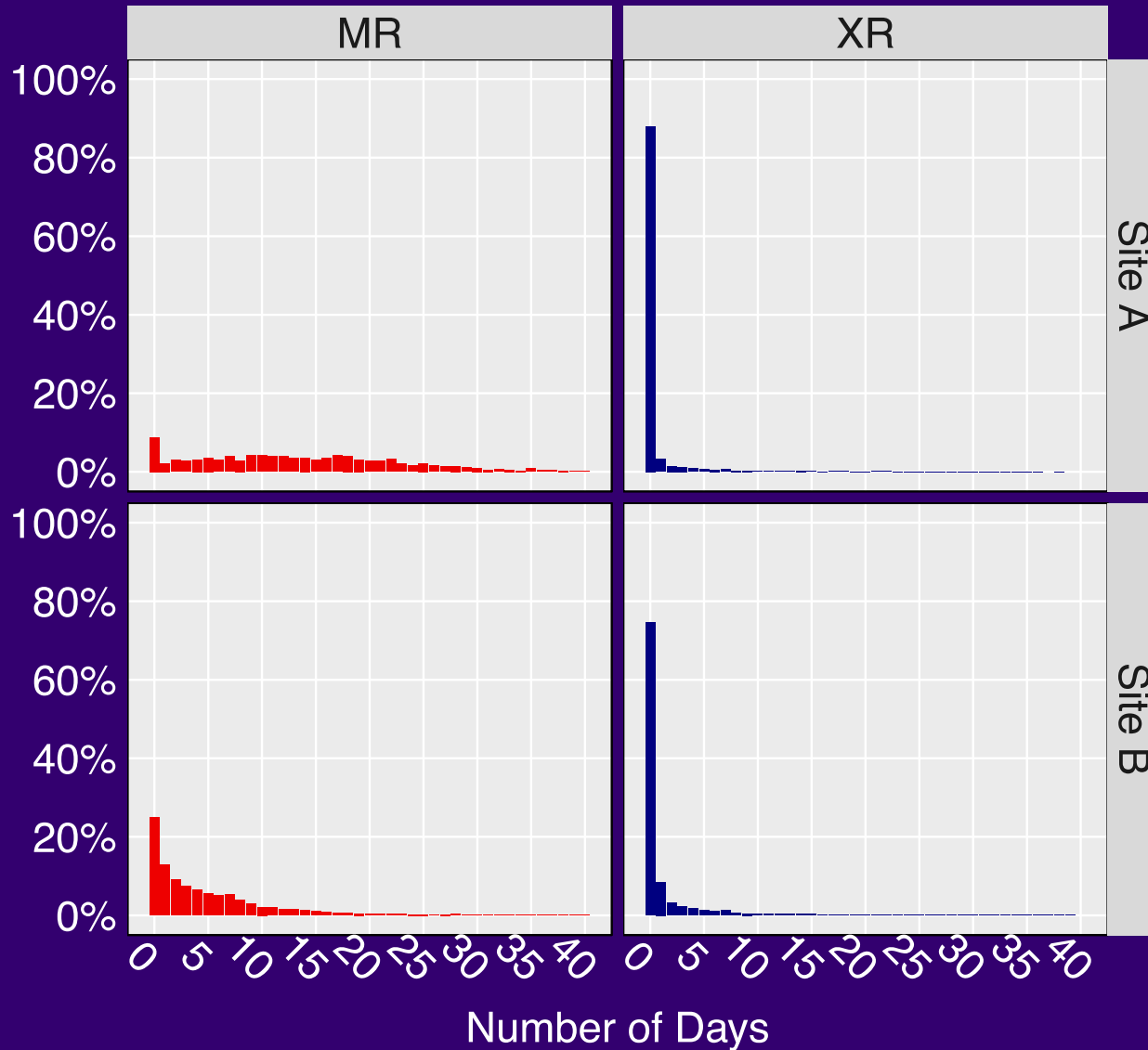
- Katie James, PA, MPH, Director
- Brian Bresnahan, PhD- Health Econ
- Bryan Comstock, MS- Biostats
- Janna Friedly, MD- Rehab
- Laurie Gold, PhD- Radiology
- Patrick Heagerty, PhD- Biostats
- Larry Kessler, PhD- HSR
- Danielle Lavalley, Pharm D, PhD
- Eric Meier, MS- Biostats
- Nancy Organ, BA- Statistics
- Kari Stephens, PhD- Informatics
- Judy Turner, PhD- Psychol/Psych
- Sean Rundell, DPT, PhD
- Zachary Marcum, PharmD, PhD
- Katherine Tan, PhD Candidate, Biostats
- Rick Deyo, MD, MPH- OHSU
- Dan Cherkin, PhD- KPWA
- Karen Sherman, PhD- KPWA
- Heidi Berthoud, KPWA
- Brent Griffith, MD- HFHS
- Dave Nerenz, PhD- HFHS
- Dave Kallmes, MD- Mayo
- Patrick Luetmer, MD- Mayo
- Andy Avins, MD, MPH- KPNC



Why Pragmatic Trials Are Important



Time between Order and Completion for MR and XR



MR/CT Rates by Age and Gender

