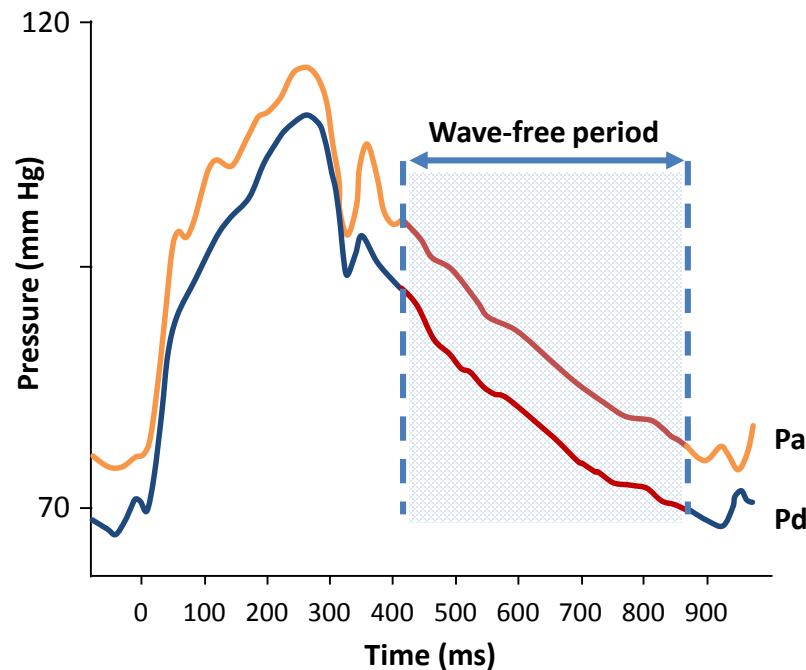# Disclosures

- **Research Grants**: AstraZeneca, Bayer, Jansen, NHBLI, Procyrion, Phillips-Volcano,

- **Advisory Board/Consultant:** AstraZeneca, Bayer, Jansen, Medscape, DukeHeart On The Go www.dukeheartonthego

Aim – Cost Analysis of DEFINE FLAIR

- To assess the health economic implications of the use of iFR or FFR to guide coronary revascularization.

Background

- iFR is a pressure wire alternative to FFR
  - Vasodilator-free (e.g. Adenosine, ATP)
  - Patient friendly
  - Streamlined workflow

Study Design

Intermediate lesion requiring physiological assessment
In ACS : intermediate *non-culprit* lesion

Non-inferiority design
with Primary Endpoint
MACE at 1 year

1:1 Randomisation

| FFR-guided PCI | iFR-guided PCI |

| FFR >0.8 Defer PCI | FFR ≤0.8 Perform PCI | iFR >0.89 Defer PCI | iFR ≤0.89 Perform PCI |
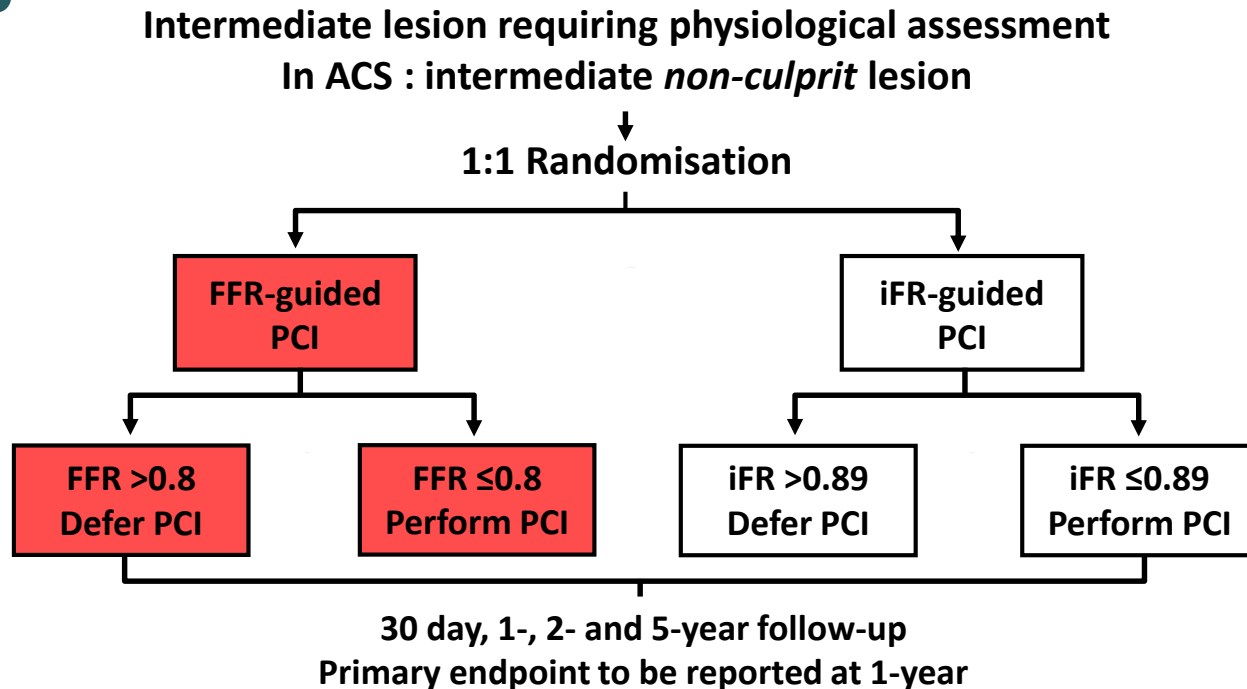
30 day, 1-, 2- and 5-year follow-up
Primary endpoint to be reported at 1-year

MACE definition

- MACE was defined as composite endpoint of
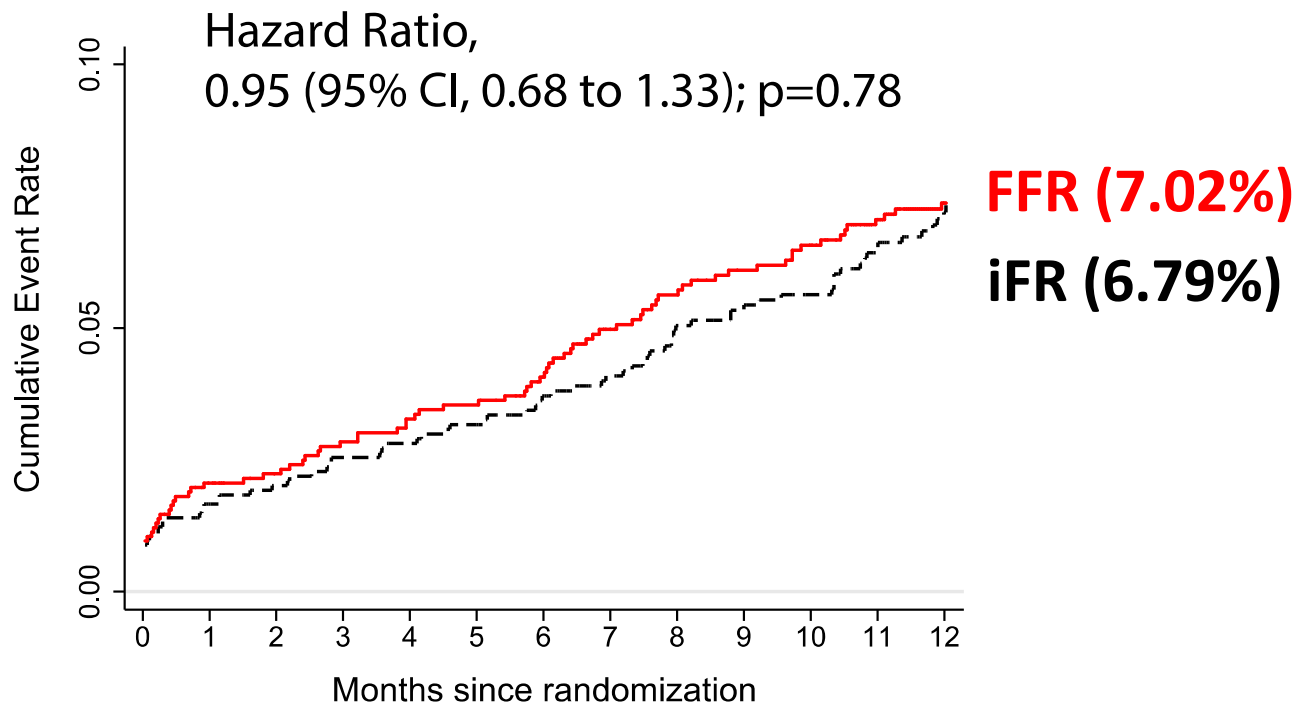 – Death

  – Non-fatal myocardial Infarction

  – Unplanned revascularization

Primary endpoint – iFR equivalent to FFR

Hazard Ratio,
0.95 (95% CI, 0.68 to 1.33); p=0.78

FFR (7.02%)

iFR (6.79%)

Cumulative Event Rate

Months since randomization

iFR guided revascularization reduces procedure time

4.5 minutes saved*

← Median Time Saving →

iFR   **40.5min**

FFR   **45min**

Time (minutes)
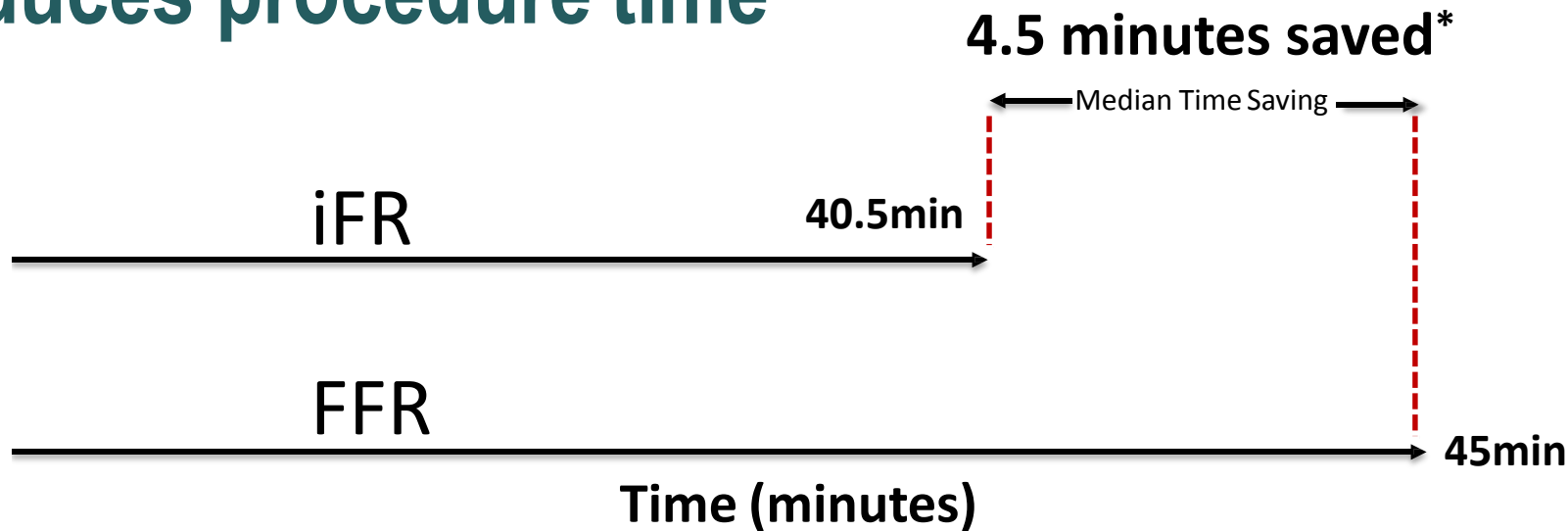
* Threshold for reduction in median time (p=0.001)
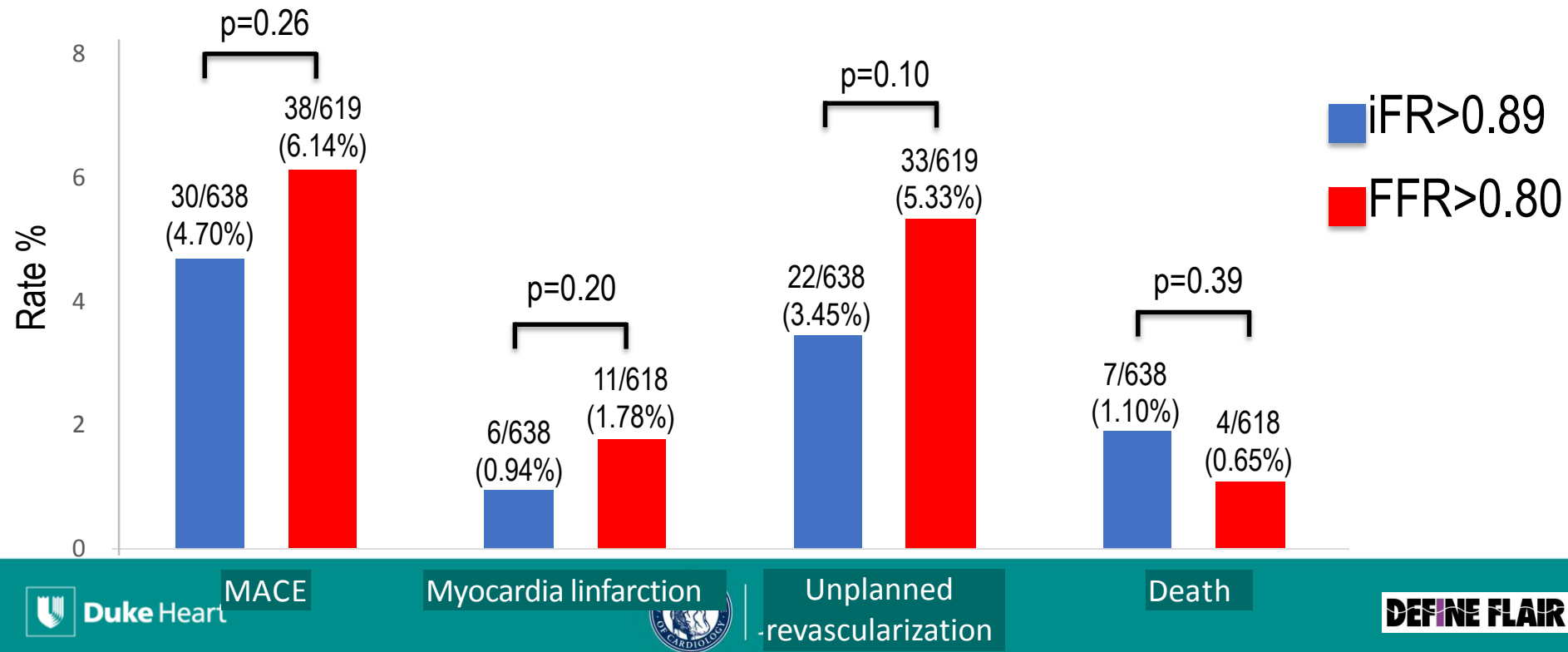
Methods

- Healthcare costs and outcomes with iFR and FFR over one year using patient-level data from DEFINE-FLAIR.

- Costs were estimated from a US healthcare payer perspective, with micro-costing for the index catheterization and Medicare costs for subsequent revascularizations, ambulatory care, and adverse events.

Methods (2)

- Outcomes included the mean number of major Adverse Coronary Events (MACE) and Quality Adjusted Life Years (QALYs).

- Cost-effectiveness scatterplots and probabilities were estimated by non-parametric bootstrapping.

Baseline Characteristics

Patient characteristic †	iFR Group (N=1147) *		FFR Group (N=1179) *	
Age, years	1147	65.4 (10.7)	1179	65.2 (10.5)
Sex, male	889 / 1147	(77.5%)	884 / 1179	(75.0%)
BMI, kg/m²	1139	27.8 (5.0)	1161	27.5 (5.0)
Diabetes	355 / 1139	(31.2%)	357 / 1171	(30.5%)
Current smoker	222 / 1107	(20.1%)	243 / 1121	(21.7%)
Previous MI	330 / 1136	(29.1%)	349 / 1158	(30.1%)
Previous PCI	450 / 1145	(39.3%)	490 / 1162	(42.2%)
Disease type				
Stable disease	916 / 1134	(80.8%)	957 / 1172	(81.7%)
Acute coronary syndrome	170 / 1134	(15.0%)	174 / 1172	(14.9%)
STEMI (>48 hours ago)	48 / 1134	(4.2%)	41 / 1172	(3.5%)

Baseline Characteristics

Patient characteristic †	iFR Group (N=1147) *		FFR Group (N=1179) *	
CCS angina class				
0 no symptoms	203 / 1061	(19.1%)	225 / 1057	(21.3%)
I with strenuous exertion	327 / 1061	(30.8%)	283 / 1057	(26.8%)
II with moderate exertion	343 / 1061	(32.3%)	335 / 1057	(31.7%)
III with mild exertion	119 / 1061	(11.2%)	146 / 1057	(13.8%)
IV symptoms at rest	69 / 1061	(6.5%)	68 / 1057	(6.4%)
Congestive heart failure	66 / 1106	(6.0%)	64 / 1111	(5.8%)
NYHA class				
I no limitation	18 / 57	(31.6%)	15 / 63	(23.8%)
II slight limitation	26 / 57	(45.6%)	31 / 63	(49.2%)
III marked limitation	12 / 57	(21.1%)	14 / 63	(22.2%)
IV severe limitation	1 / 57	(1.8%)	3 / 63	(4.8%)

Costs over one year

Resource	Mean cost per person, 2017 US$ (95% Confidence Interval)			
	iFR Group (N=1147) [a]		FFR Group (N=1179) [a]	
Index procedure: assessment				
Pressure wire	1085.00	(-)	1085.00	(-)
Laboratory and staff time [b]	675.67	(657.32 to 694.01)	723.91	(706.00 to 741.81)
Medications	0.47	(0.27 to 0.67)	25.55	(23.55 to 27.56)
Other angiography costs [b]	728.10	(719.85 to 736.36)	729.93	(721.73 to 738.13)
Total	**2489.24**	**(2469.05 to 2509.42)**	**2564.39**	**(2544.46 to 2584.32)**
Index procedure: PCI				
Stents	1099.37	(1010.93 to 1187.81)	1196.40	(1105.97 to 1286.82)
Guide wire	56.23	(50.13 to 62.34)	62.45	(56.19 to 68.71)
Balloons	186.14	(164.33 to 207.95)	194.47	(172.99 to 215.94)
Other PCI costs	384.51	(359.43 to 409.59)	411.78	(386.90 to 436.65)
Total	**1726.25**	**(1595.71 to 1856.79)**	**1865.09**	**(1733.99 to 1996.19)**

Costs over one year

Resource	Mean cost per person, 2017 US$ (95% Confidence Interval)			
	iFR Group (N=1147) [a]		FFR Group (N=1179) [a]	
Planned CABG	**521.07**	**(309.95 to 732.19)**	**815.49**	**(556.50 to 1074.47)**
Ambulatory care				
Specialist consultation [b]	456.65	(419.12 to 494.18)	460.95	(426.88 to 495.01)
Primary care visits [b]	153.40	(132.57 to 174.23)	166.90	(147.21 to 186.59)
Medications	690.54	(631.28 to 749.79)	724.52	(661.36 to 787.69)
Total	**1300.58**	**(1227.66 to 1373.50)**	**1352.37**	**(1275.57 to 1429.17)**
Admissions				
PCI and CABG	973.11	(674.51 to 1271.71)	1297.46	(946.57 to 1648.34)
Non-fatal MI	220.85	(141.55 to 300.16)	214.86	(128.62 to 301.10)
Non-fatal stroke	13.89	(0 to 33.15)	20.27	(0 to 43.20)
All-cause mortality	197.24	(115.50 to 278.99)	113.39	(52.00 to 174.78)
Total	**1405.10**	**(1040.48 to 1769.70)**	**1645.98**	**(1244.96 to 2047.00)**
Total cost	**7442.23**	**(6993.30 to 7891.16)**	**8243.39**	**(7726.86 to 8759.92)**

Health Outcomes over 1 year

Outcome	iFR Group (N=1147) [a]		FFR Group (N=1179) [a]	
Procedural symptoms				
Patients with symptoms – n/N (%)	32/1126	(2.8%)	359/1157	(31.0%)
Symptom grade – N, median (IQR)	31	4 (3 to 7)	357	5 (3 to 6)
MACE – mean events per person (95% CI) [b]				
Unplanned PCI	0.039	(0.029 to 0.052)	0.046	(0.034 to 0.060)
Unplanned CABG	0.003	(0.001 to 0.009)	0.008	(0.003 to 0.014)
Non-fatal MI	0.027	(0.018 to 0.038)	0.026	(0.018 to 0.037)
All-cause mortality	0.019	(0.012 to 0.029)	0.011	(0.006 to 0.019)
Total MACE	0.089	(0.073 to 0.108)	0.091	(0.074 to 0.110)
Quality of life – mean per person (95% CI) [c]				
EQ-5D utility score at 1 month	0.842	(0.832 to 0.851)	0.844	(0.835 to 0.853)
EQ-5D utility score at 1 year	0.839	(0.829 to 0.849)	0.839	(0.830 to 0.849)
QALYs over 1 year	0.835	(0.825 to 0.844)	0.838	(0.829 to 0.847)

Effect of iFR on costs and outcomes over 1 year

	Mean difference iFR – FFR (95% CI)			
	Unadjusted		**Adjusted** [d]	
Healthcare costs (2017 US$ per patient) [a]				
Index procedure: assessment	-75	(-104 to -47) **	-76	(-105 to -48) **
Index procedure: angioplasty	-139	(-324 to 46)	-185	(-372 to 2)
Planned CABG	-294	(-628 to 40)	-332	(-665 to 0) *
Ambulatory care	-52	(-158 to 54)	-34	(-127 to 59)
Hospital care	-241	(-783 to 301)	-219	(-770 to 332)
Total cost	**-801**	**(-1483 to -119) ***	**-896**	**(-1537 to -255) ***
Health outcomes				
Number of MACE per patient [b]	0.002	(-0.031 to 0.033)	0.004	(-0.030 to 0.035)
QALYs per patient [c]	-0.003	(-0.017 to 0.010)	-0.003	(-0.017 to 0.010)

* Each individual row cost was done as a regression model, and then combined amount is run as a model

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Cost effectiveness scatterplot: incremental cost and MACE avoided (iFR vs FFR)
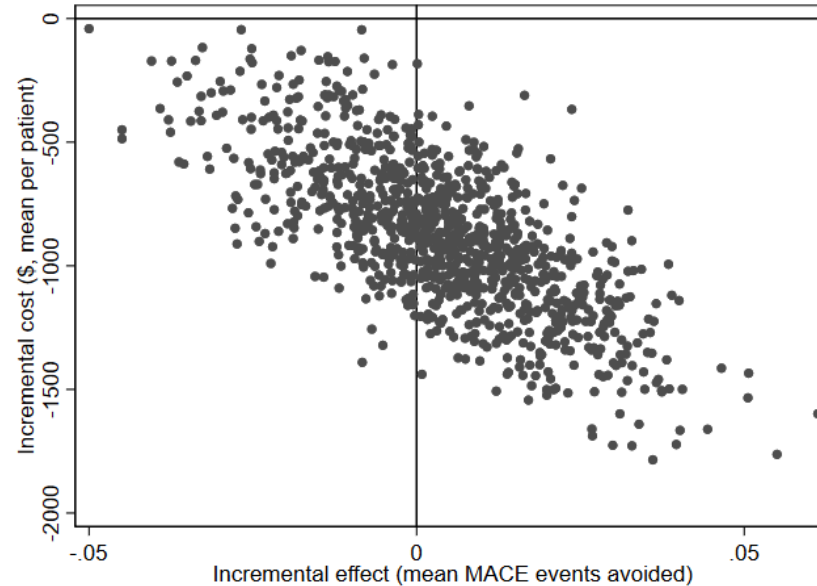
Limitations

- DEFINE FLAIR – non-inferiority study – therefore cost analysis focused on estimations rather hypothesis testing around superiority

- 12 month data – longer term outcomes / costs not yet reported

- Conservative estimates / costs used for medications procedures

Conclusions

- Coronary physiology strategy of iFR vs. FFR lead to similar clinical outcomes (DEFINE FLAIR – ACC17)

- When preferentially opting for an iFR-guided approach, an economic cost saving estimated $896 per patient was achieved.

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