QUASI-EXPERIMENTAL HEALTH SERVICE EVALUATION

COMPASS 1 APRIL 2016

AIM & CONTENTS

Aim – to explore what a quasi-experimental study is and some issues around how they are done

- Context and Framework
- Review of NZ health service evaluation studies
- Case study – Evaluation of the ITC project

CONTEXT & FRAMEWORK

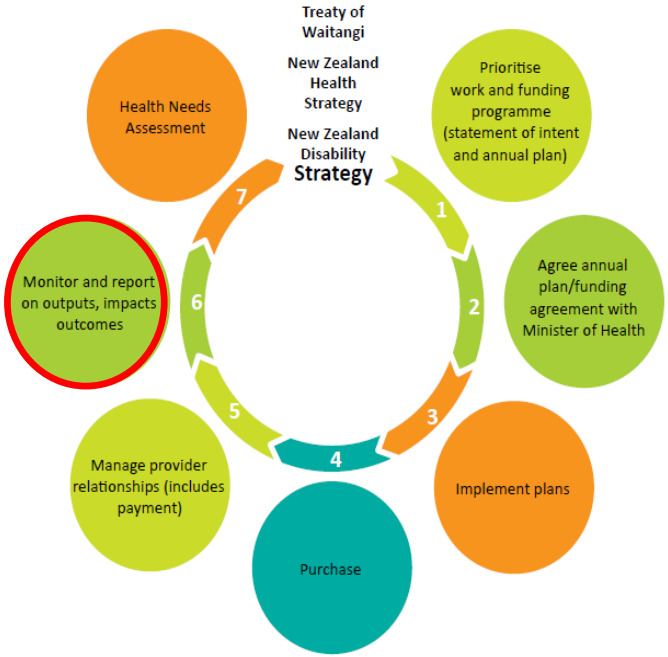
QUASI-EXPERIMENTAL DESIGN

AUCKLAND & WAITEMATA PLANNING & FUNDING

Waitemata District Health Board

Best Care for Everyone

AUCKLAND DISTRICT HEALTH BOARD
Te Toka Tumai



Population > 1 million

Budget $2.4b per year

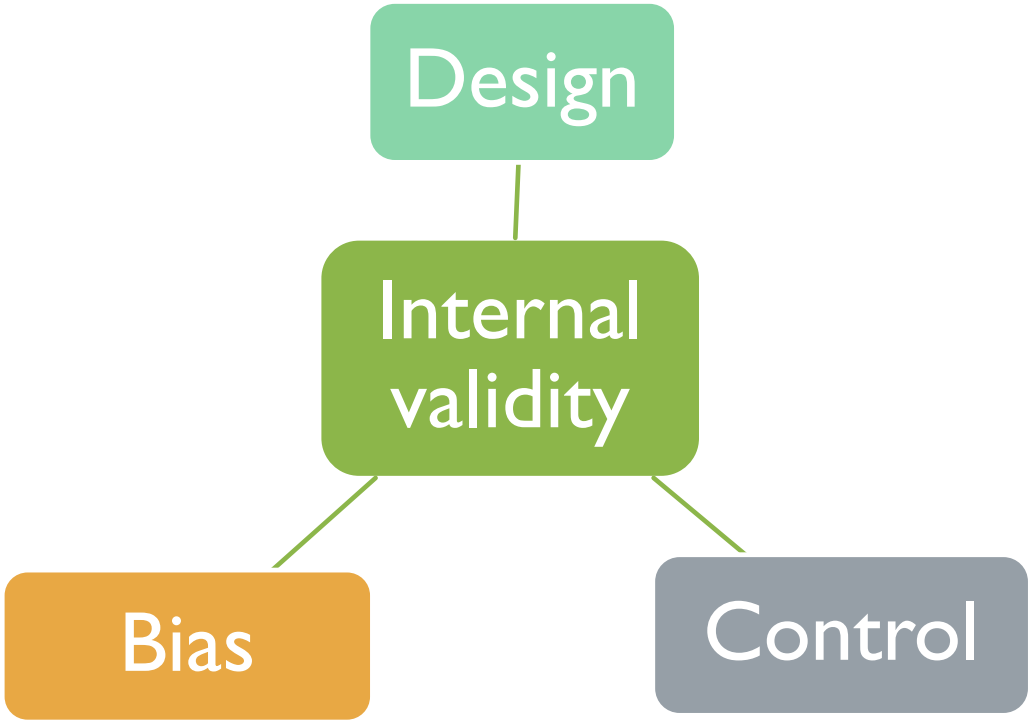
EVALUATING CHANGE IN HEALTH SERVICES

- Change is constant and frequent
- Health service changes are typically complex
- Evaluation undertaken for learning and accountability
- Evaluation of outcomes is only a part of evaluation
- For outcome evaluation RCTs are best – but frequently cannot be undertaken
- Quasi-experimental outcome evaluations may be feasible

WHAT IS A QUASI-EXPERIMENTAL STUDY?

- Shadish & Cook (2002)
  - Share experimental study's purpose of testing causal hypotheses about manipulable causes
  - Share many of experiment's structural elements for counterfactual inference e.g. control groups, pre-tests etc
  - But allocation is by self-selection or researcher control but not randomisation
- Rosenbaum (2010) – "when investigators are especially proud of devices included to distinguish treatment effects from plausible alternatives…"
- RCT ⇐ Quasi-experimental ⇒ Non-experimental

FRAMEWORK



REVIEW OF CURRENT PRACTICE

NEW ZEALAND HEALTH SERVICE OUTCOME EVALUATIONS

CURRENT PRACTICE

- Review of 52 outcome evaluations
- 2010-2015
- Using a data extraction tool
  - Design
  - Constructs - Control
  - Bias or threats

SEARCH

Search	Number of results	Evaluations
HIIR	1332	24
Google	600	12
Medline	421	7
National Library	360	10
NZMJ	694	18
Total	**3,407**	**52**

DESCRIPTION OF EVALUATIONS

	Number	Percent
Setting		
Primary care	11	21%
Community	22	42%
Hospital	10	19%
Outpatient	5	10%
National (Policy)	4	8%
Type of care		
Prevention	21	40%
Acute care	8	15%
Long term care	23	44%
Change made		
New service	22	42%
Model of care	14	27%
New role	7	13%
Quality improvement	4	8%
Policy	5	10%
Outcomes measured		
Health outcomes	49	94%
Efficiency	7	13%
Patient experience	3	6%

QUASI-EXPERIMENTAL DESIGN

Designs – two main types

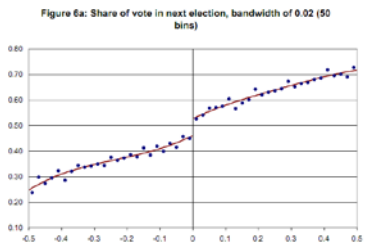
- Non-equivalent control group designs

  O_1 X O_2

  O_1 _ O_2

- Discontinuity designs
  - Interrupted time series designs

    O_1 O_2 O_3 O_4 X O_5 O_6 O_7 O_8
  - Regression discontinuity designs



With variations - Managing selection bias

Measured bias

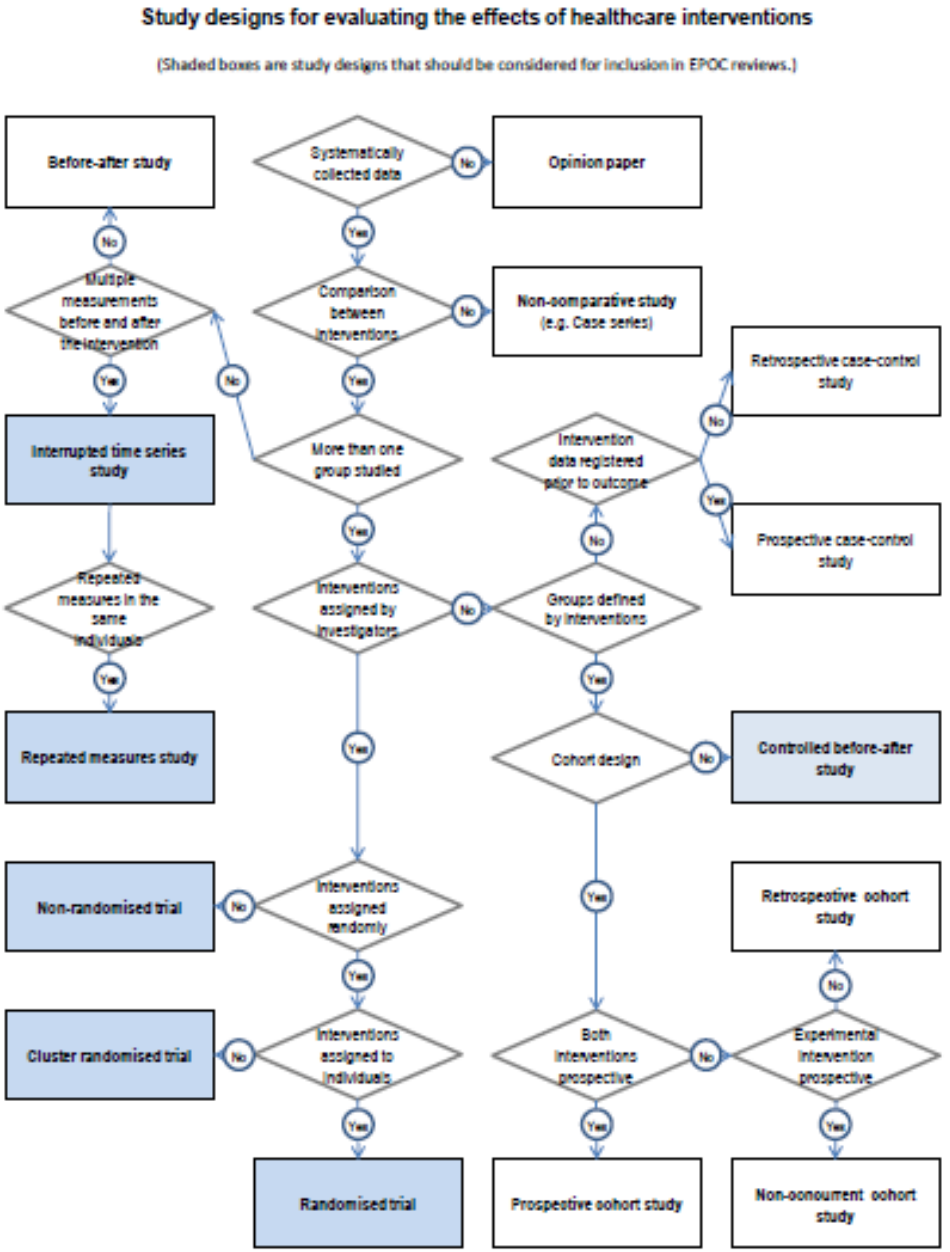
- Variables – selectors, prognostics, outcomes
- Methods - Propensity scores, Inverse probability weights, regression etc

Unmeasured bias

- Intact group matching
- Difference in difference
- Instrumental variables
- Discontinuities

Effective Practice and Organisation of Care Group (EPOC)

Cochrane Collaboration



DESIGNS - EPOC

Study type	Number	Percent
EPOC Included designs		
Non-randomised trial	3	5%
Controlled before and after	4	7%
Interrupted time series	11	20%
Repeated measures study	2	4%
Total	20	36%
EPOC excluded designs		
Uncontrolled before and after	28	51%
Cohort studies	6	11%
Case-control studies	1	2%
Regression discontinuity	0	0%
Intrumental variable studies	0	0%
Total	35	64%
Total studies	**52**	
Total study designs	**55**	

BIAS ASSESSMENT - INCLUDED STUDIES

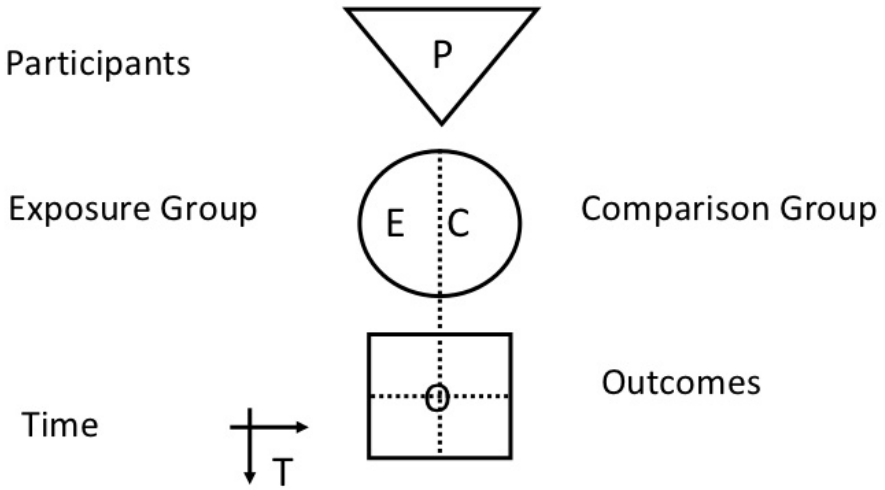
Cause of bias	Design			
	NRT	CBA	ITS	RMS
Allocation to groups likely to cause bias	1	4		
Baseline outcomes different	1	1		
Baseline characteristics different	3	3		
Contamination of control	1	0		
Outcome assessment likely to be biased	1	1	1	0
Selective outcome reporting	0	0	0	0
Attrition likely to cause bias	1	1	0	1
Other events may have caused effect			8	0
No clear pattern of outcome change predicted			6	0
Intervention caused change in outcome assessment			0	0
Other bias	0	0	0	1
Number of studies	**3**	**4**	**11**	**2**

BIAS ASSESSMENT – EXCLUDED STUDIES

Cause of bias	Study type	
	Before-after	Cohort
Allocation to groups likely to cause bias		2
Baseline characteristics different		4
Contamination of control		0
Other events may have caused effect	9	2
Effect may have been caused by maturation of participants	3	0
Regression to the mean	20	0
Attrition likely to cause bias	13	2
Repeated testing of outcome may have led to change in response	3	0
Outcome assessment likely to be biased	9	2
Other problems with outcome measurement	3	1
Total studies	**28**	**6**

CONTROL OF CONSTRUCTS OF STUDY

PECOT: the 5 parts of every epidemiological study



All epidemiological studies can be hung on the GATE frame

EXAMPLES OF CONSTRUCT ISSUES

- **Participants** – 1715 entered a new programme, 278 in evaluation – no reason or comparison given
- **Intervention** – evaluation of a assessment unit model of care – unclear if the improved outcomes were due to the new care model or additional resources
- **Control** – school lifestyle intervention control was different schools, from different regions, from different time period
- **Outcomes –** Intervention to improve GP access – un-validated patient experience measure with 80-90% positive on pre-test
- **Time** – outcomes measured at last follow up – "3 months to several years"

SUMMARY

- Only about a third of evaluations used a design that EPOC recommends including
- Of these ITS studies are the most common
- Selection bias is the biggest problem for controlled studies (despite DID)
- History threats are the biggest problems for ITS

- About a half of evaluation use only uncontrolled before and after studies
- These are very susceptible to regression to the mean
- Also troubled by history threats, attrition, and bias in assessment of outcomes

LIMITATIONS

- Small study – precision
- Probably unrepresentative sample
- Single investigator and subjective decisions
- Limited by information in reports – sometimes inadequate
- Unable to say cause of limitations
- New Zealand only study

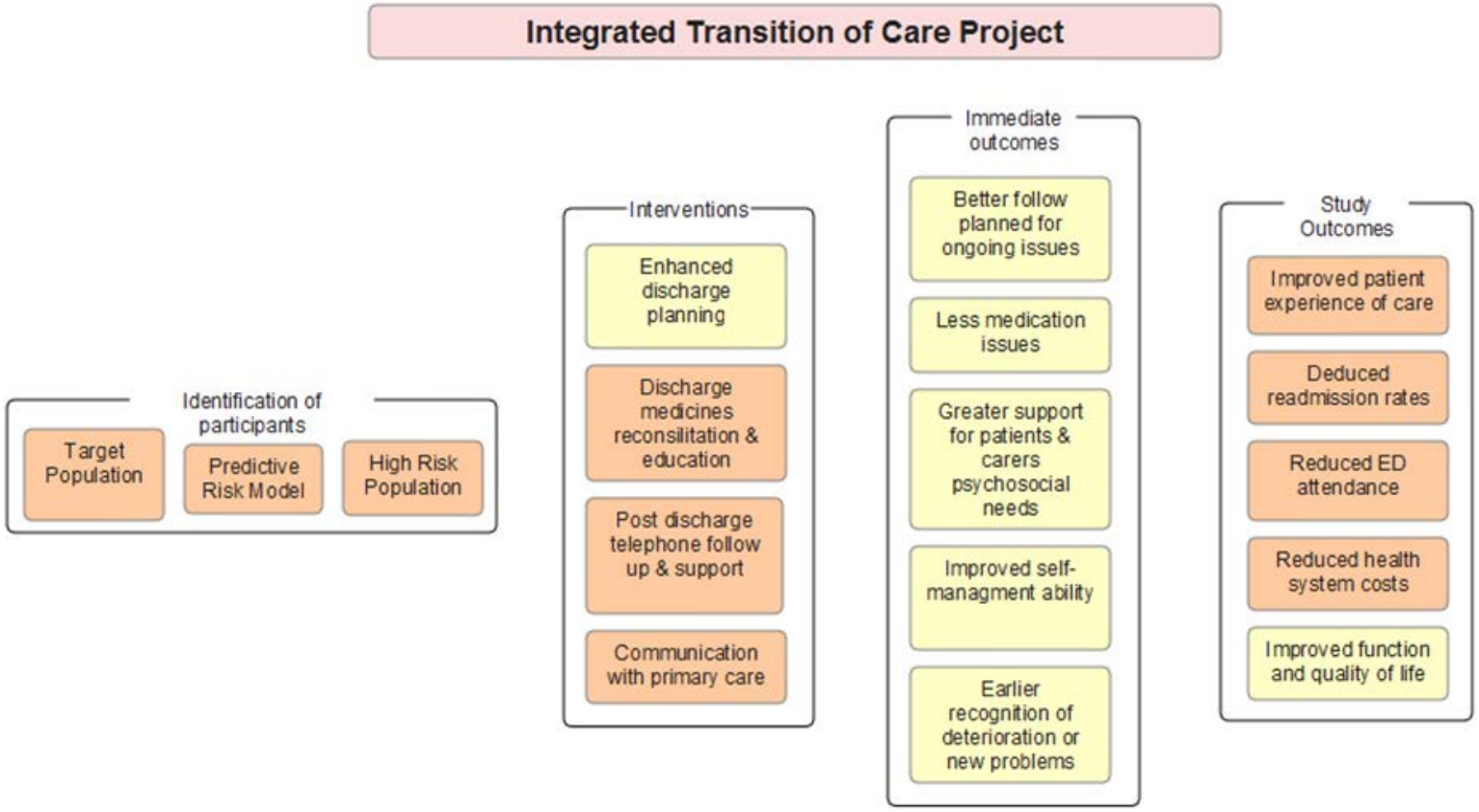
INTEGRATED TRANSITION OF CARE

CASE STUDY OF A QUASI-EXPERIMENTAL EVALUATION

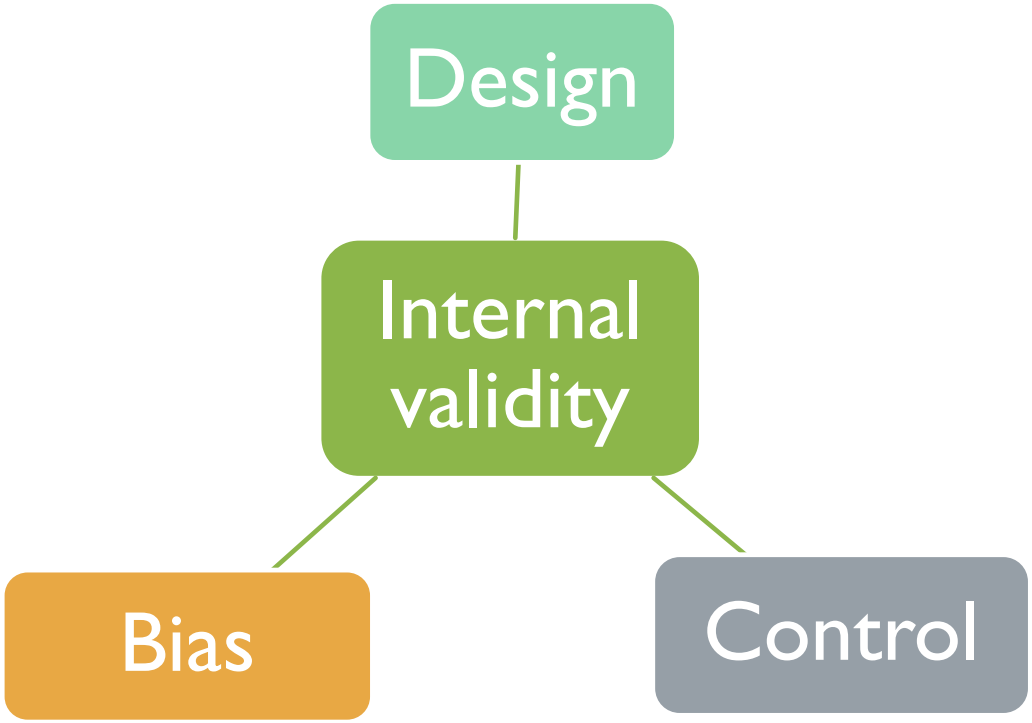
BACKGROUND

- Waitemata DHB has high rates of early readmission in older patients (75+)
- Assumed this was due to poor transitions from discharge back into the community
- Integrated Transition of Care Project was an attempt to improve transitions
- Selected patients judged to be at high risk of readmission on a predictive risk model (>20%)
- Intervention began in March 2012 and ran for a year
- Aim to reduce readmissions by 25% (from 26% to 20% 28 day readmission)
- 5,172 people treated
- **Involved in design and evaluation from conception**

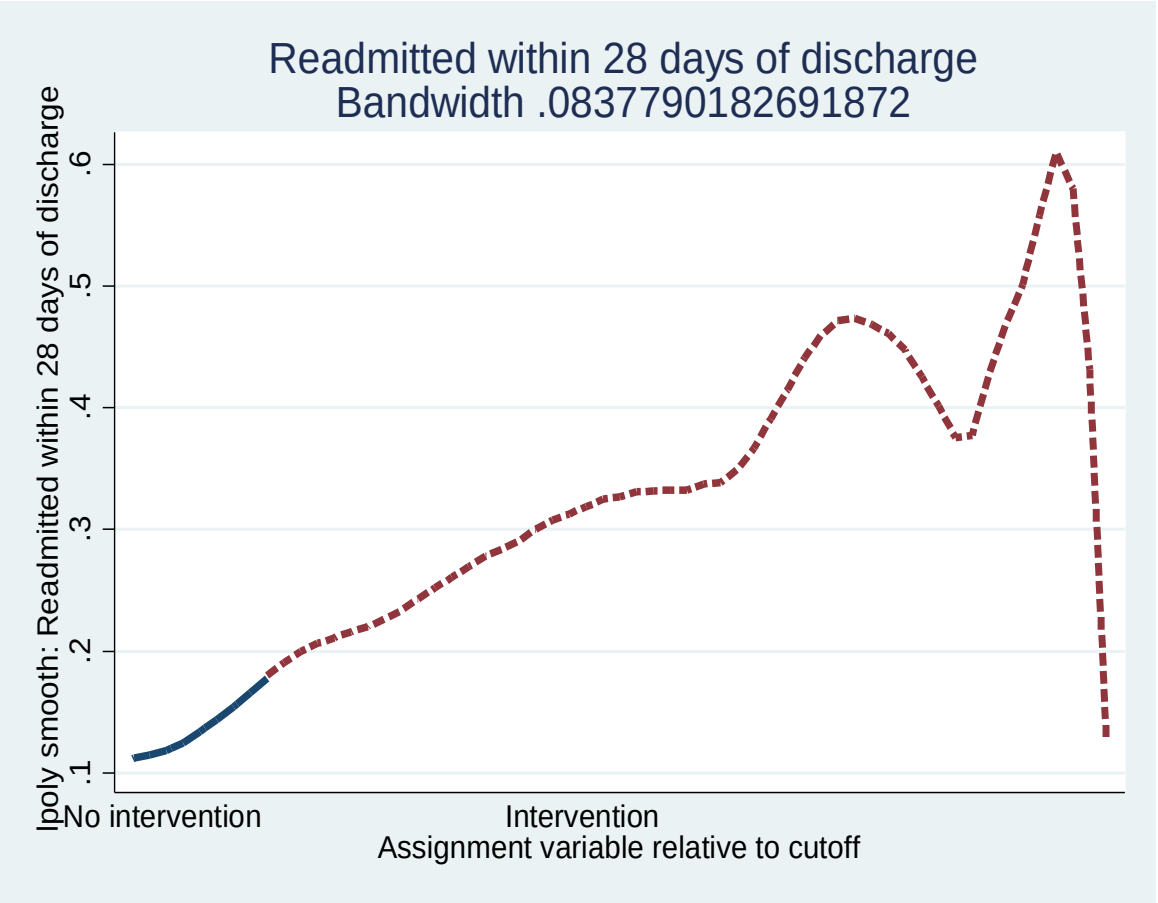
INTERVENTION



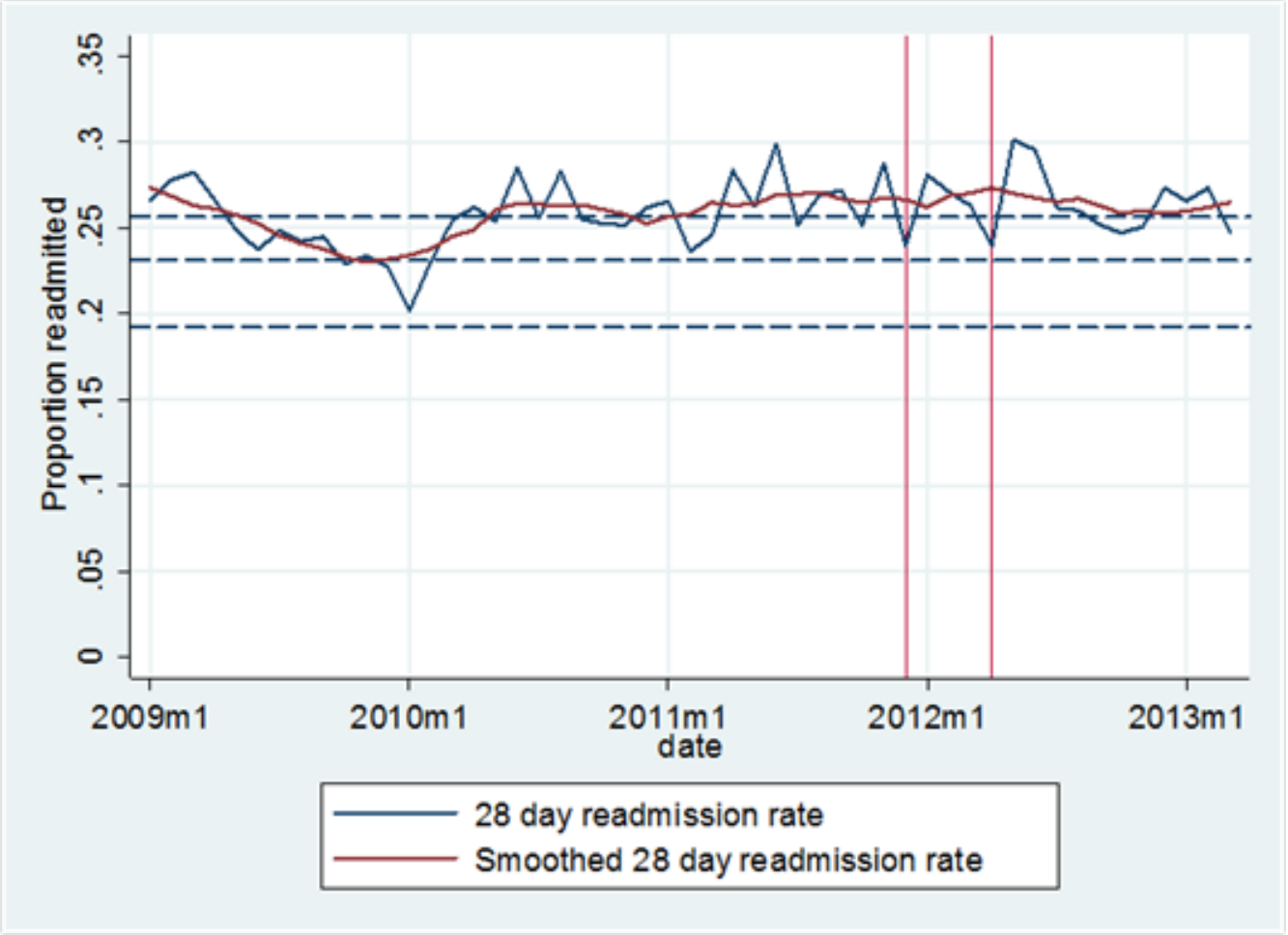
QUASI-EXPERIMENTAL EVALUATION



DESIGN – REGRESSION DISCONTINUITY



DESIGN – INTERRUPTED TIME SERIES



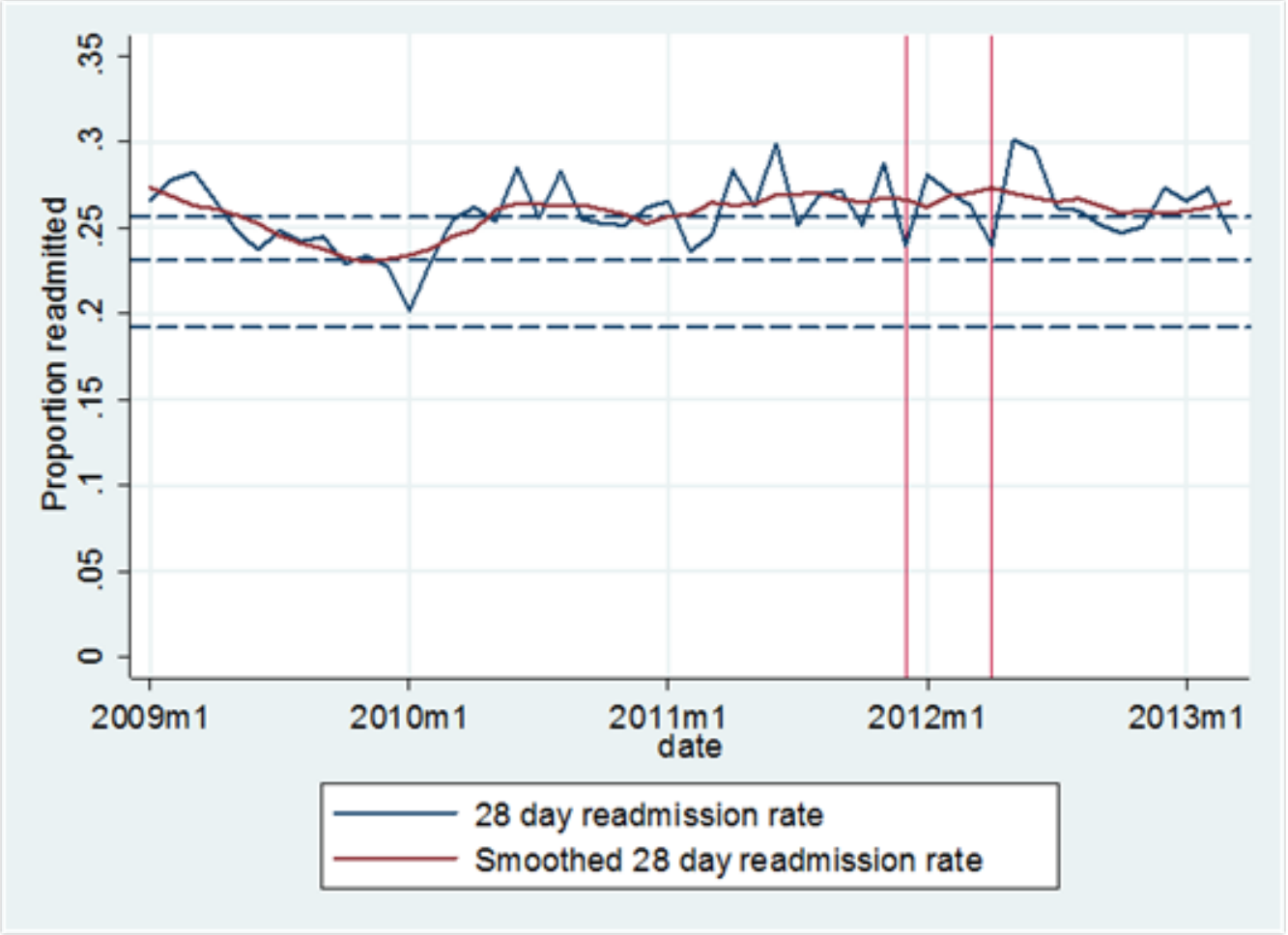
BIAS – ITS DESIGN

MORE ANALYSIS

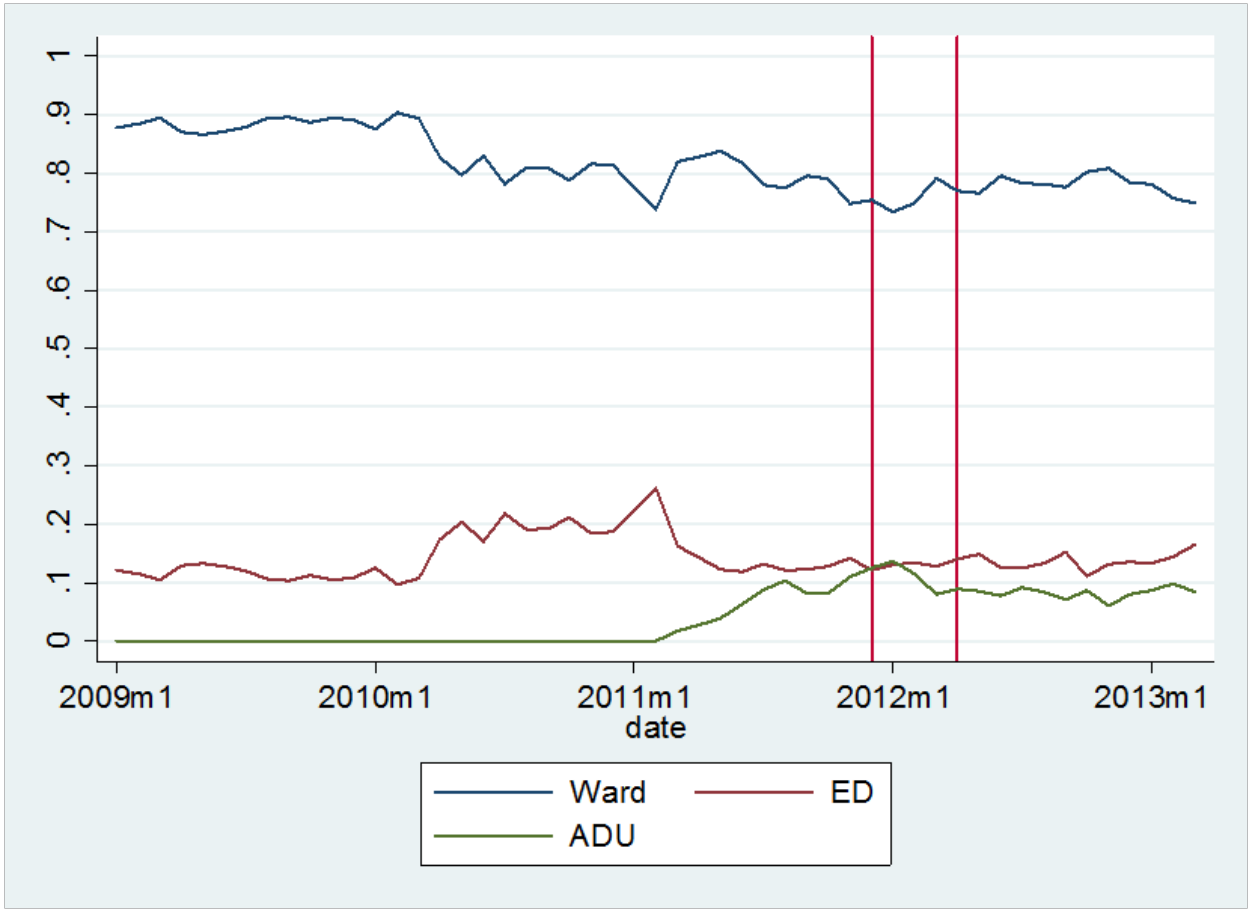
BIAS – OTHER EVENTS

- Opening of Assessment and Discharge Unit – early 2011
- ED Waiting Times Health Target - July 2009
- Bad Influenza season
- Other unidentified

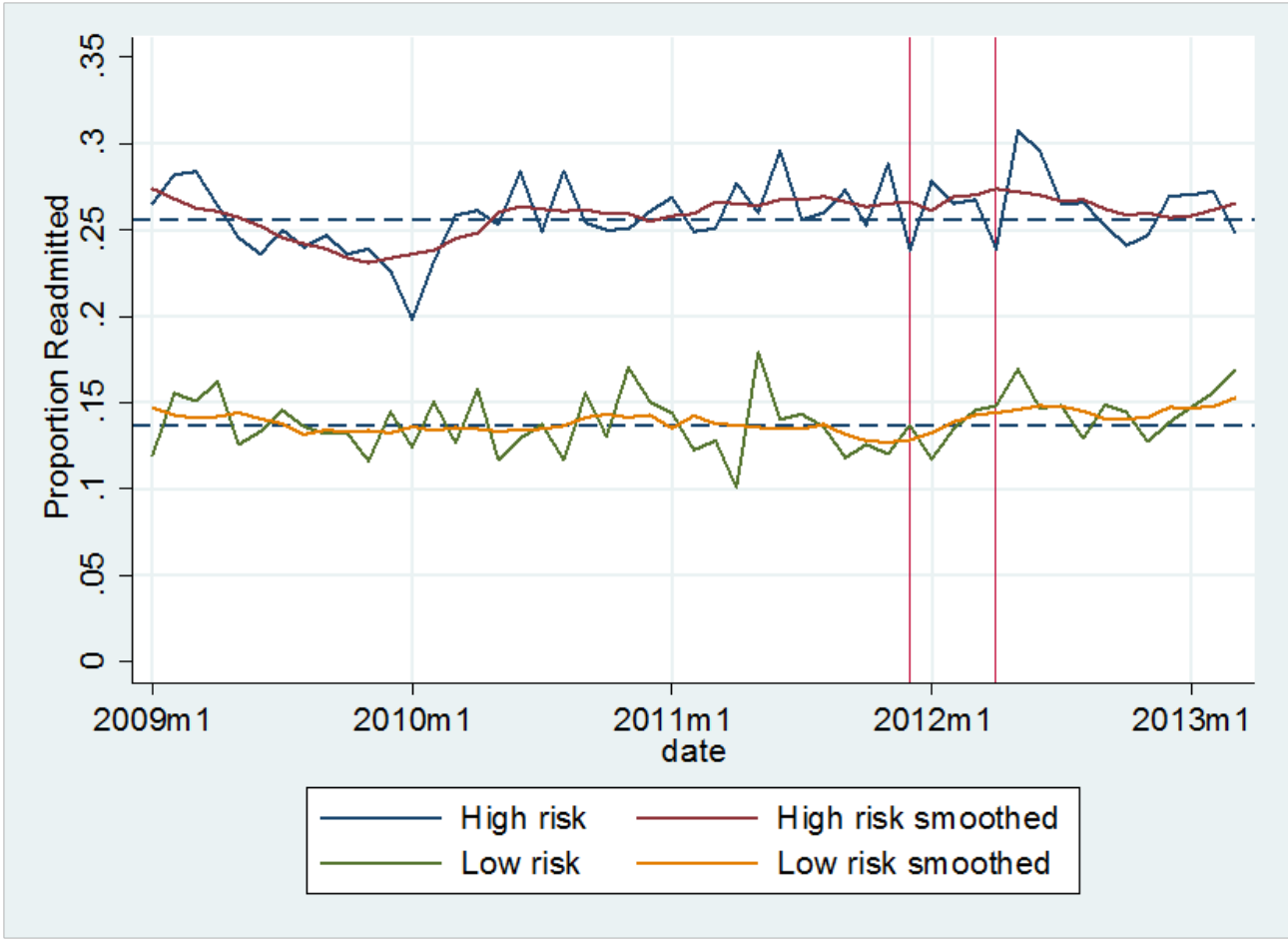
DESIGN – INTERRUPTED TIME SERIES



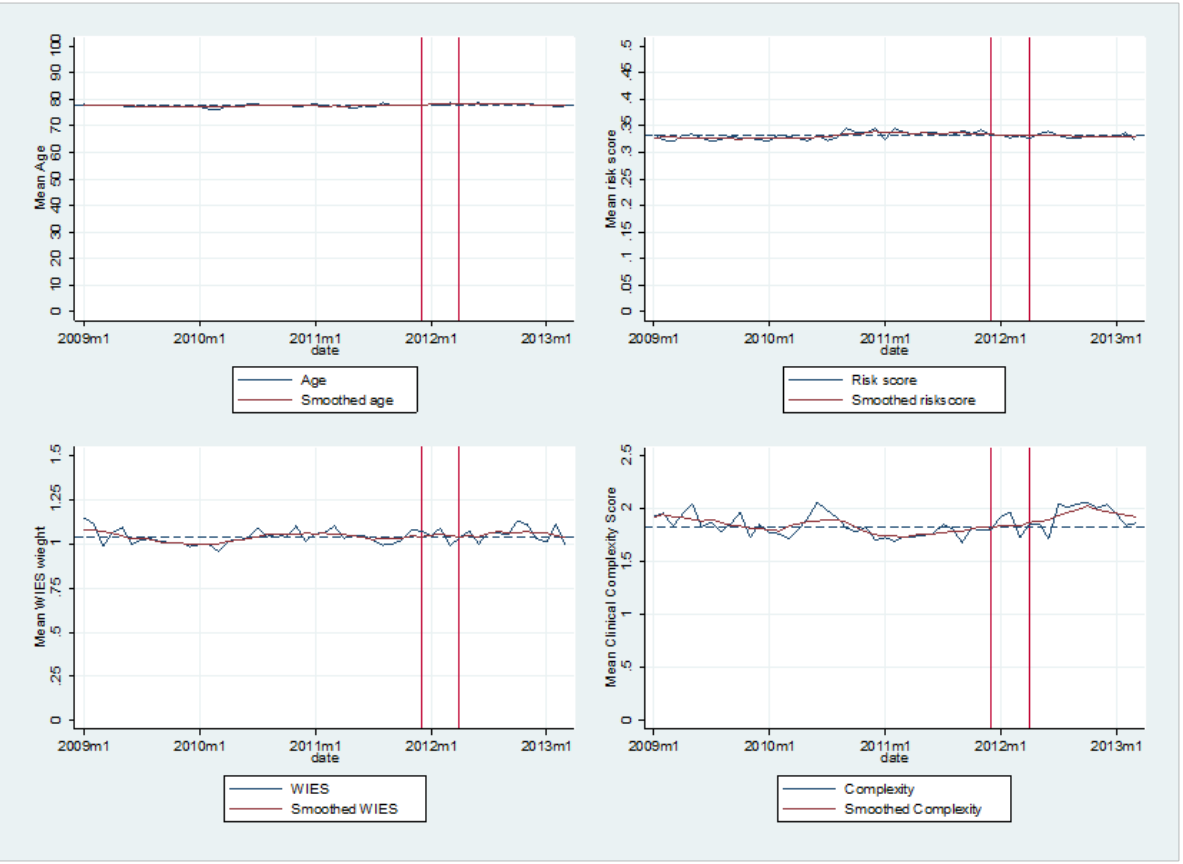
BIAS – OTHER EVENTS



BIAS – OTHER EVENTS



BIAS – SELECTION

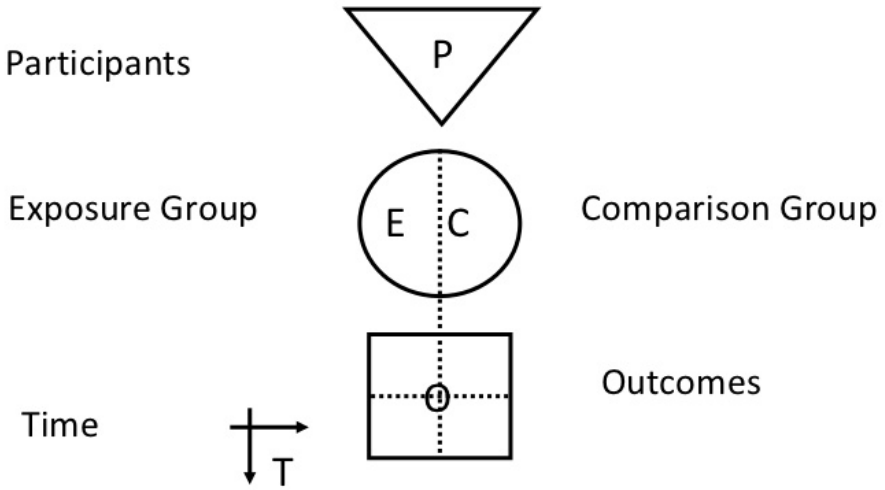


BIAS - OTHER

- Attrition – 97% data outcome capture
- Instrument – measurement bias unlikely as objective outcomes, no change
- Maturation – not plausible
- Regression - unlikely in ITS
- Testing – not an issue
- Selective reporting of outcomes – pre-specified in protocol

CONTROL OF CONSTRUCTS OF STUDY

PECOT: the 5 parts of every epidemiological study



All epidemiological studies can be hung on the GATE frame

CONTROL - PARTICIPANTS

Selection by investigator on predictive risk model threshold

Strengths

- Selection on known covariate (risk score) – easy to create control group
- Can use regression discontinuity design

Weaknesses

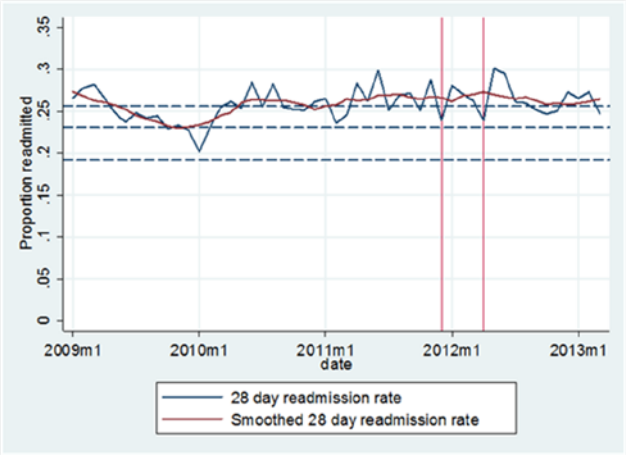
- Unable to create risk score in control group for technical reasons – difficult to create control group (or control ITS)
- Difficult to create risk score retrospectively – not completely sure of accuracy

CONTROL - INTERVENTION

Poor control over intervention – timing and contamination

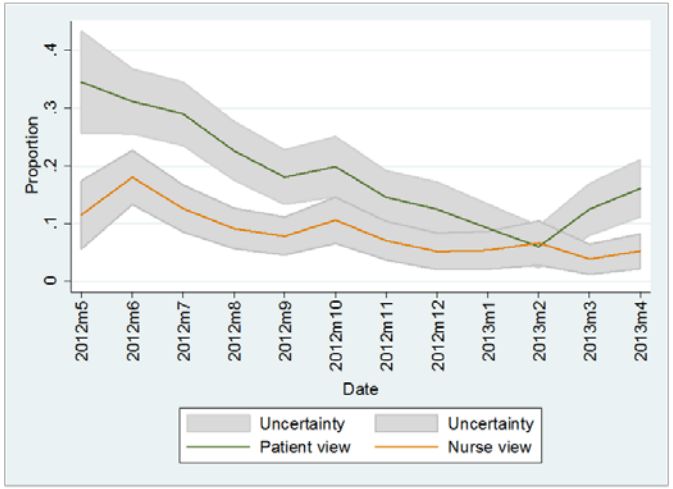
ITS

- Did not create rapid onset of intervention – due to development period



Regression discontinuity

- Discharge planning improvement probably contaminated control group



CONTROL - OUTCOMES

Measured

Health system focussed

- Readmission
- ED attendance
- Mortality (underpowered)
- Other health service utilisation
- Health service cost

Existing data collections

Not measured

Patient focussed

- Patient experience
- Quality of life
- Functional status

Would have required new data collection

SUMMARY

- Early involvement in both intervention design and evaluation design
- Still trade off between two needs
- Research control over selection very important
- Able to use strong quasi-experimental designs
- Validity threats plausibility can be (partially) investigated by additional analysis
- Control over constructs is important – we didn't make best use of it

FUTURE RESEARCH

- Feasibility of strong QE Evaluation
  - 5 further case studies
- Do good QE evaluations produce internally valid results?
  - Systematic review of studies examining this question
  - Within study comparison