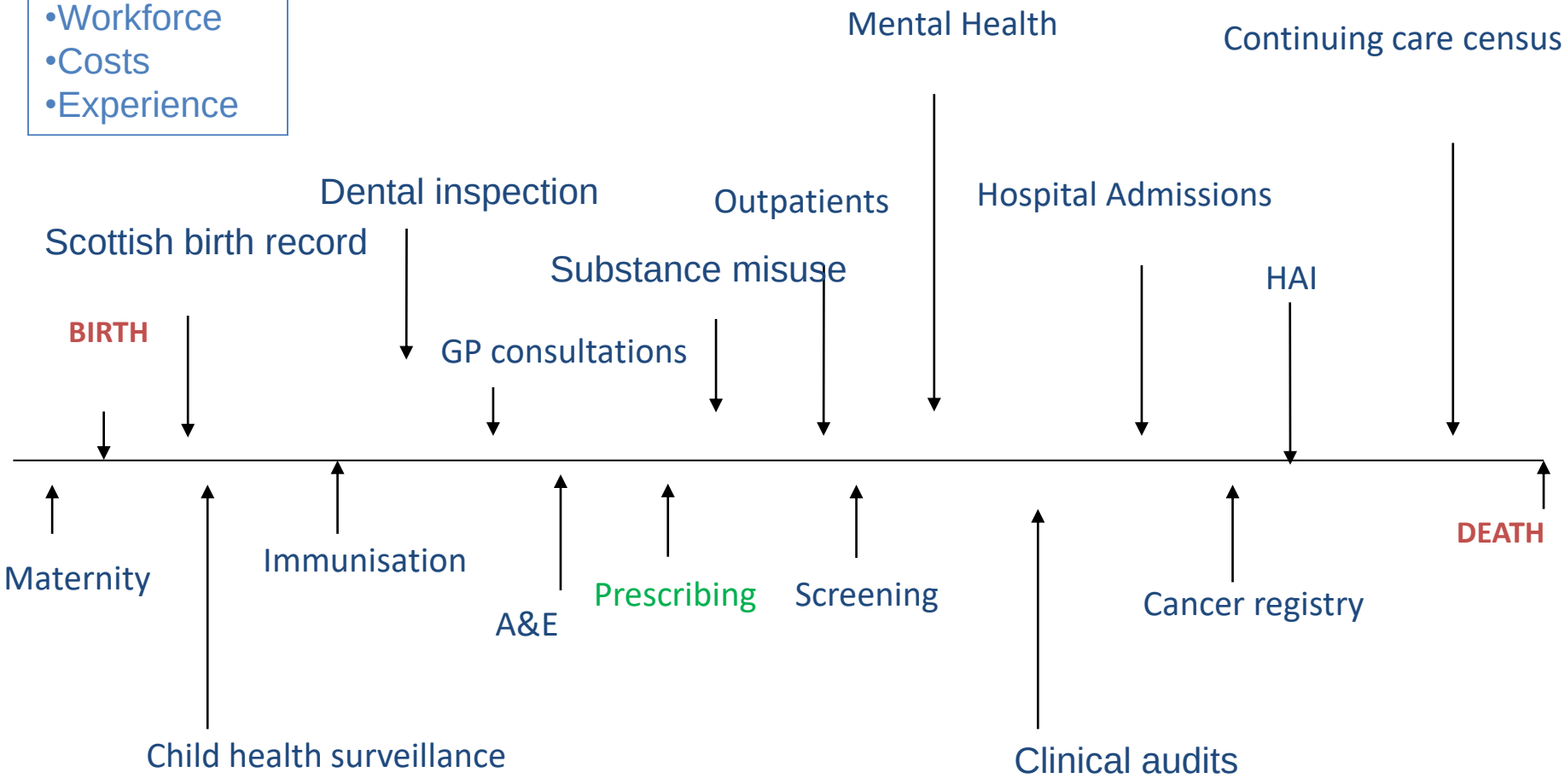
Using patient level data in drug utilisation research

Amanj Baker Kurdi (University of Strathclyde) and Brian Godman (University of Strathclyde and Karolinska Institutet, Sweden)

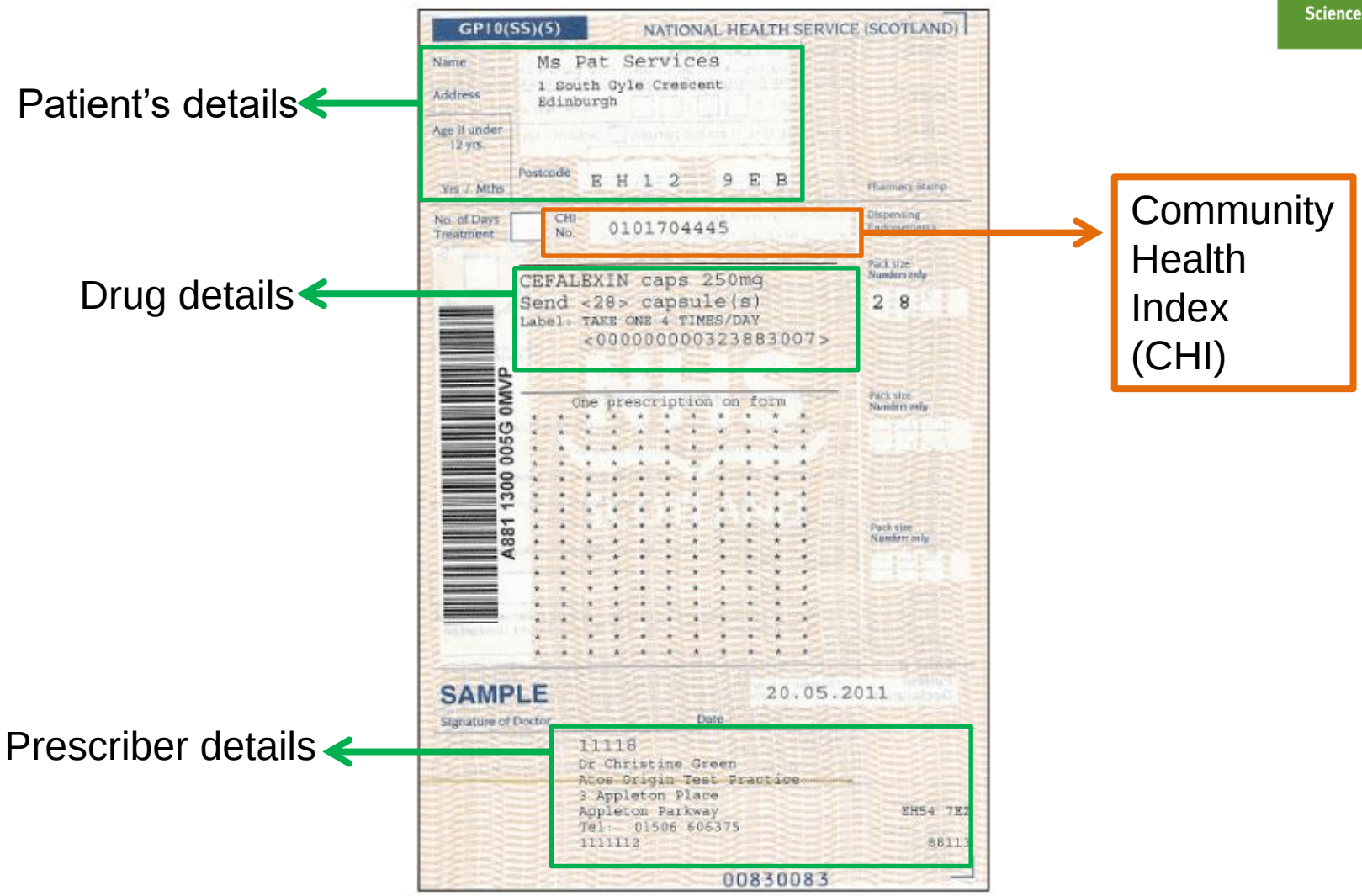
Data from cradle to grave (selected data sources) in Scotland

University of Strathclyde Science

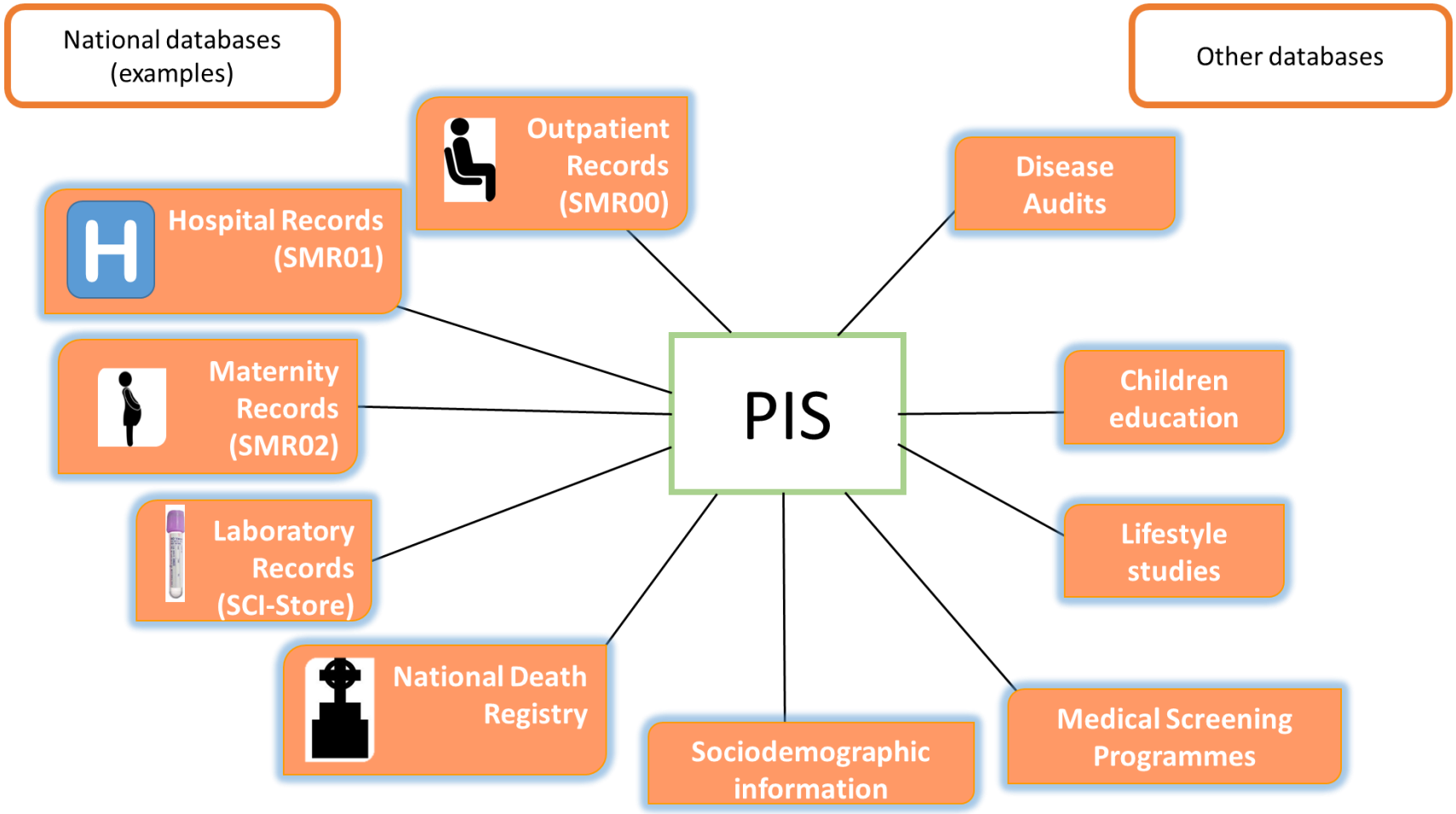
Plus
- Workforce
- Costs
- Experience



Paper prescription



PIS- supporting evidence generation



Scottish Infection Intelligence Platform (IIP)

University of Strathclyde Science

Improving patient outcomes and reducing harm from infection through innovative data integration to support clinicians across NHS Scotland

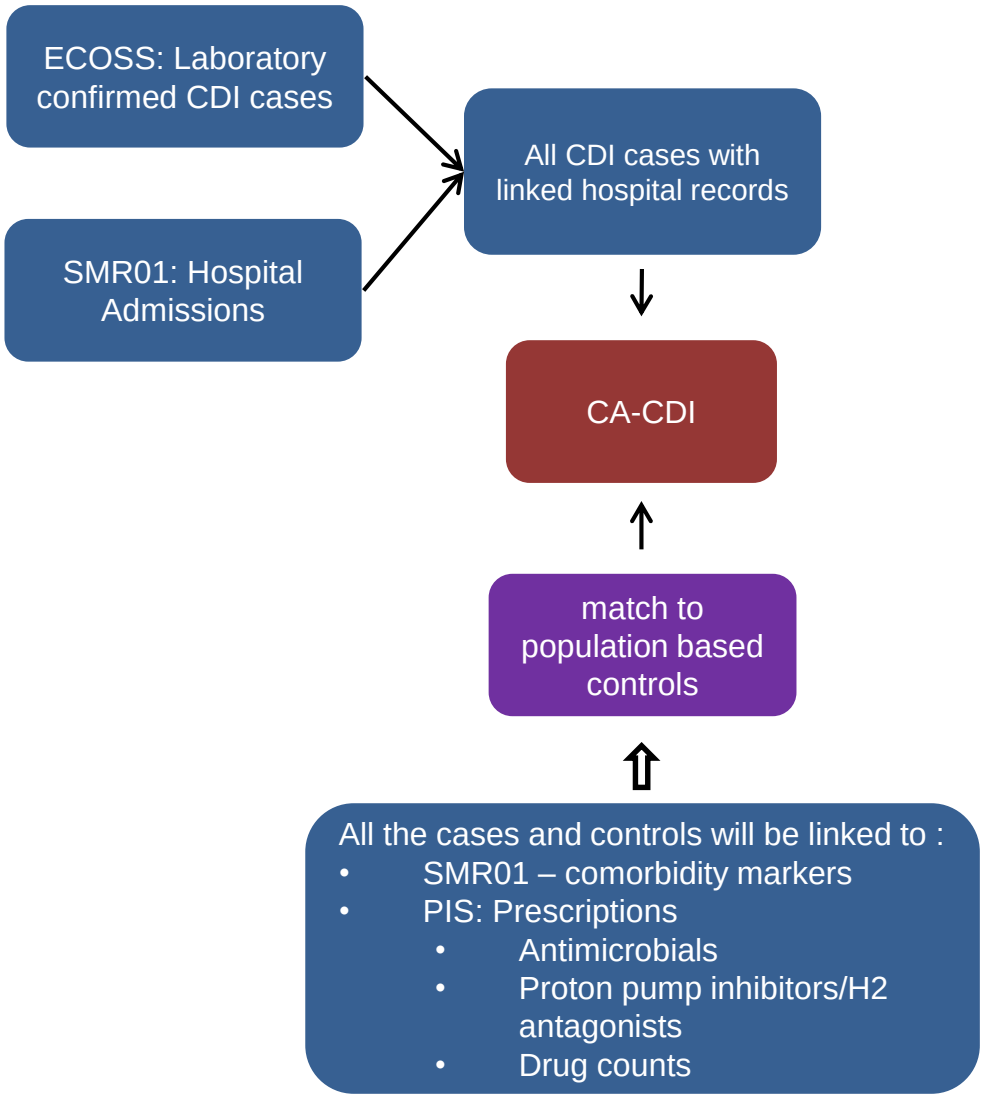
Key datasets:

- ECOSS-microbiology
- HMUD-medication use in hospital
- PIS-primary care prescribing
- SMR-hospital activity and deaths
- SSIRS-surgical site infections
- Laboratory results

Estimating the association between community prescription of antimicrobials and *Clostridium difficile* infection using data linkage

Jiafeng Pan, Kim Kavanagh, Chris Robertson, Charis Marwick, Peter Davey, Camilla Wiuff, Scott Bryson, Marion Bennie

Data Linkage



CA-CDI: tested in the **community** or tested **within 48 hours of hospital admission (n=1447)**

Up to **6** controls are matched on the basis of **age, gender** and **location**. **(n= 7964)**

Compare antibiotic exposure in cases and controls using conditional logistic regression

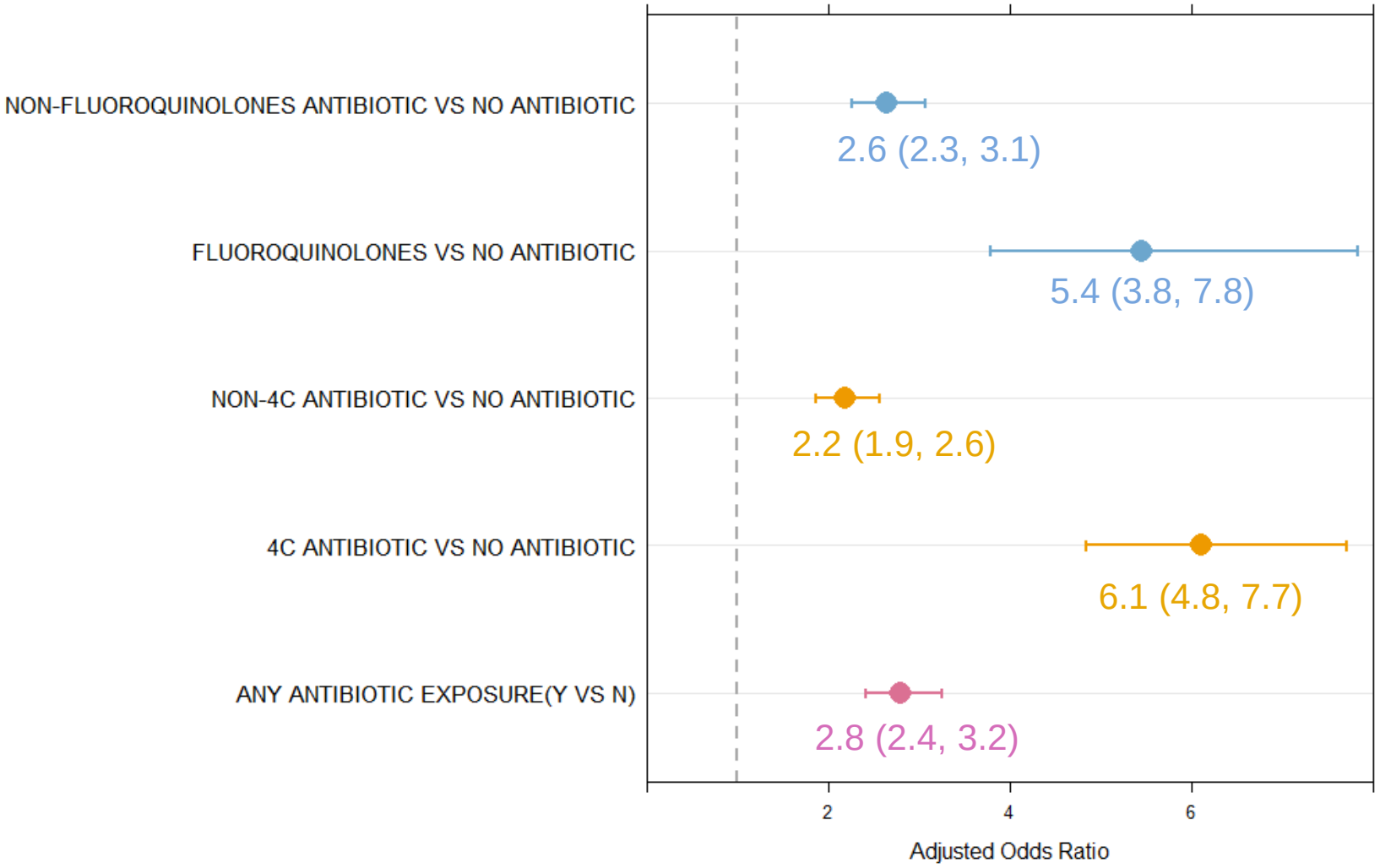
Exposure variables

- **Antimicrobial use** in the previous 6 months
  - **Any antimicrobial**
  - Use of the **4C antimicrobials** – Clindamycin, Cephalosporins, Fluoroquinolones (Ciprofloxacin, Levofloxacin, Moxifloxacin, Norfloxacin, and Ofloxacin) and Co-amoxiclav
  - Use of **Fluoroquinolones**

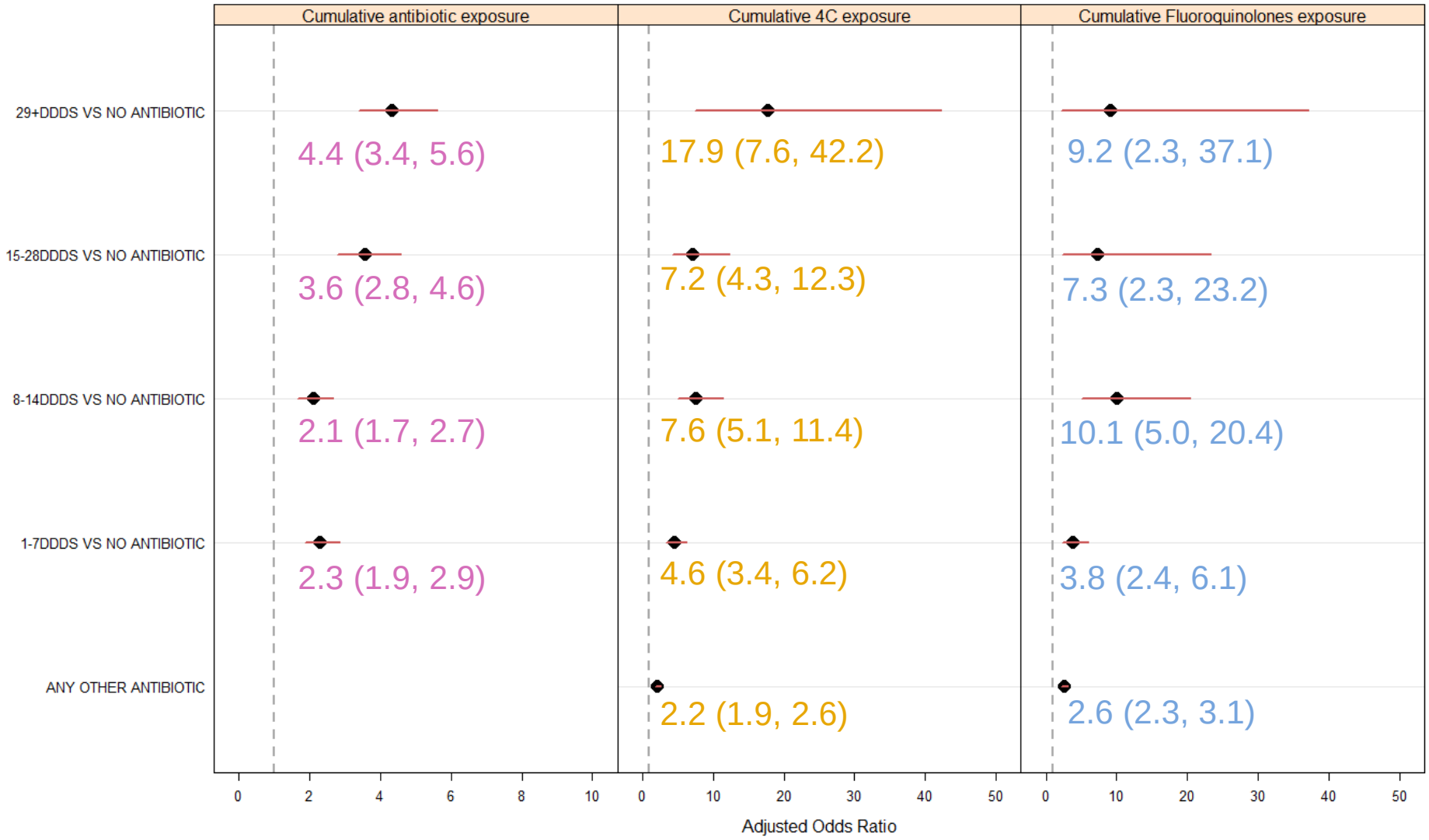
- **Cumulative antimicrobial exposure**
  - Measured by the number of Defined Daily Dose (DDD) in the 6 month prior to CDI date
  - DDD is assumed average maintenance dose per day for a drug used for its main indication in adults

- **Temporal antimicrobial exposure**
  - If used antimicrobials in previous 6 months when was the last dose?
  - Less than 1 month, 2-3 months, 4-6 months

Antibiotic exposure



Cumulative exposure in 6 months



Temporal exposure

Time of most recent exposure	Adjusted OR	95% CI	P value of linear trend test
Any antibiotic			0.064
None	1		
<= 1 month	**6.30**	**(5.16, 7.69)**	
2-3 months	**2.20**	**(1.78, 2.72)**	
4-6 months	1.10	(0.86, 1.42)	
4C			<0.0001
None	1		
<= 1 month	**12.45**	**(8.89, 17.44)**	
2-3 months	**5.12**	**(3.50, 7.51)**	
4-6 months	**2.59**	**(1.74, 3.87)**	
Any other antimicrobial	2.17	(1.84, 2.56)	
Fluoroquinolones			<0.0001
None	1		
<= 1 month	**11.06**	**(5.85, 20.90)**	
2-3 months	**4.96**	**(2.79, 8.82)**	
4-6 months	**3.13**	**(1.68, 5.83)**	
Any other antimicrobial	2.62	(2.25, 3.06)	

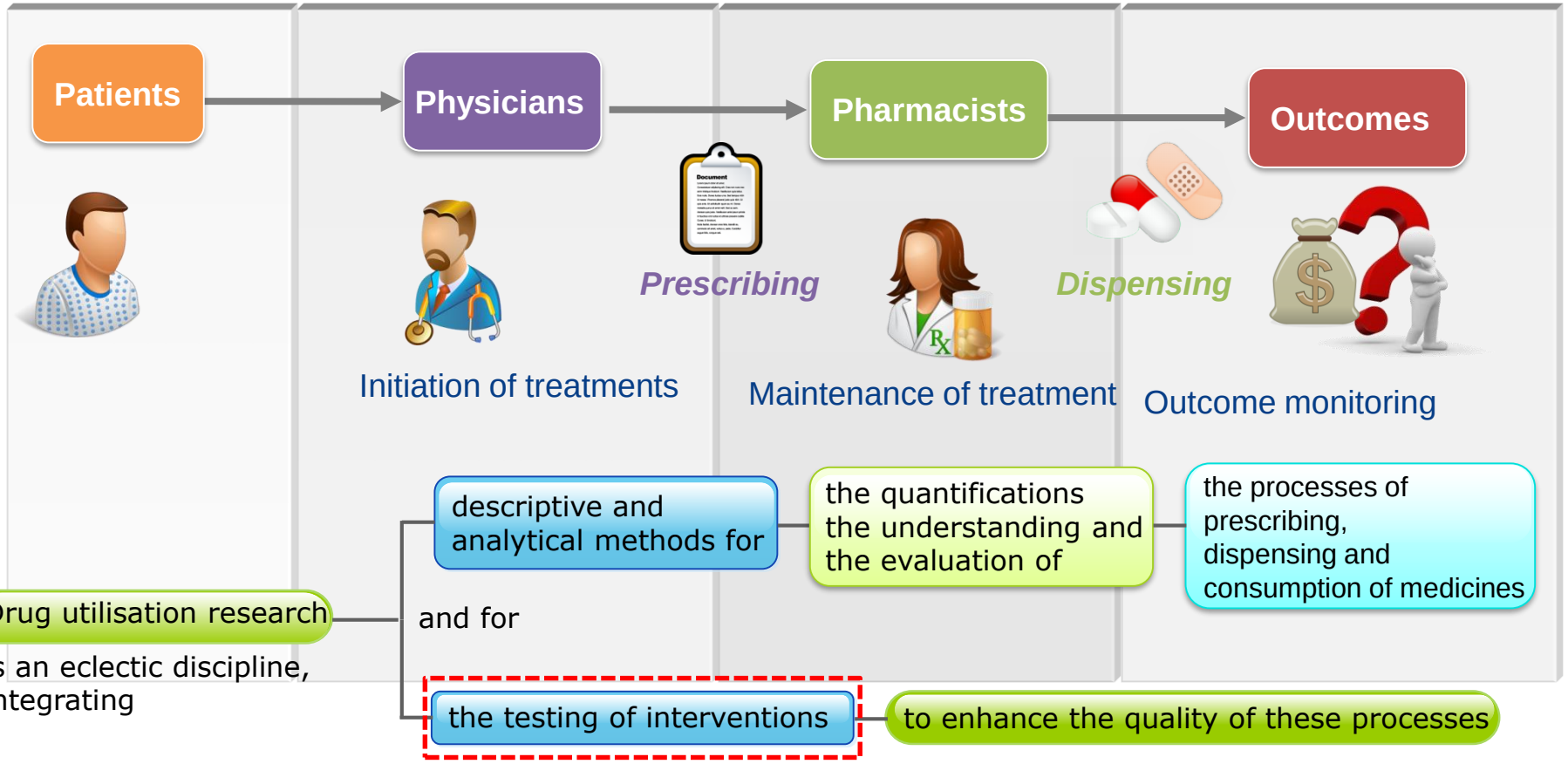
Summary

- Association community acquired CDI and community prescribing of antimicrobials clearly demonstrated
  - Overall, cumulative and temporal effects demonstrated
  - Differential quantified by type of antimicrobial

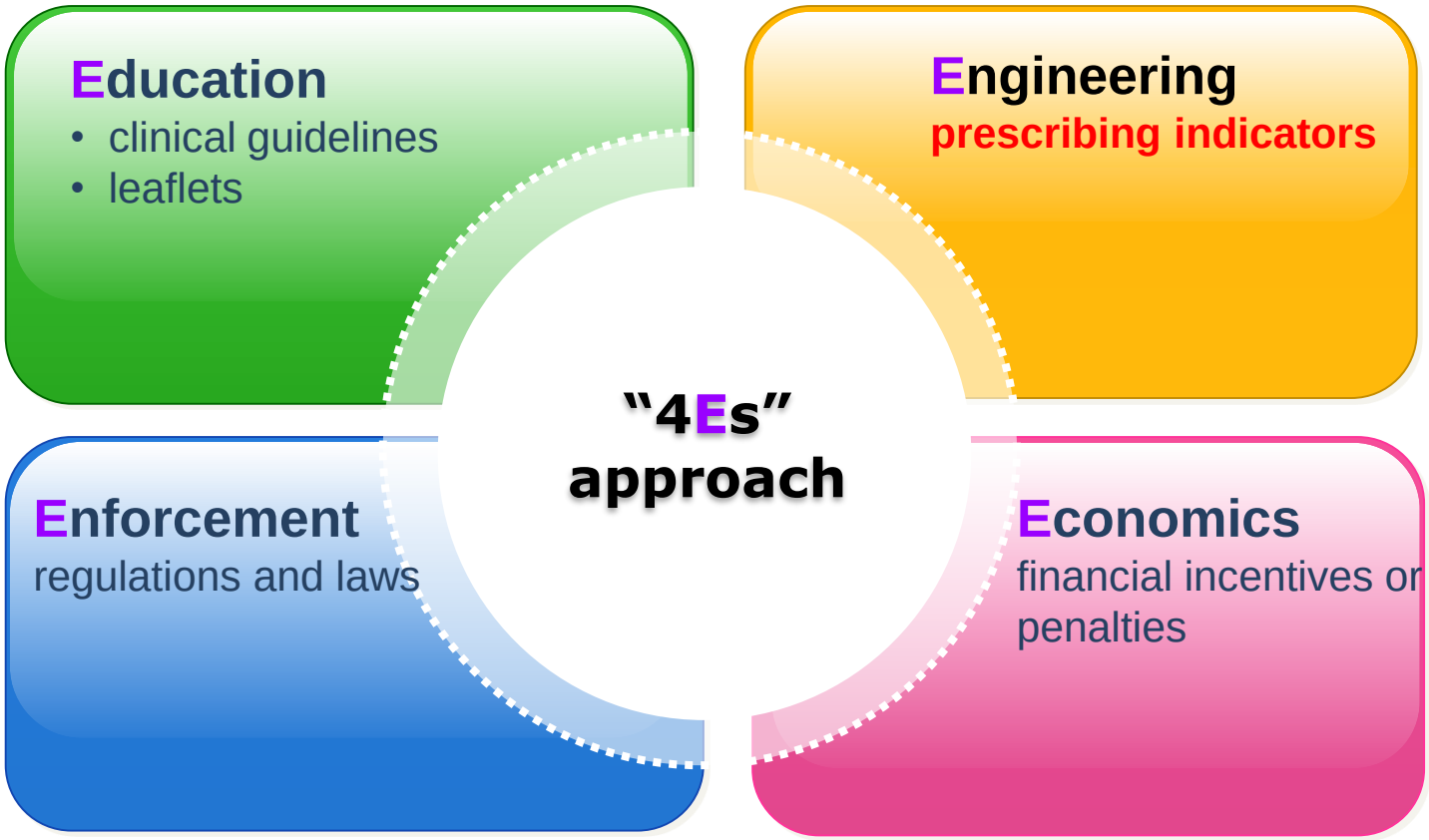
- Next steps…
  - Analysis generates information to potentially populate **clinical decision support tools** to guide clinicians on the risk of antimicrobial prescription in individual patients

Use of Drug Utilisation Data to Test the Impact of Healthcare Interventions

Drug Utilisation Process



Strategies to Optimise Drug Utilisation



Better Care Better Value (BCBV) Indicators - UK

- In April 2009, the NHS institute for innovation and improvement, initiated BCBV indicators with the following aim (building on previous indicators for the PPIs and statins):
  - Efficiently using healthcare resources
  - Ensure appropriate and efficient utilisation of medication
  - Improve quality of healthcare

- One indicator targeted Angiotensin-Converting Enzyme Inhibitors (ACEIs) and Angiotensin II Receptor Antagonists (ARBs)
  - The number of items written for ACEI as a percentage of the total volume of prescribing for drugs affecting RAS (as considerable differences in prices between generic ACEIs and patented ARBs)
  - A **80% target** suggested by NICE based on the 10% incidence of ACEIs inducing a dry cough.

The NHS Institute for Innovation and Improvement (2009); NICE (2006)

BCBV Indicator was Expected to Incur Potential Cost Saving to the NHS

- The National Audit Office (NAO) estimated a costing saving of:
  - £67 million in 2007
  - £443 million in 2009 compared to 2005 in four drug classes including ACEIs/ARBs

- The National Prescribing Centre (NPC) of England, in 2009 estimated a cost saving of:
  - £68 million if 80% ACEIs would have been achieved
  - £149 million if 90% ACEIs would have been achieved

- **However, neither the impact of BCBV on ACEIs and ARBs utilisation and nor its clinical and economic effects are clearly known.**

A Policy Evaluation Research

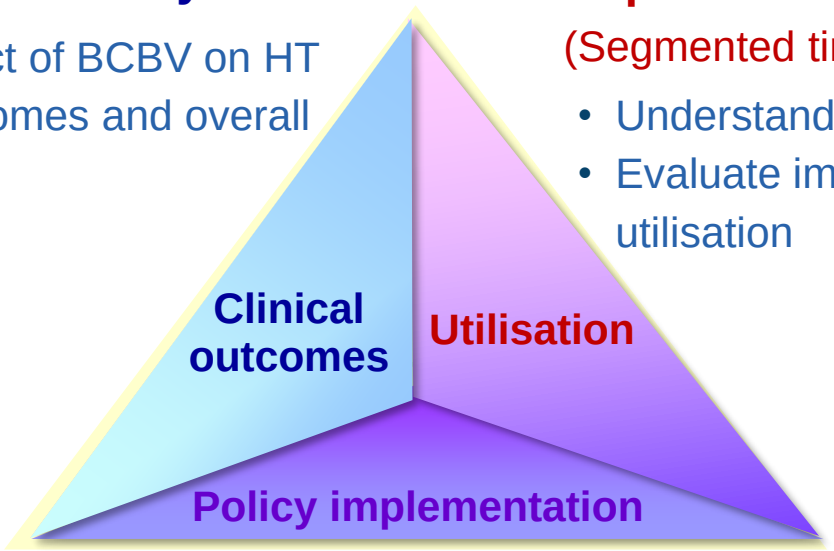
Retrospective cohort study

- Investigate the effect of BCBV on HT related clinical outcomes and overall expenditure

Repeated cross-sectional study

(Segmented time-series analysis)

- Understand the current utilisation
- Evaluate impacts of BCBV on utilisation

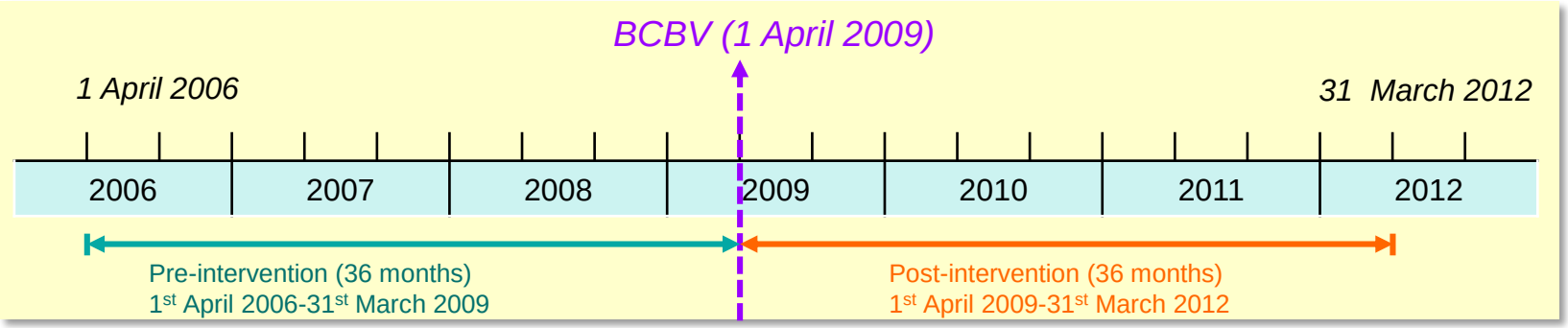


Qualitative interviews

- Explore how the BCBV was implemented in primary care settings and prescribers' attitudes and perceptions on the BCBV policy

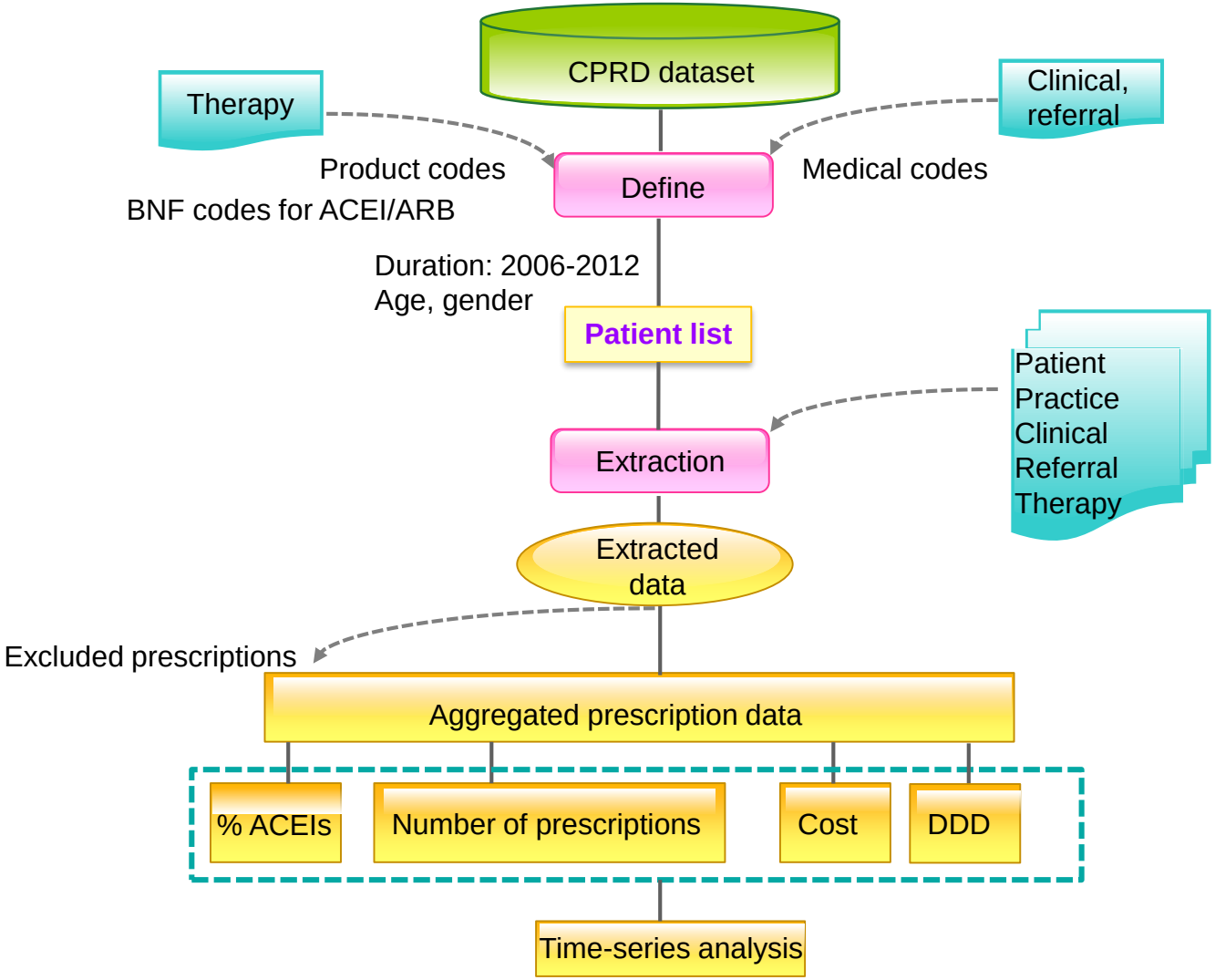
Has the BCBV indicator worked?

- **Aim:** To evaluate the impact of BCBV on the utilisation of ACEI/ARB in adults with primary hypertension in primary care settings in the UK.
- **Data source: CPRD (Clinical Practice Research Data-link)**(2006-2012)
- **Research subjects:** ACEIs/ARBs prescriptions issued during 6-year study period for hypertension treatment
- **Outcome measures:**
  - Repeat monthly measures of %ACEI, number of prescriptions, and costs



- **Analysis: Interrupted time-series analysis**, accounting for generic losartan and perindopril

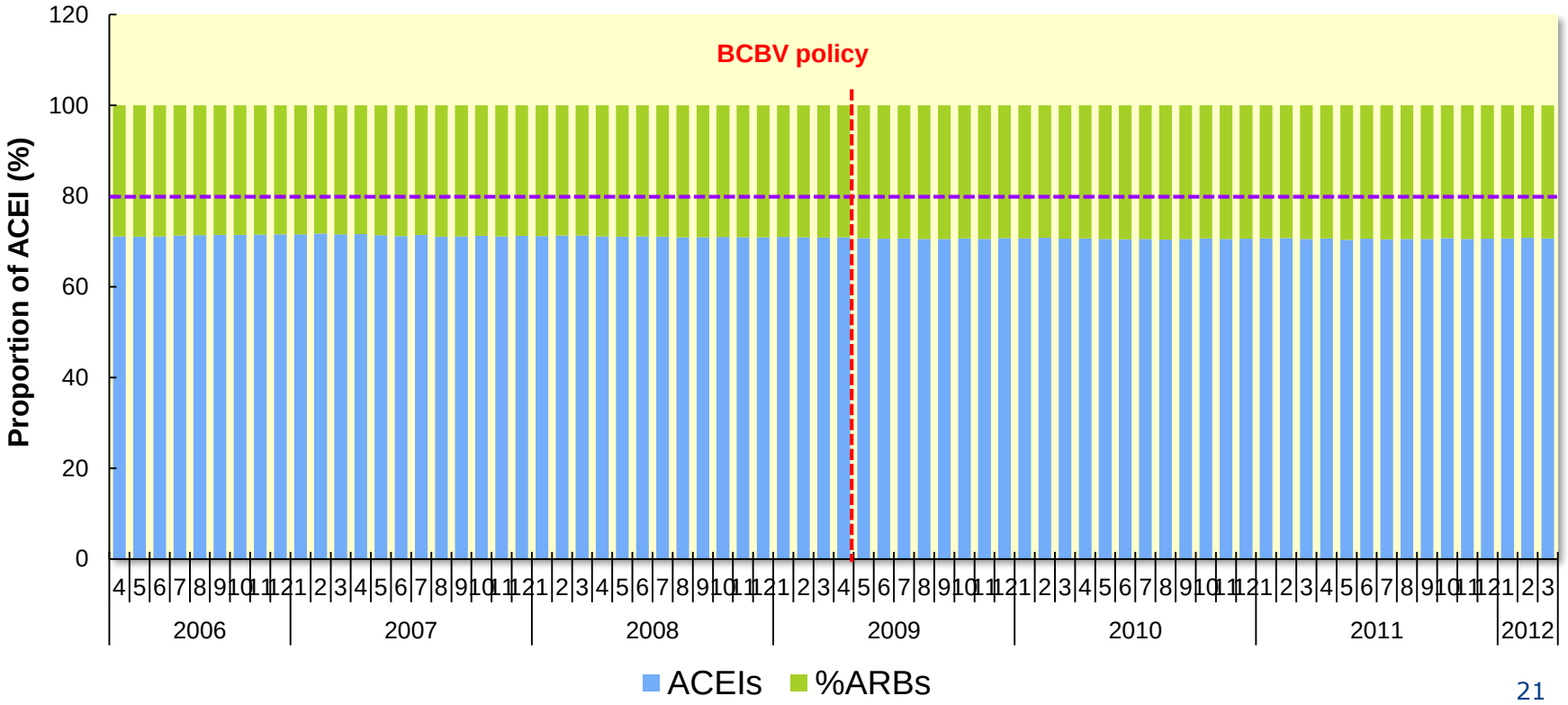
Data Management



BCBV was associated with a statistical significant increase, albeit very small

- % ACEIs declined from 71.2% in April 2006 to 70.7% in March 2012.

	β_1	β_2	β_3
% ACEIs	-0.02	-0.3	**0.013**



BCBV indicator was not associated with any cost savings

Baker *et al. BMC Health Services Research* (2015) 15:367
DOI 10.1186/s12913-015-1013-y

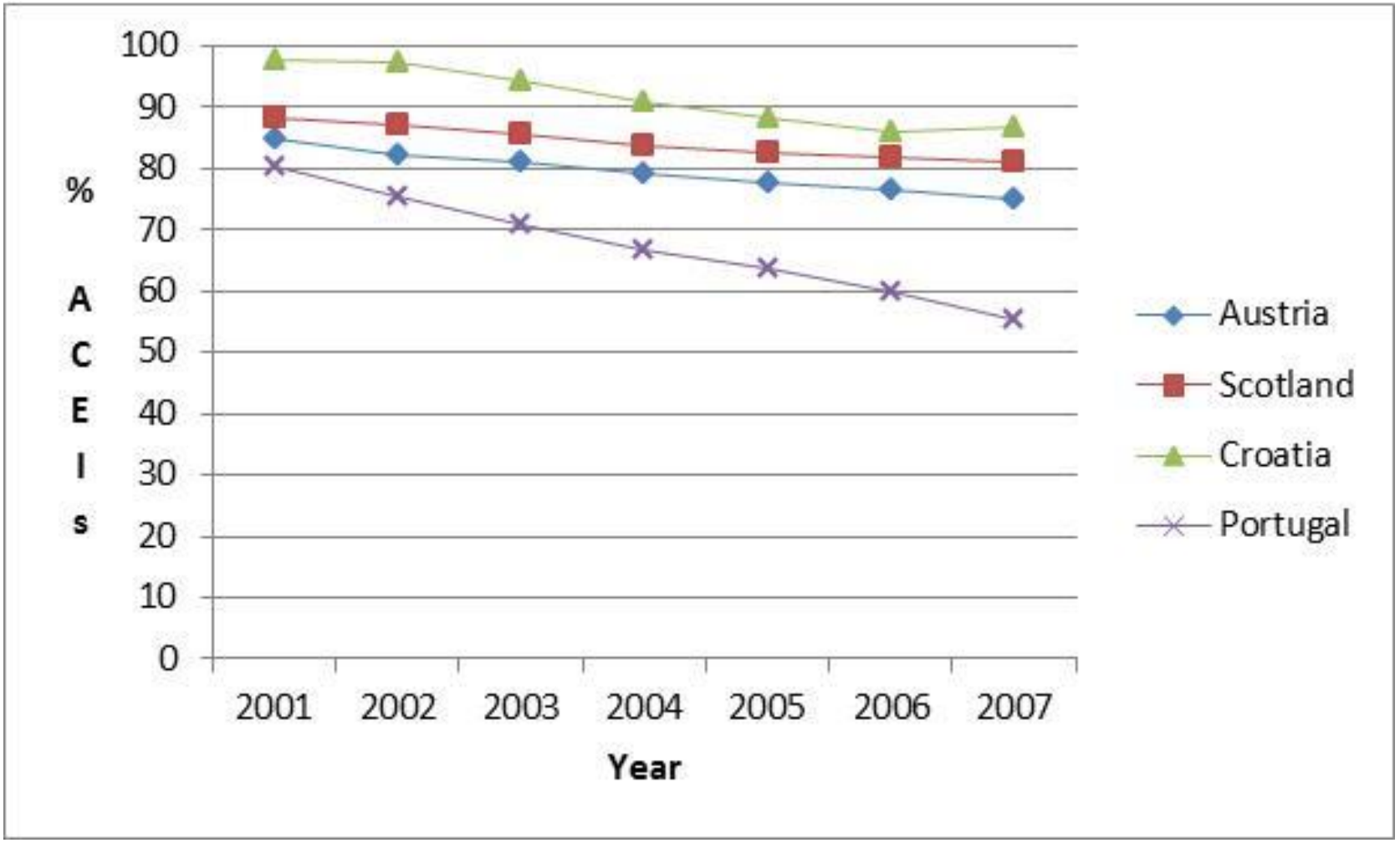
BMC
Health Services Research

RESEARCH ARTICLE Open Access

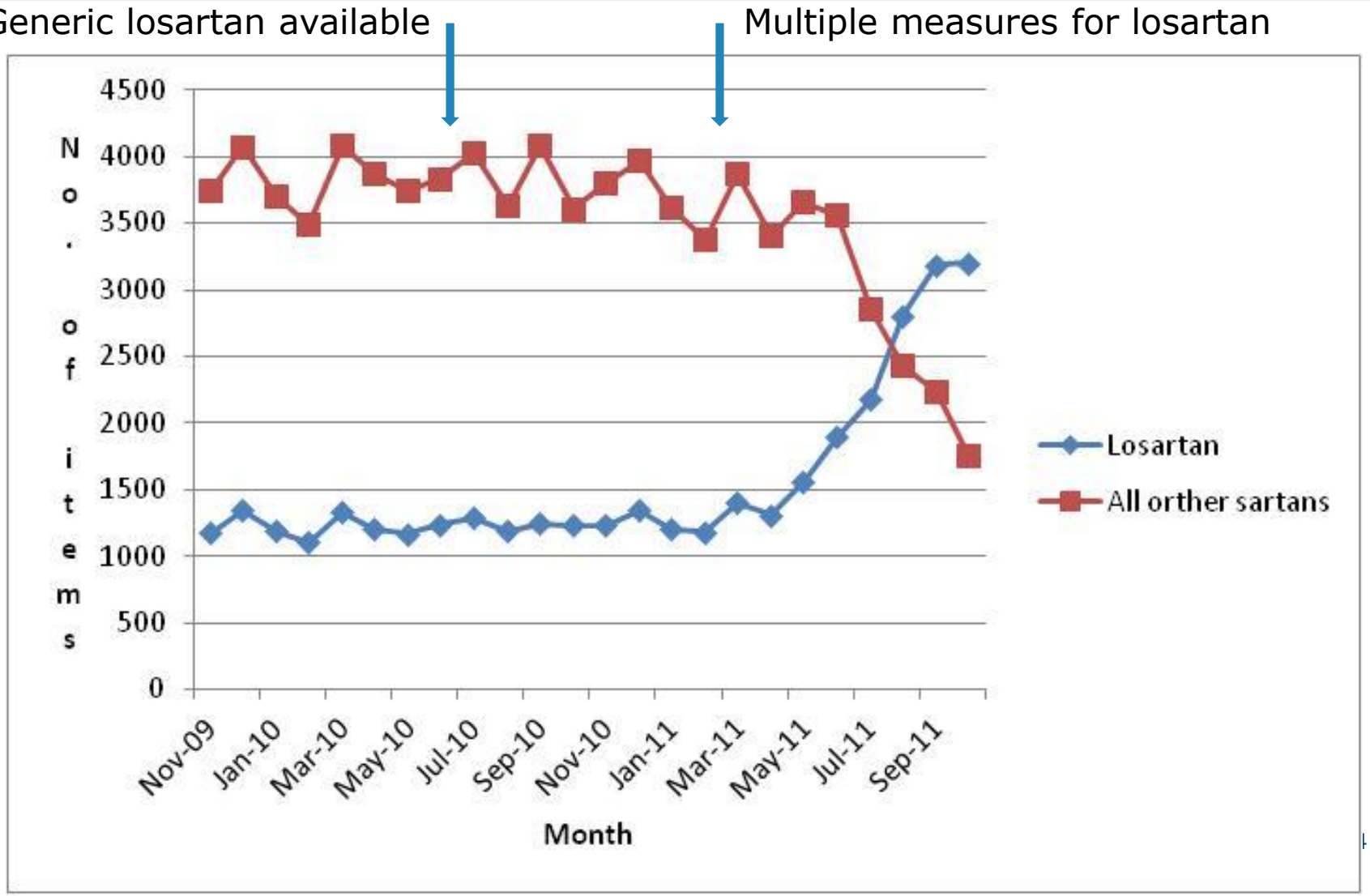
The impact of the 'Better Care Better Value' prescribing policy on the utilisation of angiotensin-converting enzyme inhibitors and angiotensin receptor blockers for treating hypertension in the UK primary care setting: longitudinal quasi-experimental design

Amanj Baker[1,2], Li-Chia Chen[1*], Rachel A. Elliott[1] and Brian Godman[3,4]

One reason is that this additional measure was introduced several years after multiple activities to reduce ARB prescribing in UK - with similar results to prescribing restrictions in Austria and Croatia



Multiple activities were needed in the UK to switch patients from patented ARBs to generic losartan once available. Little change in no health authority activity



Why the BCBV indicator was ineffective

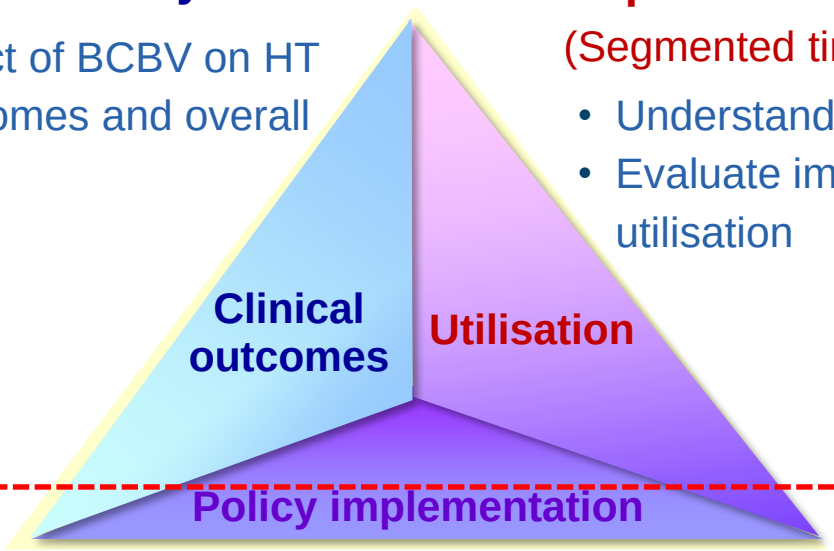
Retrospective cohort study

- Investigate the effect of BCBV on HT related clinical outcomes and overall expenditure

Repeated cross-sectional study

(Segmented time-series analysis)

- Understand the current utilisation
- Evaluate impacts of BCBV on utilisation



Qualitative interviews

- Explore how the BCBV was implemented in primary care settings and prescribers' attitudes and perceptions on the BCBV policy

Why the BCBV indicator was ineffective- continue

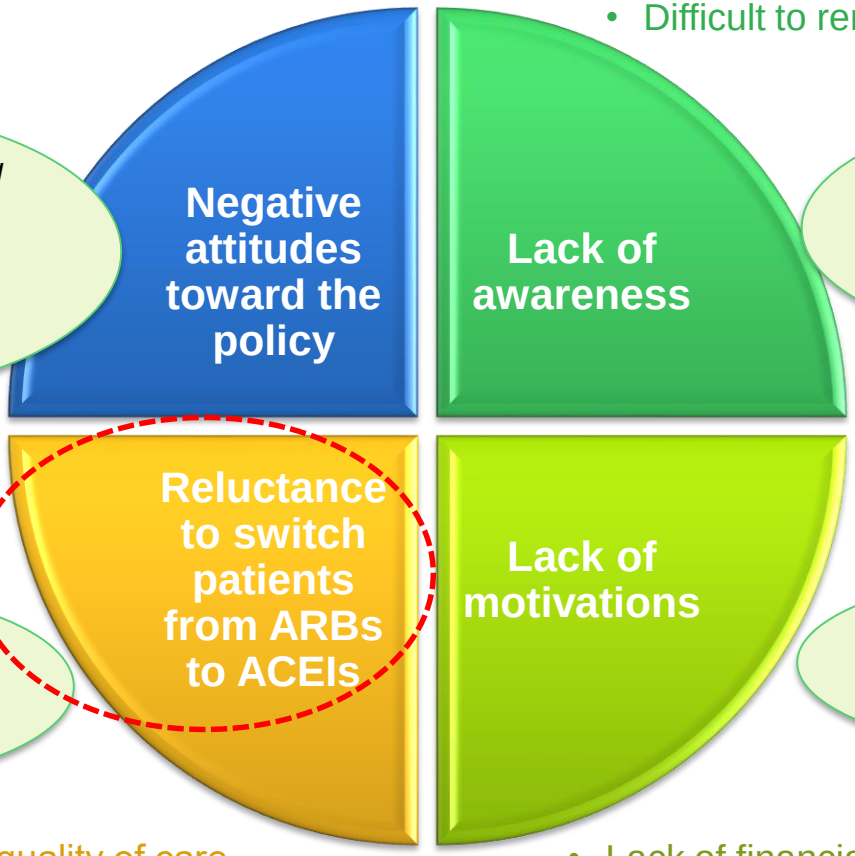
- **Aim of this study**
  - To explore the reasons underpinned the ineffectiveness of BCBV policy

- **Research methods**
  - Semi-structured interviews using a interview schedule included open questions to explore:
    - GPs' perceptions and views of BCBV policy and ACEIs/ARBs prescribing
  - Purposive sampling of GPs from Nottinghamshire, Derbyshire, and Leicestershire.
    - 16 GPs were interviewed face-to-face
  - Interviews were recorded, transcribed verbatim and analysed using thematic analysis.

Poor policy uptake was the most potential reason underpinning the policy's failure

- Decrease prescribing autonomy
- Cost-oriented

"*It can feel like a sort of a Big Brother watching you, you naughty person, why could you think of prescribing that ARB, that's really hideous*"
37-yr, male, salaried GP



- Poor dissemination and advertisement
- Difficult to remember

"*No, I have not heard of it. I think it's just information overload or it's not well advertised*" **36-yr,male, partner GP**

"*If it isn't broken, why do you fix it, why do you mess about*"
58-yr, male, partner GP

Concerns about patients' quality of care

"*It could be because it's not financially incentivised*"
32-yr,male, salaried GP

- Lack of financial incentives
- Loss of cost differential between ACEIs and ARBs

Clinical and economic impact of the BCBV indicator

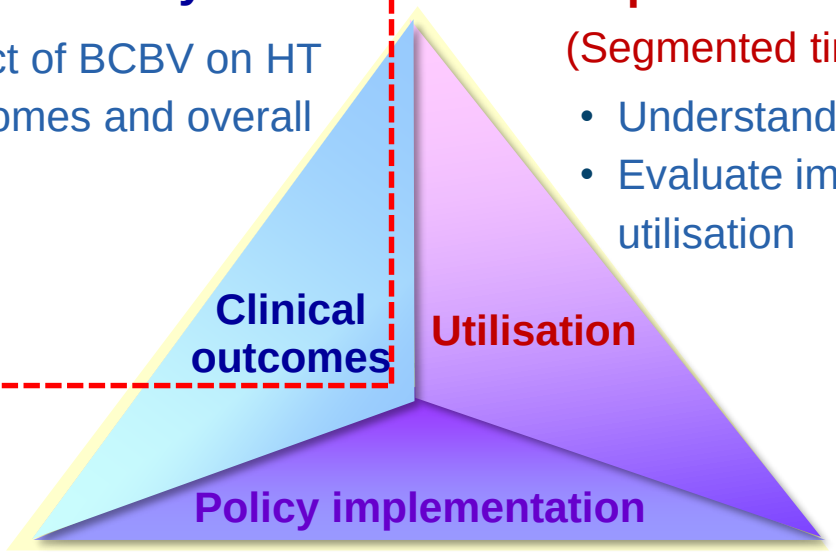
Retrospective cohort study

- Investigate the effect of BCBV on HT related clinical outcomes and overall expenditure

Repeated cross-sectional study

(Segmented time-series analysis)

- Understand the current utilisation
- Evaluate impacts of BCBV on utilisation

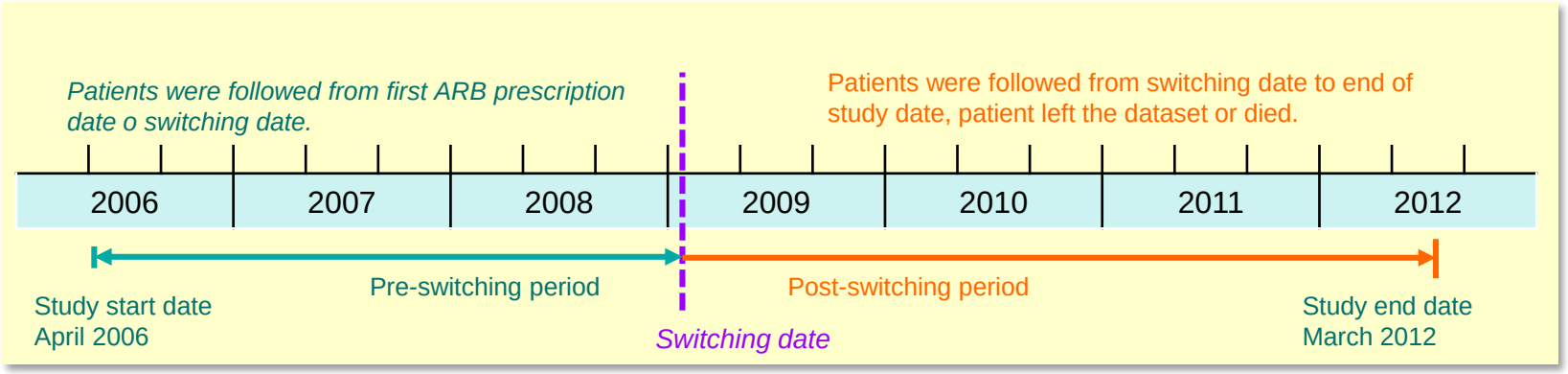


Qualitative interviews

- Explore how the BCBV was implemented in primary care settings and prescribers' attitudes and perceptions on the BCBV policy

Clinical and Economic Impact of ARBs Switching to ACEIs

- **Aim:** To evaluate the impact of the BCBV policy on adherence, BP level, HT-related clinical outcomes and expenditure
- **Data source: CPRD** and **HES (Hospital Episode Statistics)**
- **Research subjects:** Hypertensive patients switched their therapy from ARBs to ACEIs



- **Outcome measures**
  - Adherence (PDC), BP value
  - HT-related clinical outcomes (stroke, IHD, HF, RF)
  - healthcare resource utilisation

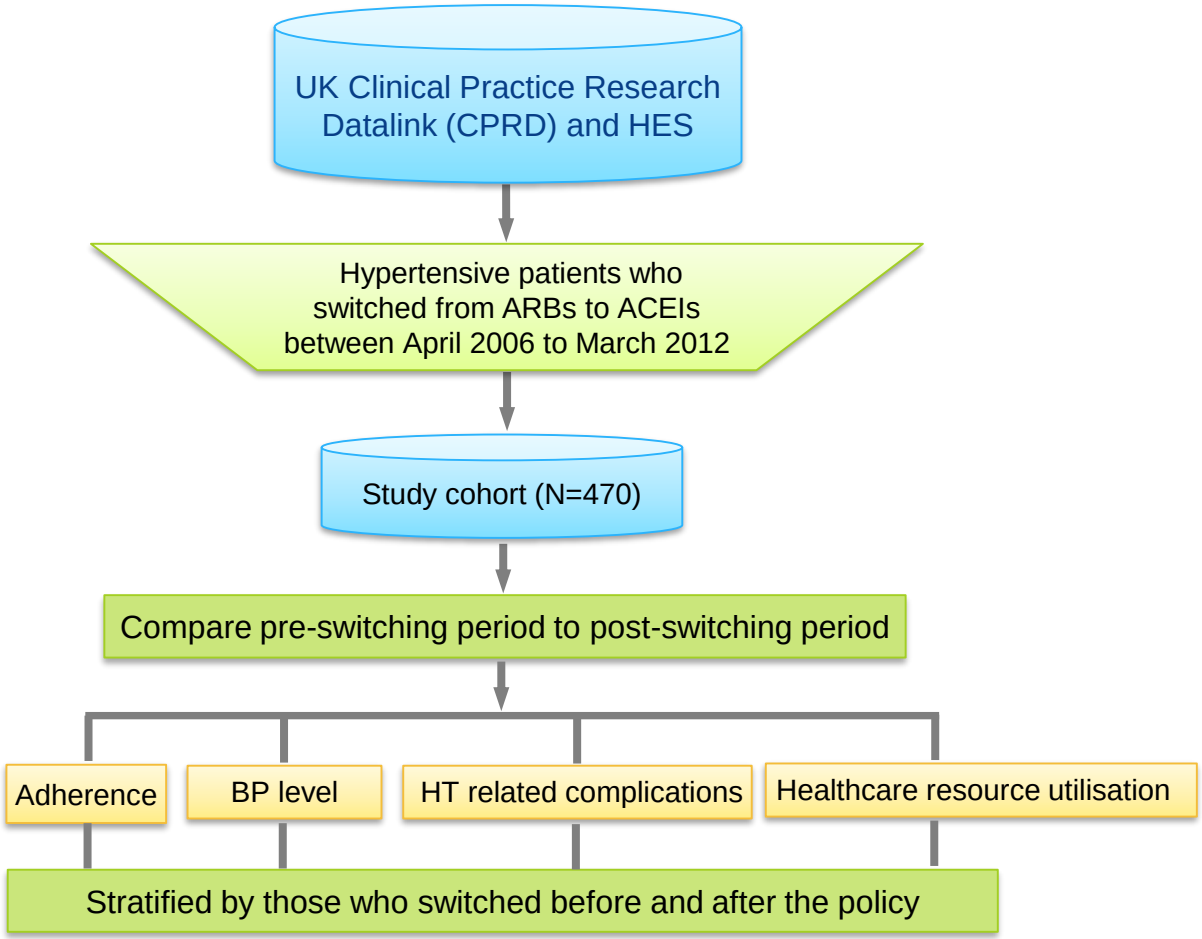
Data Management and Analysis

Data

Periodicity

Cohort size

Data analysis (**multilevel modelling**)



ARBs switching had no impact on adherence

- **Baseline characteristics**
  - 470 patients were included, with 78.5% (n=369) were prescribed other antihypertensive drugs (ACEIs-combined)

- **Patients' adherence to antihypertensive drug class**
  - Switching was associated with lower adherence (ACEIs-combined group)
  - Suggesting that it was not linked to the switching

	Total (n=470)		ACEIs-combined (n=369)		ACEIs-monotherapy (101)	
	Before switching	After switching	Before switching	After switching	Before switching	After switching
Median PDC	98.5*	97.9*	99.2*	97.9*	95.7	98.0

ARBs switching had no impact of BP level

- Switching of ARBs to ACEIs was associated with significantly lower systolic and diastolic BP
- **Stratification by the two study groups**
  - The significant difference was only found in ACEIs-combined group
  - This suggested that reduction in BP was not associated with the switching

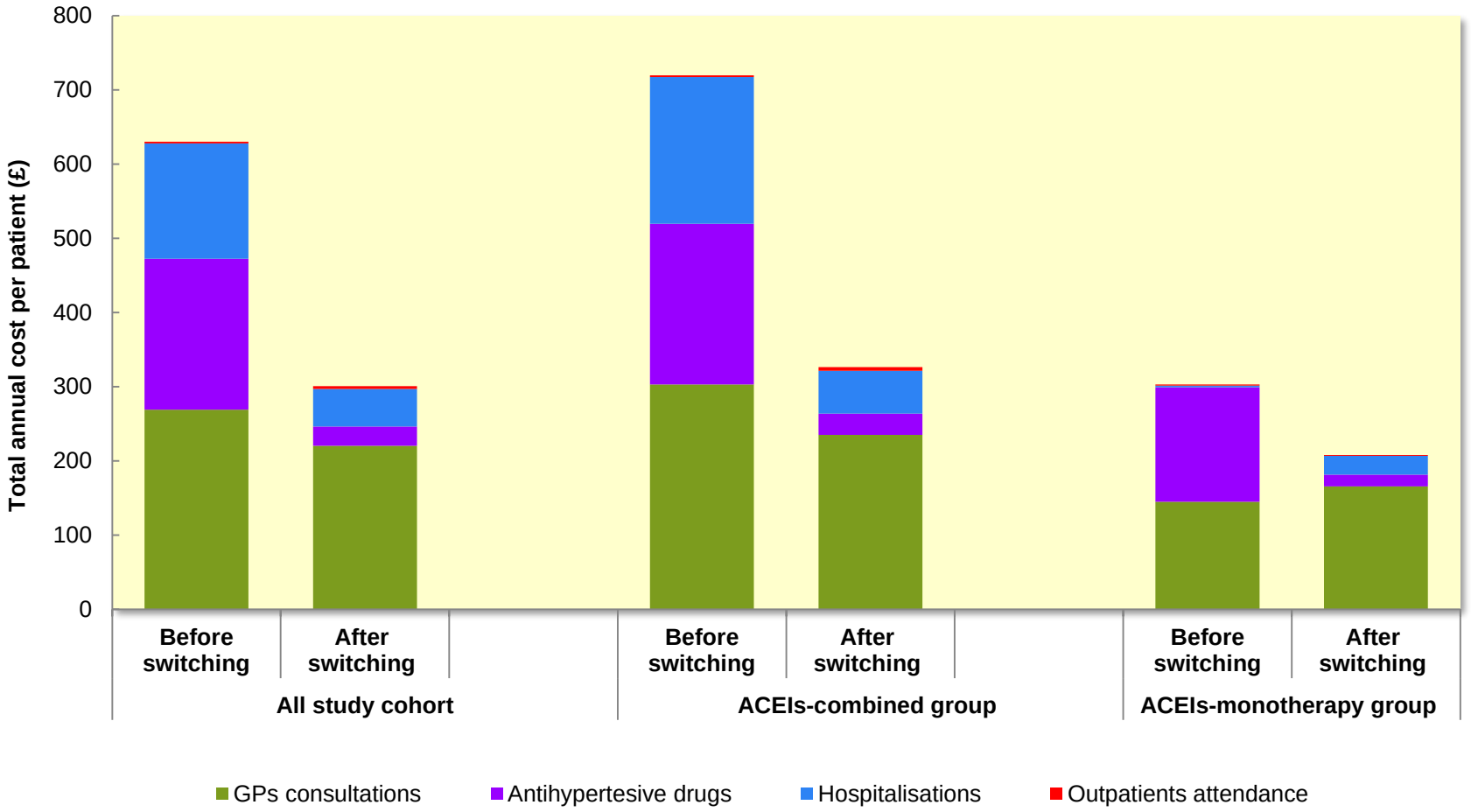
	Total (n=470)		ACEIs-combined (n=369)		ACEIs-monotherapy (101)	
	Before switching	After switching	Before switching	After switching	Before switching	After switching
SBP	143.2*	141.3*	144.2*	141.9*	139.8	138.8
Mean Differ	-2.3*		-2.2*		**-2.0**	
DBP	84.1*	82.5*	84.6*	82.6*	82.4	81.9
Mean Differ	-1.9*		-2.1*		**-1.0**	

ARBs switching had no impact on HT-related complications

- No significant difference in the incidence of HT related clinical outcomes before and after switching, except for MI
- Same results were confirmed in the multilevel analysis

	Total (n=470)		ACEIs-combined (n=369)		ACEIs-monotherapy (101)	
	Before switching	After switching	Before switching	After switching	Before switching	After switching
Composite outcome (%)	19 (4.0)	21 (4.5)	18 (4.9)	18 (4.9)	1 (1.0)	3 (3.0)
Stroke (%)	1 (0.2)	2 (0.4)	0 (0.0)	1 (0.3)	1 (1.0)	1 (1.0)
MI (%)	13 (2.8)*	3 (0.6)*	13 (3.5)*	3 (0.8)*	0 (0.0)	0 (0.0)
HF (%)	0 (0.0)	1 (0.2)	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)
RF (%)	0 (0.0)	1 (0.2)	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)
Angina (%)	6 (1.3)	7 (1.5)	6 (1.6)	6 (1.6)	0 (0.0)	1 (1.0)
Atherosclerosis and other IHD (%)	4 (0.9)	11 (2.3)	4 (1.1)	10 (2.7)	0 (0.0)	1 (1.0)

ARBs switching resulted in significant cost saving



ARBs switching resulted in significant cost saving- continue

- **Switching of ARBs was associated with:**
  - Lower overall cost, driven mainly by reduction in drug cost and partly by hospitalisation cost
  - No significant difference GP consultations and outpatient attendance cost

	Total (n=470)		ACEIs-combined (n=369)		ACEIs-monotherapy (n=101)	
	Before switching	After switching	Before switching	After switching	Before switching	After switching
GPs consultations	268.9	220.2	302.8	235.2	145.0	165.5
Mean difference	**-48.7**		**-67.6**		**20.5**	
Antihypertensive drugs	203.3*	26.0*	216.7*	28.7*	154.1*	16.0*
Mean difference	**-177.3***		**-188.0***		**-138.1***	
Hospitalisations	155.6*	50.6*	197.6*	57.6*	2.2	25.4
Mean difference	**-105.0***		**-140.0***		**23.2**	
Outpatients attendance	2.3	4.0	2.4	4.8	1.8	1.0
Mean difference	**1.8**		**2.4**		**0.8**	
Total cost	630.0*	300.9*	719.5*	326.3*	303.0*	207.9*
Mean difference	**-329.2***		**-393.2***		**-95.1***	

Conclusions and Learning Points

- This BCBV indicator was ineffective (versus others)
  - Poor policy implementation and uptake
  - There are ongoing necessity to consider this policy
- Multiple initiatives are needed to improve the future uptake
  - Effective implementation strategies (reminder tools, local adoption)
  - Linking the policy with financial incentives
  - Ensure GPs and policy makers that BCBV indicator has no negative clinical consequences
- Learning Points
  - Effective implementation strategies are integral to any successful policy
  - Failure of a policy may be due to the poor implementation strategy rather than the policy itself

Namibia

Now over to colleagues from Namibia to say a few words