



# **Using Administrative Data in Health Economics:**

## **An Illustrative Study on Competition and Inequality**

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# Outline of talk

1. Background on administrative datasets used by health economists in England
2. Study of competition and inequality

# Background on administrative health data in England

1. Patient level hospital data (HES)
  2. Patient level primary care data (CPRD)
- Other useful administrative datasets I won't talk about include...
    - QOF & GMS data on GP practices
    - Clinical registry and audit data (e.g. cancer registry, national joint registry, central cardiac audit database etc.)

# Hospital Episode Statistics

- All inpatient, outpatient and A&E attendances in NHS hospitals in England
  - Inpatient data from 1989/90
  - Outpatient data from 2003/4
  - A&E attendances from 2007/8
- Held by the Health and Social Care Information Centre on behalf of the Secretary of State
  - Complex data extraction & manipulation to produce a useful dataset for research
  - Stringent data protection requirements
  - Data extraction fees

**[www.hscic.gov.uk/hes](http://www.hscic.gov.uk/hes)**

# Patient information available

- Demographic
  - Age, gender, ethnicity, and “sensitive” fields: NHS number, postcode
- Admission
  - Dates, methods, source/destination, waiting time, length of stay
- Medical
  - Diagnostic and procedure codes, treatment specialty, HRG for payment
  - Death rates, emergency re-admission rates, patient reported outcomes
- Organisational
  - Provider, commissioner, GP practice and “sensitive” field: consultant
- Geographical and socioeconomic
  - Census output areas, wards, local authorities and attributed SES data
- Maternity
  - Birth weight, gestation period, live birth, delivery methods
- Psychiatric
  - Detention, mental health status, psychiatric status

# Data generating process

- Hospital staff record information on the patient
- Medical record staff code this information and convert to electronic form
- Data sent to central “warehouse”
- Quality assurance
- Data linked to other sources of information
- Full data set compiled and made available

# Centre for Health Economics

## 3-day Course on HES

THE UNIVERSITY of York  
Centre for Health Economics


Centre for Health Economics University

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    - ▶ Applied health economics
    - ▶ Analysing patient-level data using hospital episode statistics
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  - ▶ News
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  - ▶ Intranet (staff only)
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**Who to contact**

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**Course dates**

▶ 26-28 November 2013

### Analysing patient-level data using hospital episode statistics (HES)

Overview Course dates Programme **Presenters** Registration

#### Presenters

The senior tutors for this course will be [Chris Bojke](#) and [Andrew Street](#).

Further tutors will be Research Fellows in the Centre for Health Economics.

[www.york.ac.uk/che/courses/short/patient-data](http://www.york.ac.uk/che/courses/short/patient-data)

# **CLINICAL PRACTICE RESEARCH DATALINK (CPRD)**

**[www.cprd.com/intro.asp](http://www.cprd.com/intro.asp)**

**With thanks for his slides to my colleague  
Professor Tim Doran, University of York  
Department of Health Sciences**



# CPRD

## Clinical Practice Research Datalink

- ESTABLISHED 1987
- OPERATED BY THE MEDICINES AND HEALTHCARE PRODUCTS REGULATORY AGENCY
- VISION SYSTEM PRACTICES ONLY (1,492 - 18.1%)
- CURRENTLY 545 ACTIVE PRACTICES (11.2M PATIENTS)

### MARKET SHARE OF THE MAJOR CLINICAL COMPUTING SYSTEMS

	VISION	LV	SYS ONE X	PCS	SYNERGY
EAST MIDLANDS	6.7%	49.3%	27.7%	11.9%	3.5%
EAST	22.4%	35.8%	2.2%	26.6%	6.0%
LONDON	2.5%	24.8%	58.8%	12.0%	1.2%
NORTH EAST	5.4%	35.4%	48.2%	6.5%	2.5%
NORTH WEST	17.9%	42.0%	5.1%	22.9%	7.4%
SOUTH CENTRAL	11.7%	33.9%	41.4%	6.1%	4.3%
SOUTH EAST	26.0%	50.5%	1.6%	16.6%	2.5%
SOUTH WEST	36.5%	36.8%	6.8%	10.9%	6.0%
WEST MIDLANDS	27.2%	44.8%	4.4%	8.9%	6.9%
YORKSHIRE HUMBER	13.8%	42.6%	11.3%	8.0%	9.4%

# BASIC DATA

- **EVENT FILES**

  - CLINICAL (ALL MEDICAL HISTORY DATA)

  - REFERRALS

  - IMMUNISATION

  - THERAPY (INC. ALL PRESCRIPTIONS)

  - TESTS (INC. RESULTS)

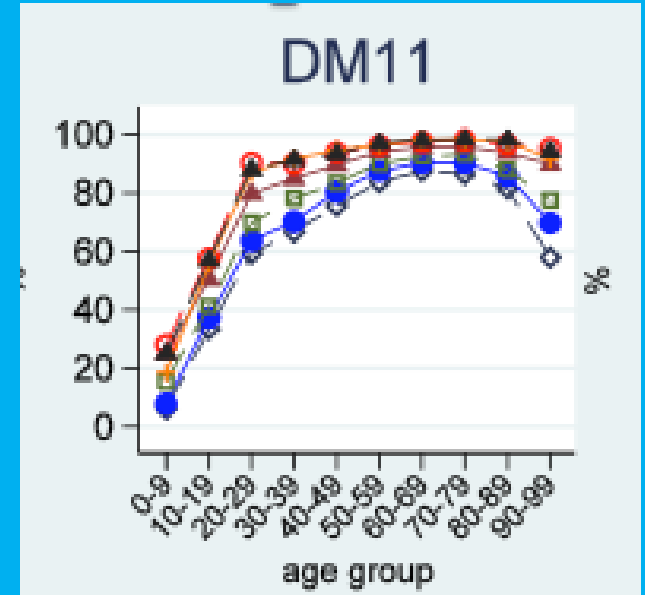
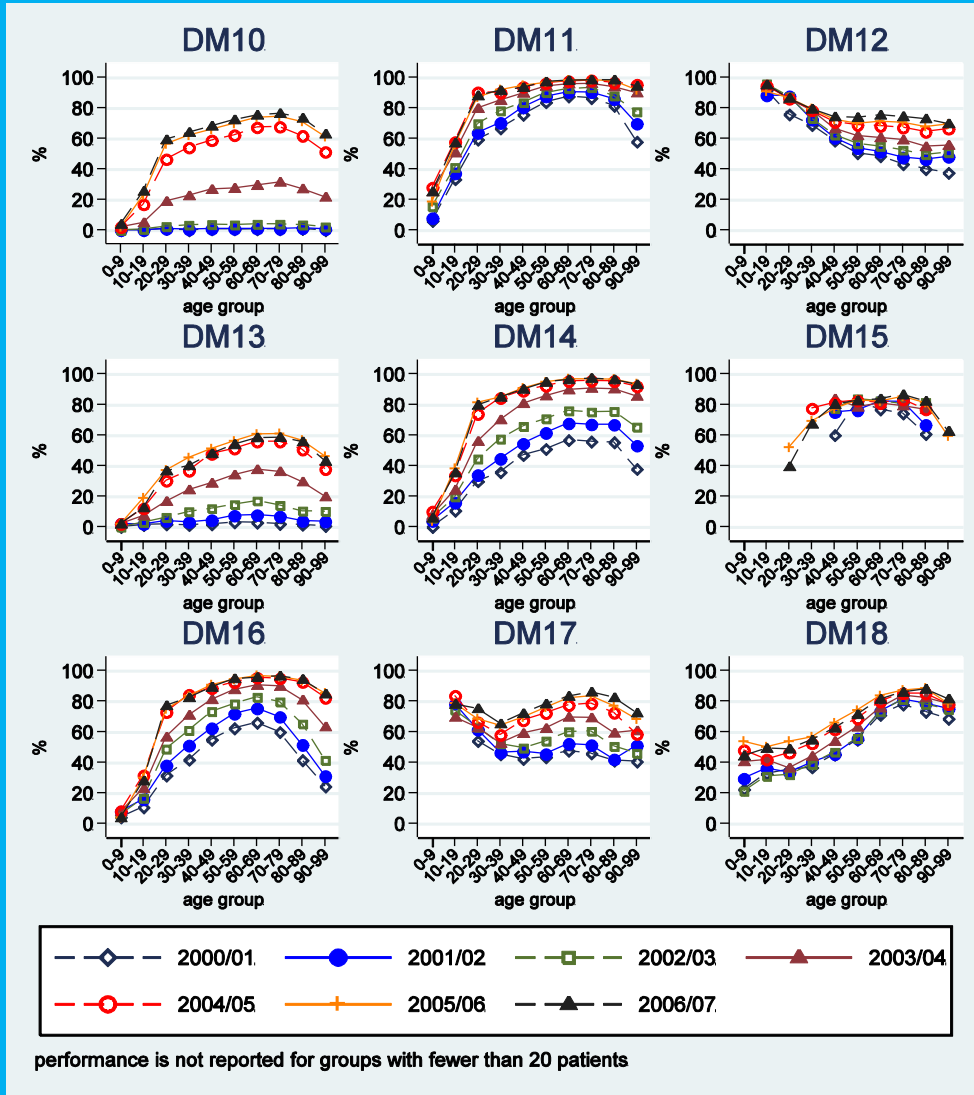
- **LOOKUP FILES**

  - READ CODES (98,031 AVAILABLE)

  - PRODUCT CODES (77,198 AVAILABLE)

  - TEST CODES (304 AVAILABLE)

# CPRD Example – Diabetes Quality Trends



ALLOWS ADJUSTMENT FOR  
AGE, SEX, CO-MORBIDITY, ETC  
(CF. PRACTICE LEVEL QMAS  
DATA)

# Illustrative Study of Competition and Inequality

# Three Doses of Hospital Competition in the English NHS



Thatcher/Major  
1991-7

Blair/Brown  
2003-10

Cameron/Clegg  
2010-??



**Project title:** Effects of health reform on health care inequality

**Funded by:** NHS NIHR Service, Delivery and Organisation Programme

**Managed by:** DH PRP Health Reform Evaluation Programme

**Project duration:** 1 April 2007 - 31 October 2010

**Lead investigator:** Richard Cookson

**Data analysis:** Mauro Laudicella and Paulo Li Donni

**Advisory input:** James Carpenter, Roy Carr-Hill, Diane Dawson, Mark Dusheiko, Hugh Gravelle, Geoffrey Hardman, Russell Mannion, Steven Martin, James Nelson-Smith, Andrew Street

**Special thanks:** George Leckie and Carol Propper

Department of Social Policy and Social Work  
The York Management School  
Department of Economics and Related Studies



# Concerns that competition may undermine equity

“The availability of good medical care tends to vary inversely with the need for it in the population served. This inverse care law operates more completely where medical care is most exposed to market forces, and less so where such exposure is reduced.”

Dr Julian Tudor-Hart, 1971  
(*The Lancet*)

“The commercialization of health care is the primrose path down which inexorably lies American medicine: first-rate treatment for the wealthy and 10th-rate treatment for the poor.”

Dr David Owen, 1989  
(Quoted as leader of the opposition Social Democratic Party)

“Allowing private providers to compete for NHS business will exacerbate the inverse care law, because most profit can be made in more affluent healthier groups.”

Margaret Whitehead, Barbara Hanratty and Jennie Popay, 2010  
(*The Lancet*)

# Three stories

1. Competition undermines equity by reducing rent for benevolent hospitals to treat unprofitable patients
2. Competition undermines equity by “crowding out” benevolent hospital motivations
3. Competition improves equity by reducing waiting times and increasing activity in all hospitals, even poorly performing local hospitals disproportionately used by disadvantaged patients



# Blair/Brown NHS Reforms 2001-8

Cookson, R, Laudicella, M and Li Donni, P. (2013). Does hospital competition harm equity? Evidence from the English National Health Service. 32(2): 410-422 *Journal of Health Economics*.  
<http://dx.doi.org/10.1016/j.jhealeco.2012.11.009>

Cookson, R, Laudicella, M, Li Donni, P and Dusheiko, M. (2012). Effects of the Blair/Brown NHS reforms on socioeconomic equity in health care. *Journal of Health Services Research and Policy*. 17(Suppl 1): 55–63; doi:10.1258/jhsrp.2011.011014

# Blair/Brown NHS Reforms

- Sustained spending growth
  - Real annual UK NHS expenditure growth averaged 6.56% from 1999/00 to 2010/11 compared with 3.48% from 1950/51 to 1999/00
- Hospital reform
  - Target driven performance management focusing especially on hospital waiting times
  - Re-introduction of competition

# Pro-competition elements of reform

## **1. Fixed price hospital payment (English HRGs)**

- Piloted 2003/4 and fully implemented 2005/6

## **2. Patient choice of hospital**

- Choice of 4-5 providers from December 2005
- “Free choice” from 2008

## **3. Independent Sector (IS) entry**

- “ISTC programme” share of overall NHS funded non-emergency activity grew from 0.02% in 2003/4 to 2.2% by 2008/9 (HES data)
- 11.94% for hip replacement, 5.29% for cataract
- Plus a substantial but unknown volume of sub-contracted IS activity

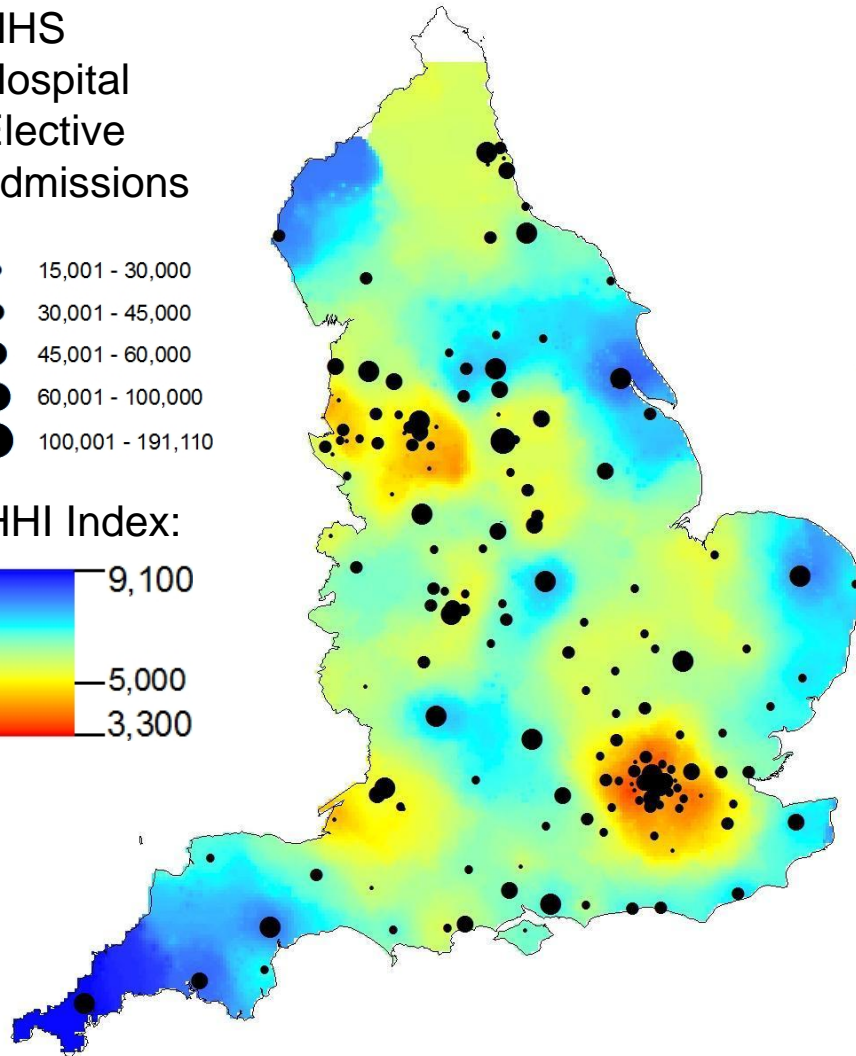
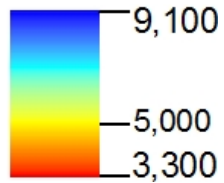
# Market Concentration in England:

## 2003

NHS  
Hospital  
Elective  
admissions

- 15,001 - 30,000
- 30,001 - 45,000
- 45,001 - 60,000
- 60,001 - 100,000
- 100,001 - 191,110

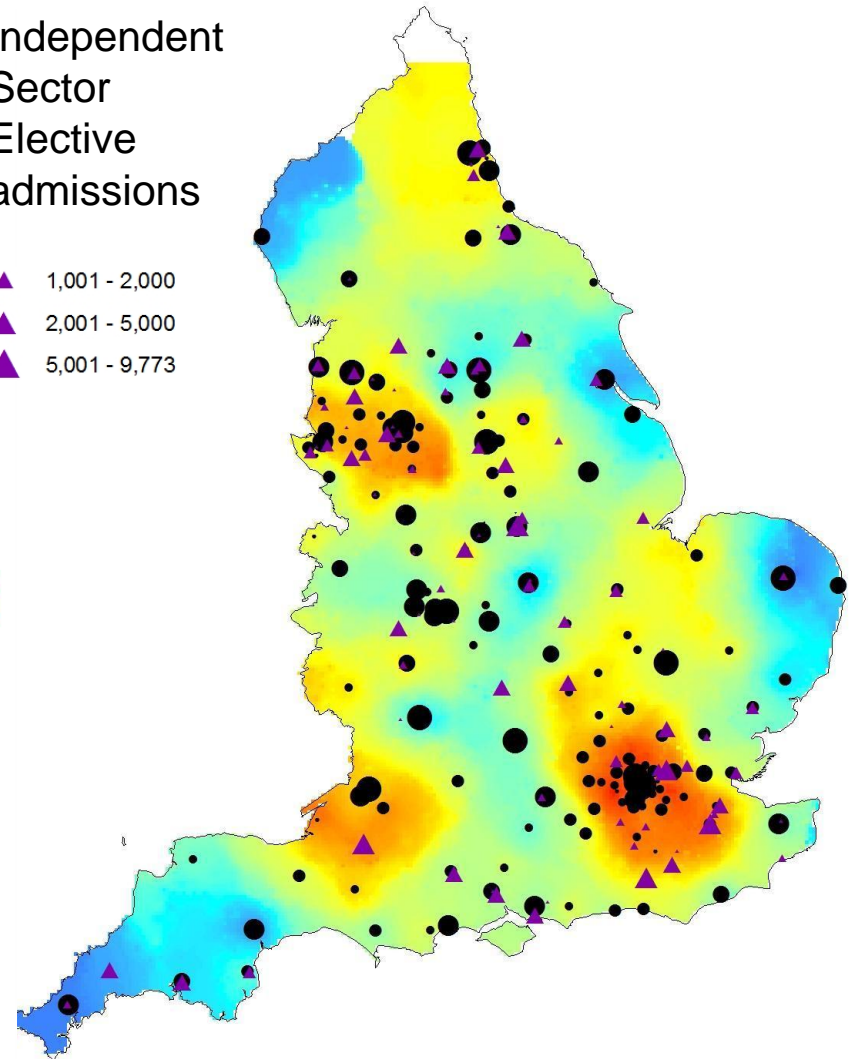
HHI Index:



## 2008

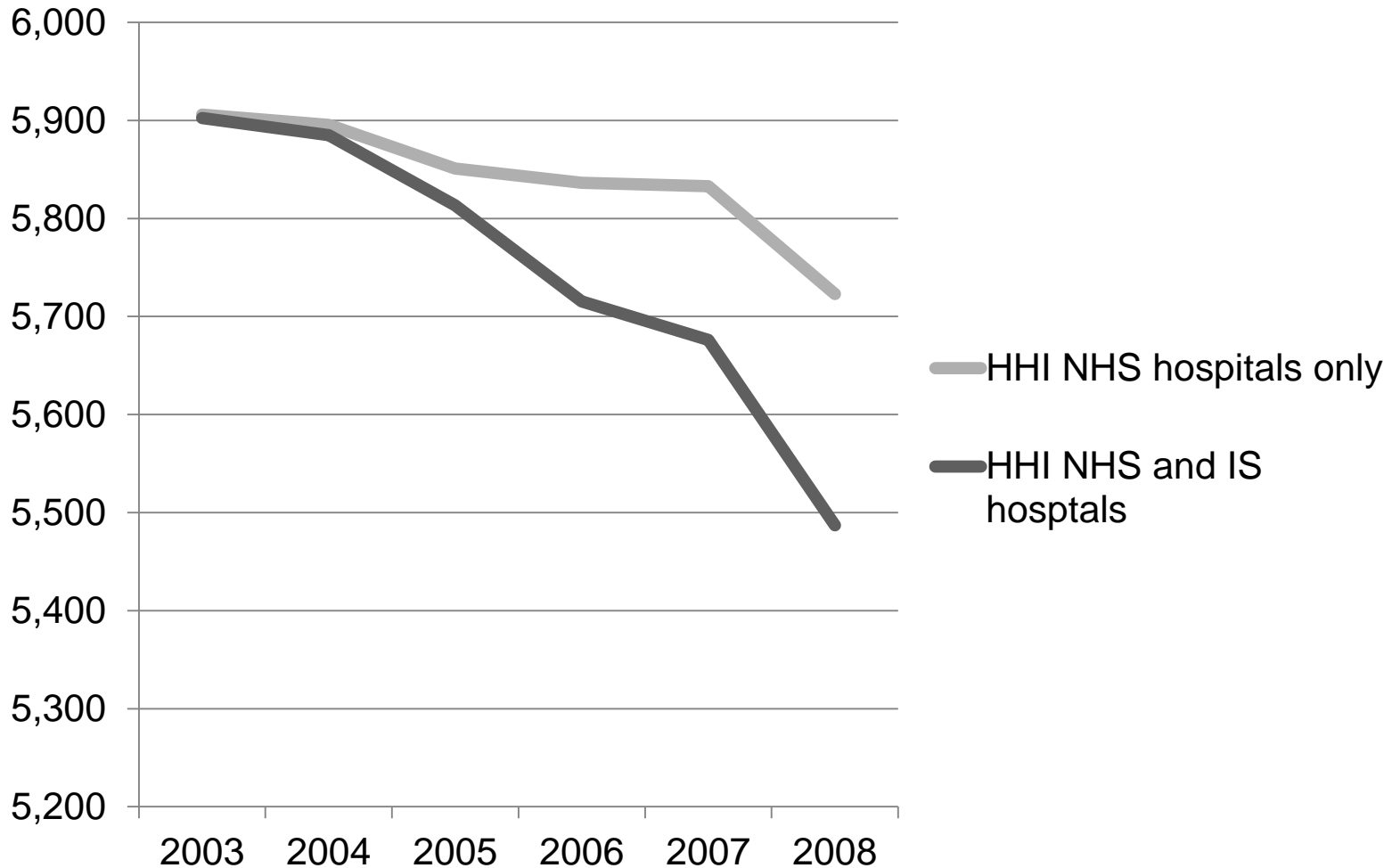
Independent  
Sector  
Elective  
admissions

- ▲ 1,001 - 2,000
- ▲ 2,001 - 5,000
- ▲ 5,001 - 9,773



# Did market concentration fall?

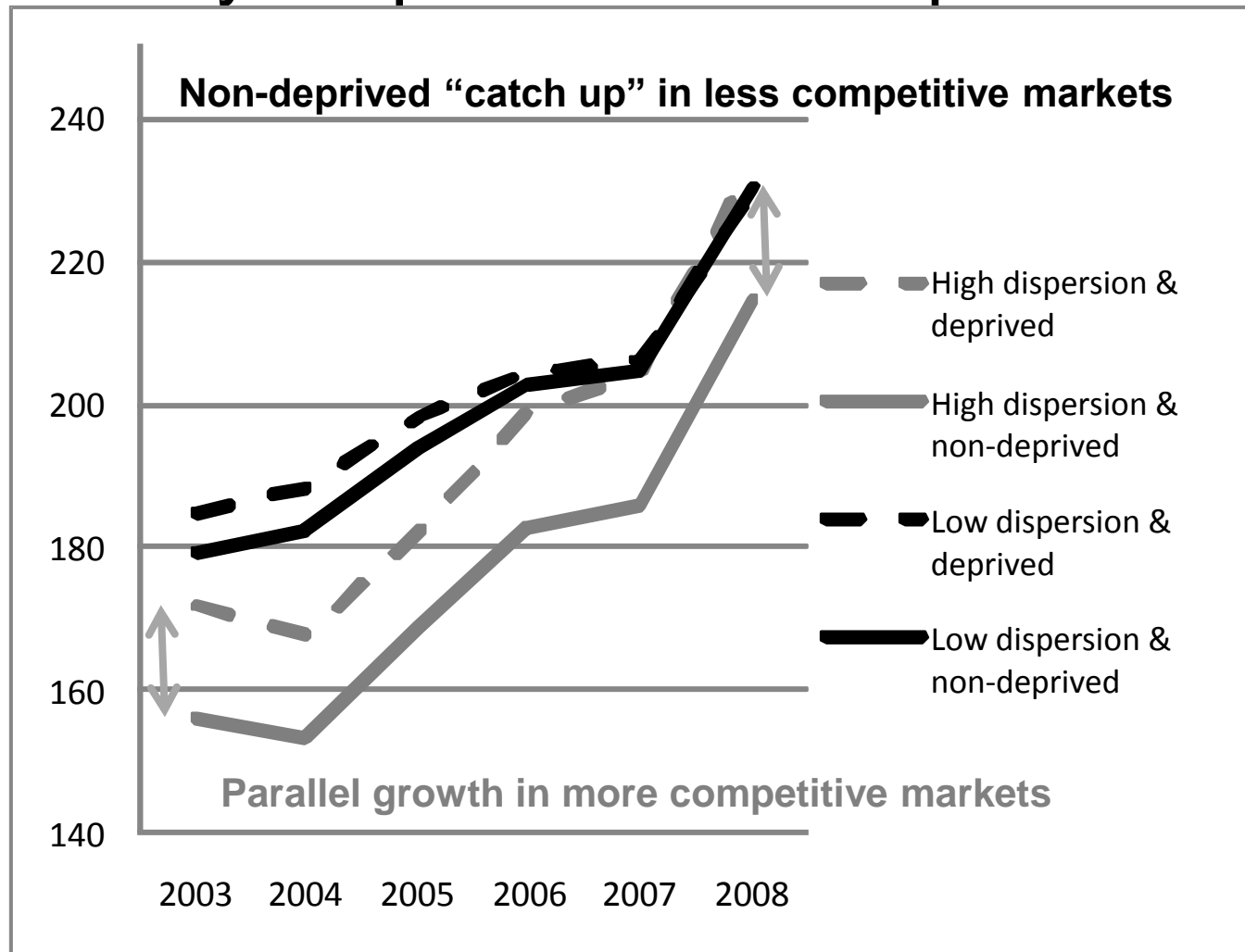
## Yes, a bit: -400 HHI pts (6.8%)



# Methods

- Basic regression design: difference-in-difference
  - Compare the deprivation-utilisation gradient between more and less concentrated hospital markets, pre and post reform
  - Time varying controls for population size, age-sex structure, disease prevalence, independent sector supply
- Improvement 1: Continuous treatment variable
  - Avoids arbitrary split into groups
- Improvement 2: Year-by-year pattern of differences
  - Expect gradual change as competition is phased in
- Improvement 3: Fixed effects
  - Measure the “dose” of competition using change in market concentration, rather than the baseline level
- Improvement 4: Predicted market concentration index
  - Predict market concentration using exogenous variables, to address potential endogeneity bias in models based on actual market concentration (2003 and 2008 only, as computationally intensive)

# Non-emergency Inpatient Admissions By Dispersion and Deprivation



- “High dispersion” refers to areas with HHI in 2003 < 5,000 (34.3% of areas)
- “Deprived” refers to areas with income deprivation > 20% (27.8% of areas)

# Basic regression equation

$$y_{it} = \delta \text{dispersion}_{it} + \omega \text{deprivation}_i \times \text{dispersion}_{it} \\ + \left( \tau + \gamma \text{dispersion}_{it} + \varphi \text{deprivation}_i \right. \\ \left. + \theta \text{deprivation}_i \times \text{dispersion}_{it} \right) \times I(t) + \beta' x_{it} + \mu_i + \varepsilon_{it}$$

$\theta$  identifies the competition effect on inequality (deprivation \* dispersion \* post reform)

$y_{it}$  is the utilisation count in small area  $i$  in year

$\text{dispersion}_{it}$  is an index of market dispersion (=HHI \* -1/100)

$\text{deprivation}_i$  is the time invariant index of small area income deprivation

$I(t)$  is an indicator function of the post reform period

$x_{it}$  is a vector of time varying controls, including need (small area population size and demographic characteristics and prevalence of diseases) and supply (number of independent sector hospitals within 60 km and whole time equivalent GP numbers)

$\mu_i$  is the small area fixed effect



**Table 3**

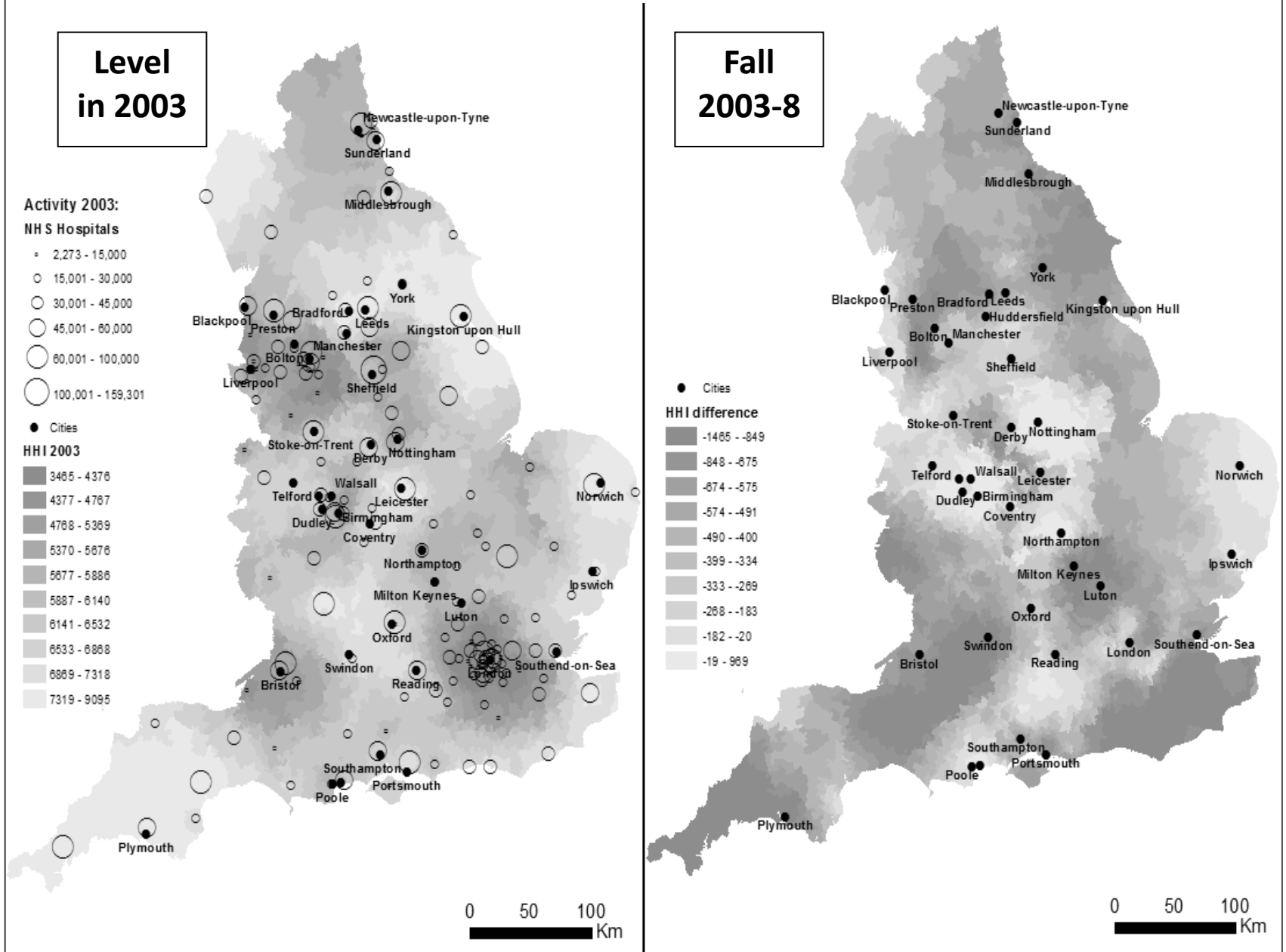
Competition effects on equity in utilisation of elective hospital services across small areas.

Variables	Model 1 (observed competition index)		Model 2 (predicted competition index)	
	Coefficients	SE	Coefficients	SE
Dispersion × Deprivation × 2008	0.0155**	(0.00362)	0.0141**	(0.00205)
Dispersion × Deprivation × 2007	0.0116**	(0.00319)	n/a	n/a
Dispersion × Deprivation × 2006	0.0135**	(0.00299)	n/a	n/a
Dispersion × Deprivation × 2005	0.00956**	(0.00247)	n/a	n/a
Dispersion × Deprivation × 2004	0.00229	(0.00183)	n/a	n/a
Dispersion × 2008	0.144*	(0.0733)	-0.0659	(0.0444)
Dispersion × 2007	0.149*	(0.0630)	n/a	n/a
Dispersion × 2006	0.202**	(0.0594)	n/a	n/a
Dispersion × 2005	-0.0661	(0.0503)	n/a	n/a
Dispersion × 2004	-0.00485	(0.0377)	n/a	n/a
Deprivation × 2008	1.339**	(0.216)	0.740**	(0.0964)
Deprivation × 2007	1.019**	(0.193)	n/a	n/a
Deprivation × 2006	0.980**	(0.183)	n/a	n/a
Deprivation × 2005	0.722**	(0.151)	n/a	n/a
Deprivation × 2004	0.225*	(0.110)	n/a	n/a
Dispersion × Deprivation	-0.0656**	(0.00842)	-0.0150	(0.00871)
Dispersion	-0.461**	(0.135)	-0.146	(0.145)
Independent sector hospitals within 60 km	0.466**	(0.0792)	0.434**	(0.120)
Year 2008	27.25**	(4.818)	10.33**	(3.565)
Year 2007	9.380*	(4.035)	n/a	n/a
Year 2006	19.09**	(3.727)	n/a	n/a
Year 2005	-1.300	(3.129)	n/a	n/a
Year 2004	-1.867	(2.272)	n/a	n/a

Notes: Results from linear panel data models with fixed effects, dependent variables: all elective hospital admissions, unit of analysis: small areas (LSOAs), both models include controls for: GPs per 10,000 population, population size, age-sex fractions and prevalence of diseases described in Table 1 (coefficients not shown), baseline: zero deprivation and zero competition areas in 2003, dispersion is measured by using the HHI indices of market concentration described in Appendices 1 and 2. Both indices are re-scaled from -100 (min market dispersion) to 0 (max market dispersion) to facilitate the interpretation of the regression results, deprivation is measured by using the income domain of the Indices of Multiple Deprivation 2007. Scale from 0 to 100, with 100 representing 100% of individuals from households on low income benefits. Deprivation is fixed over time, so its effect cannot be separately identified from the fixed effects in both models, robust standard errors clustered by small areas in parentheses.

\*\*  $p < 0.01$ .\*  $p < 0.05$ .

# Level vs. change in hospital market concentration



# Main Finding

- No evidence that competition undermined socioeconomic equity in health care
  - If anything, the opposite: deprived small areas experienced slightly faster growth relative to non-deprived small areas in dispersed (i.e. potentially more competition) markets
  - However, this effect so small as to be economically unimportant

# Back to the first two stories

1. Competition undermines equity by reducing rent for benevolent hospitals to treat unprofitable patients
  2. Competition undermines equity by “crowding out” benevolent hospital motivations
- But are socially deprived hospital patients unprofitable under fixed price payment?

# Hip replacement length of stay

(allowing for other patient characteristics and hospital effects)

	2001	2002	2003	2004	2005	2006	2007
(1) Most deprived decile	11.43	10.90	10.15	9.61	9.01	8.08	7.25
(2) Others	10.81	10.46	9.70	9.24	8.58	7.79	7.13
Gap: (1)-(2)	0.62	0.44	0.45	0.37	0.43	0.29	0.13
Ratio: (1)/(2)	1.06	1.04	1.05	1.04	1.05	1.04	1.02
(1) age 85 and over	16.62	15.62	14.87	14.88	13.82	12.45	11.81
(2) Others	10.56	10.25	9.50	9.01	8.33	7.55	6.89
Gap: (1)-(2)	6.06	5.37	5.37	5.87	5.48	4.89	4.92
Ratio: (1)/(2)	1.57	1.52	1.56	1.65	1.66	1.65	1.71
(1) 7 diagnoses or more	16.96	17.36	15.98	14.15	14.01	12.55	11.91
(2) Others	10.73	10.33	9.56	9.09	8.39	7.57	6.88
Gap: (1)-(2)	6.23	7.02	6.42	5.06	5.62	4.99	5.03
Ratio: (1)/(2)	1.58	1.68	1.67	1.56	1.67	1.66	1.73

Cookson, R, Laudicella M. Do the poor cost substantially more? The relationship between small area income deprivation and length of stay for elective hip replacement in the English NHS from 2001/2 to 2007/8. *Social Science and Medicine* 2011;72:173-84

# Overall Conclusions

- Hospital competition in the English NHS in the 1990s and 2000s had little or no effect on socio-economic equity in health care
- Concerns about harmful equity effects proved to be exaggerated
- However, doses of competition were small
  - Strong barriers to entry and exit
  - Independent sector entry < 2.5% activity
  - Public hospitals still tightly controlled

Thank you.