Modelling hospital behaviour: the impact of waiting time on the supply of and demand for hospital services

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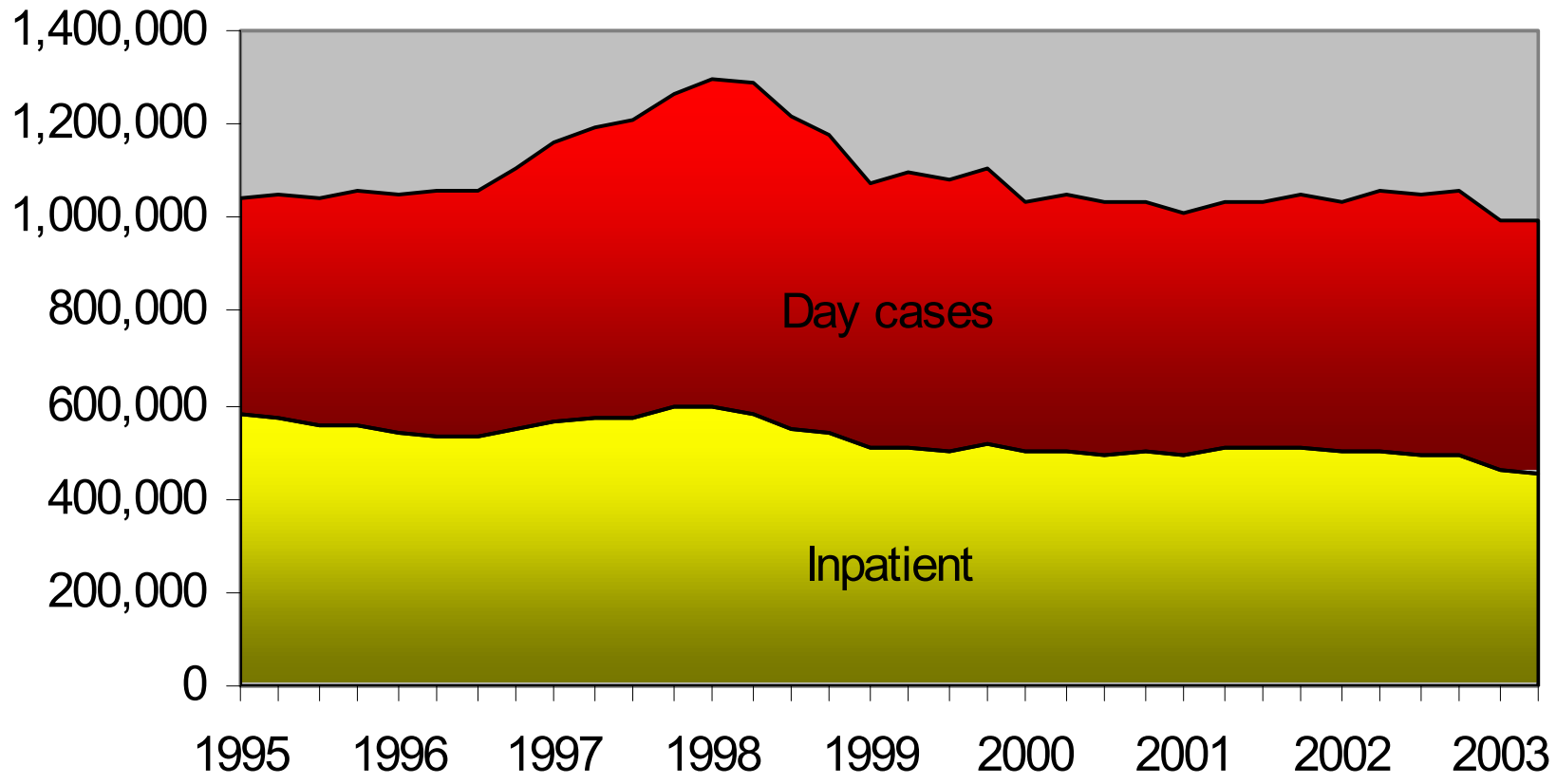
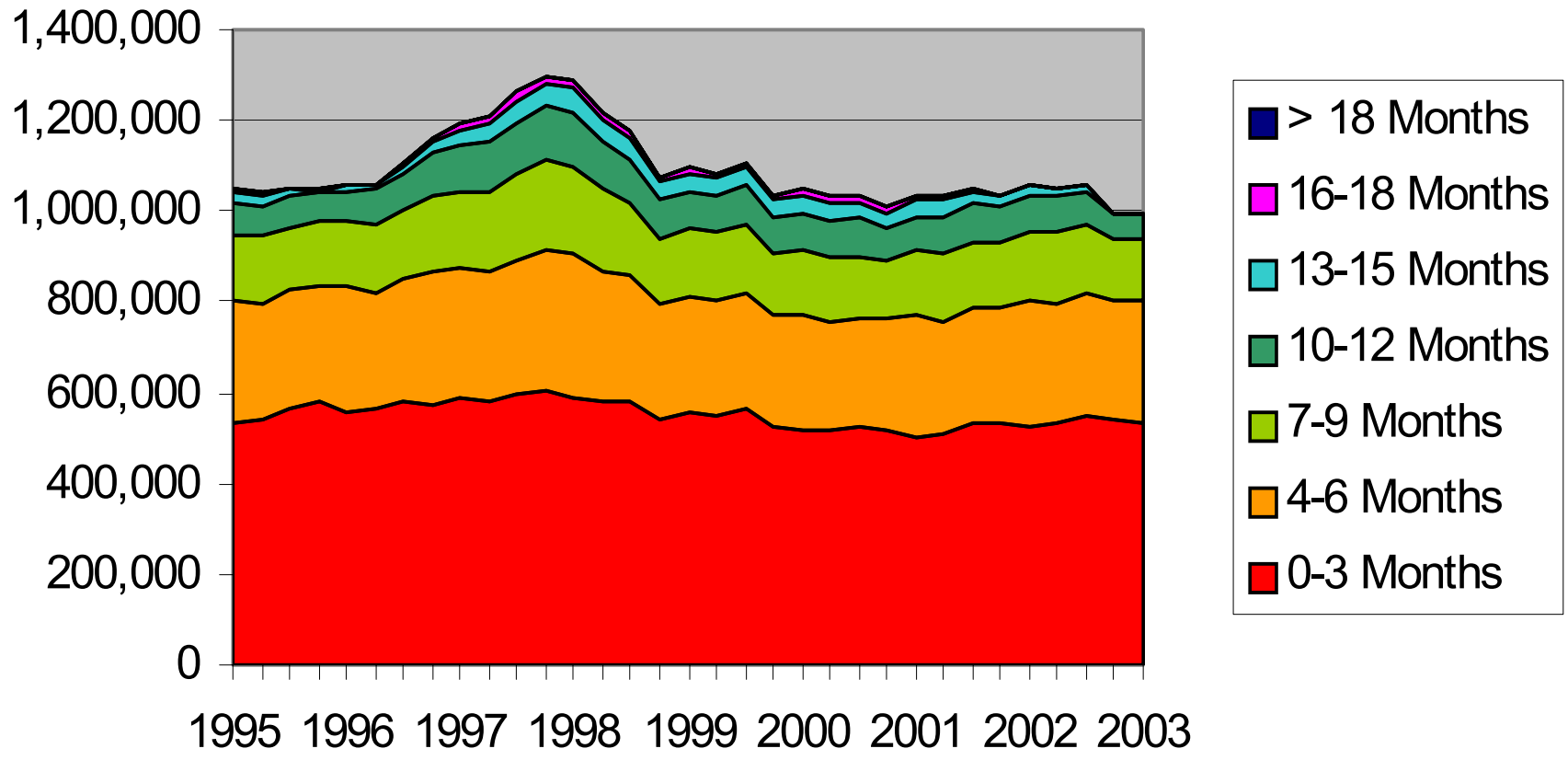
Numbers waiting for inpatient procedures



http://www.doh.gov.uk/waitingtimes/

Inpatient waiting list by length of wait



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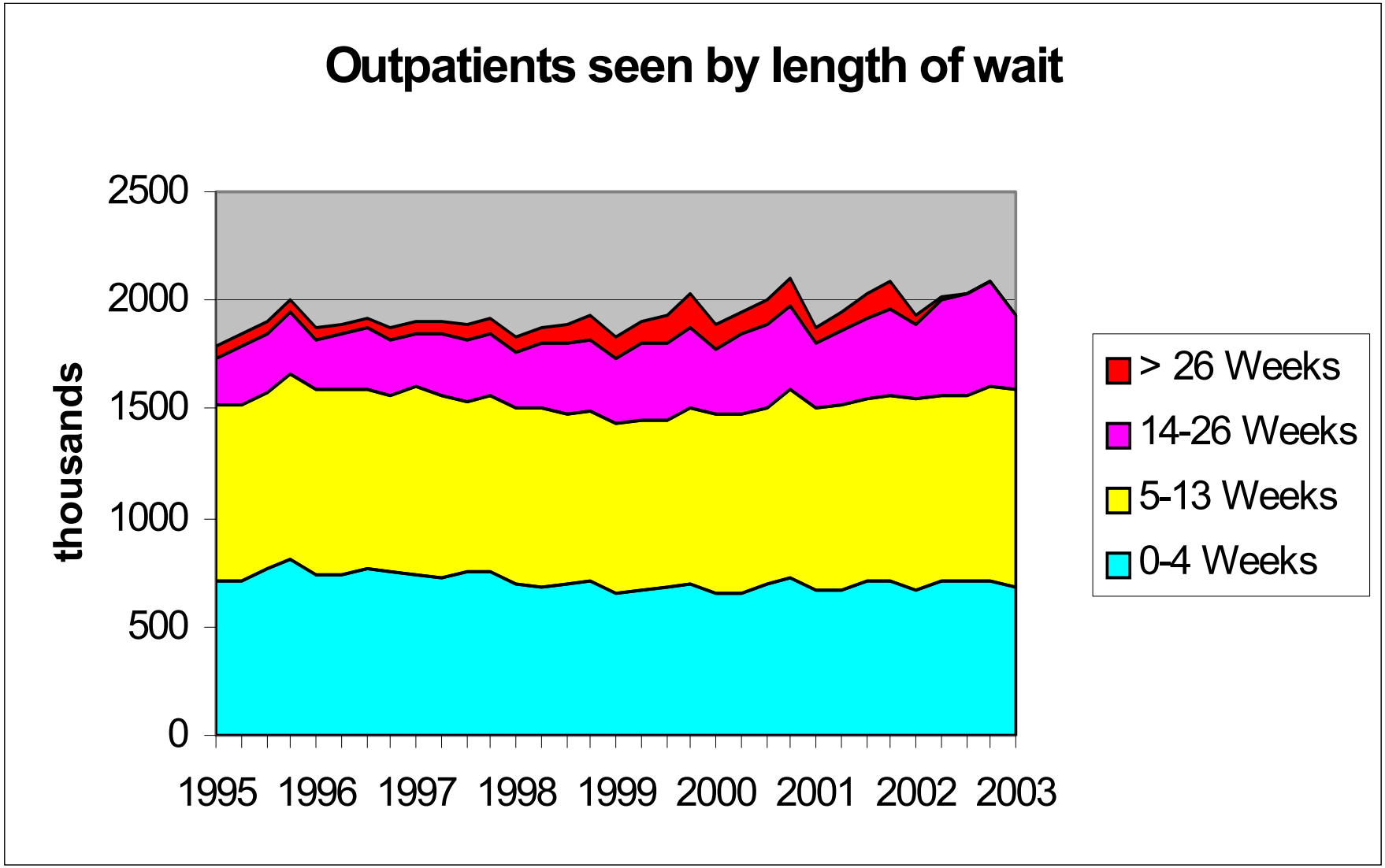

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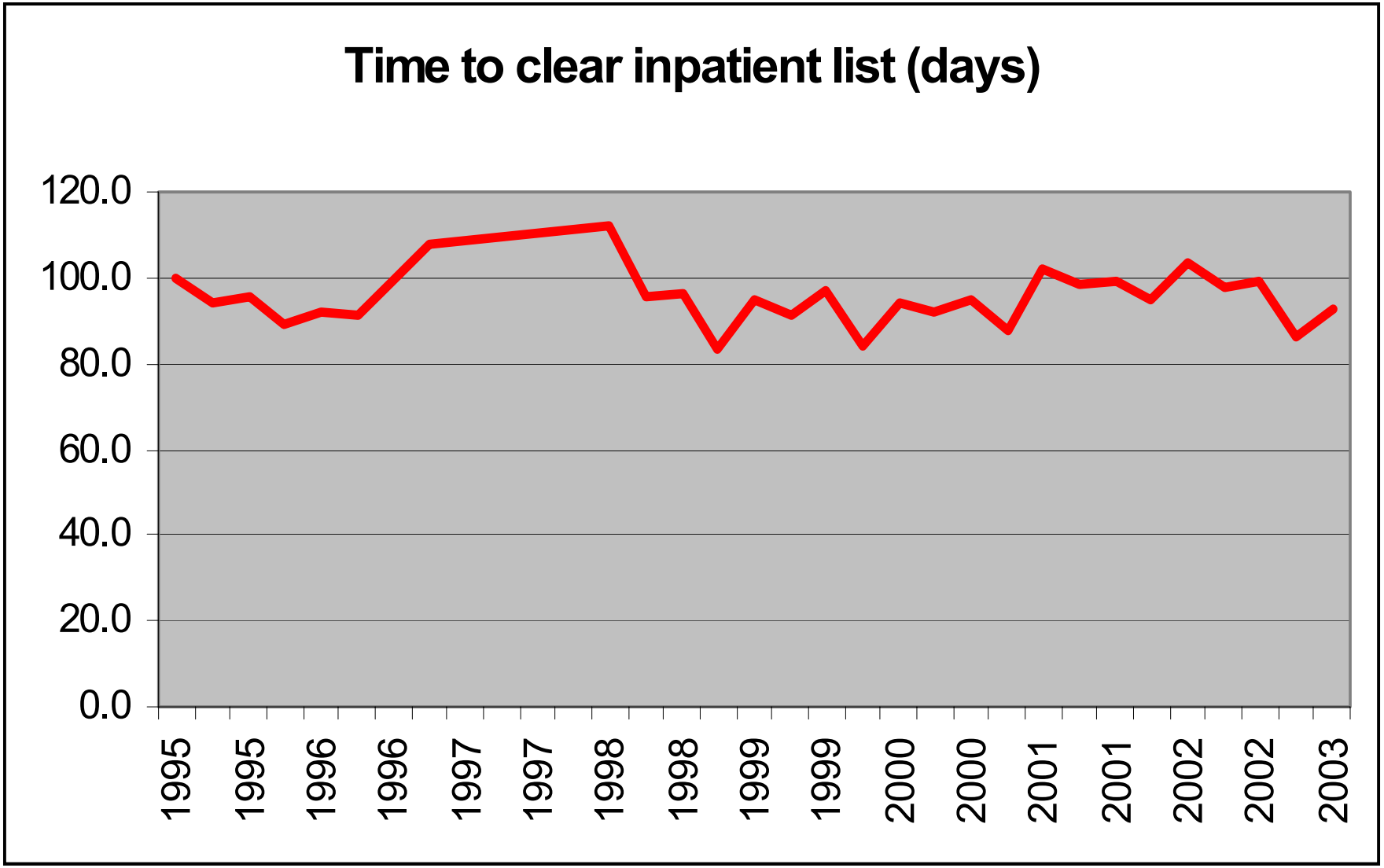
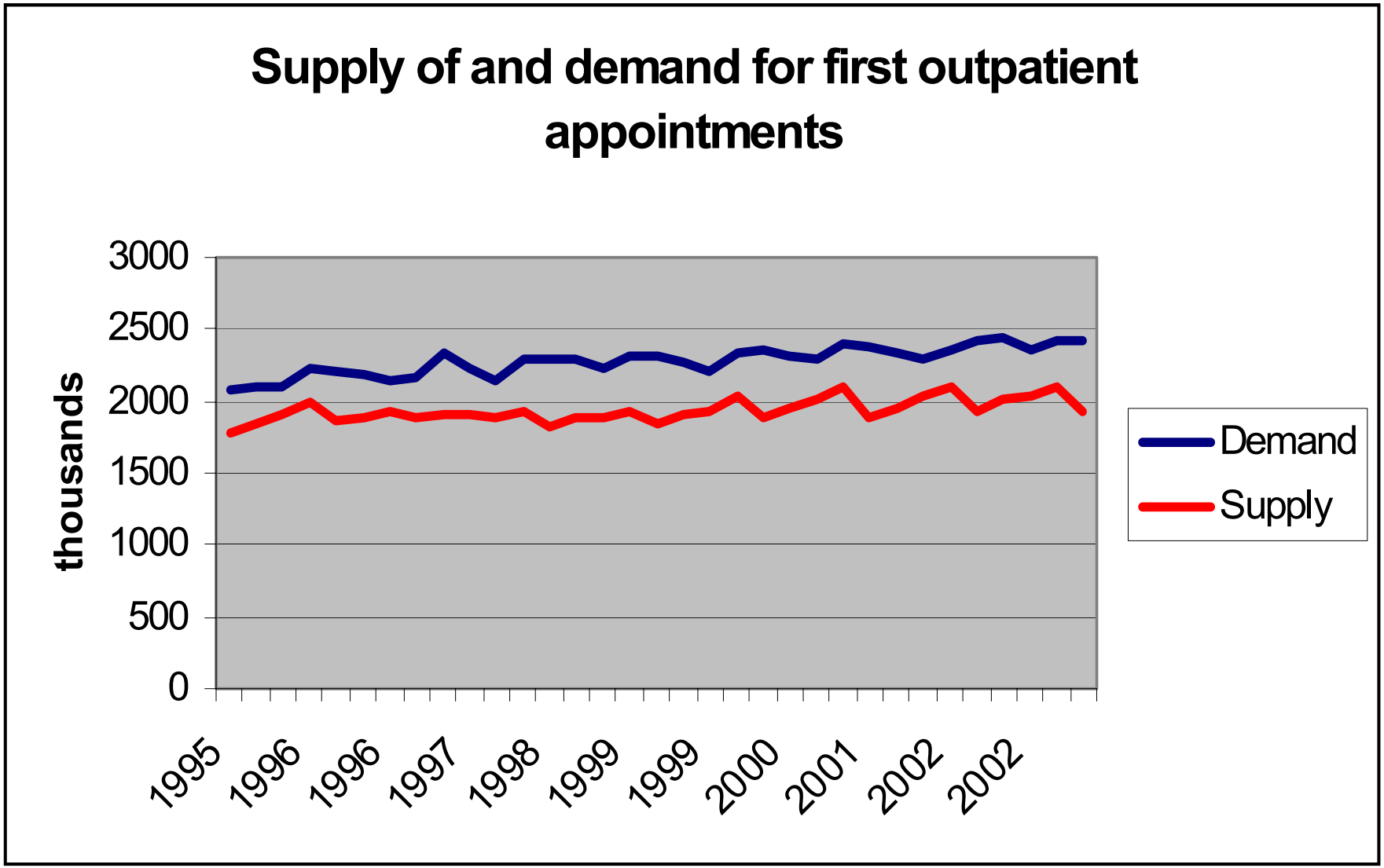

Time to clear inpatient list (days)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1995
1995
1996
1996
1997
1997
1998
1998
1999
1999
2000
2000
2001
2001
2002
2002
2003


Supply of and demand for first outpatient appointments
thousands
3000
2500
2000
1500
1000
500
0
1995
1996
1996
1997
1998
1999
1999
2000
2001
2002
2002
Demand
Supply

Policies to increase supply of surgery

- Temporary additional funding (WT fund)
- Increasing productivity (e.g. day case surgery)
- Booking patients
- Permanent additional funding
- Use of new providers (overseas, private sector)
- Diagnosis & treatment centres
- Increasing patient choice (e.g. London Choice)
- Management strategies (e.g. Modernisation Agency)
- Reduce bed blocking (e.g. social services collaboration)
- Maximum waiting time guarantees
- Incentives to reduce waiting times (bonuses, autonomy)
- Performance ratings

Policies to reduce demand for surgery

- Demand management (e.g. fundholding)
- Clinical guidelines (e.g. National Service Frameworks)
- Encourage use of private sector
- Encourage private health insurance

Department of Health – Public Service Agreement Target 1

- Reduce the maximum wait for an outpatient appointment to 3 months and the maximum wait for inpatient treatment to 6 months by the end of 2005, and achieve progressive further cuts with the aim of reducing the maximum inpatient and day case waiting time to 3 months by 2008.

http://www.hm-treasury.gov.uk/performance/Health.cfm

Inpatient targets

Date	Maximum waiting time (months)
March 2002	15
March 2003	12
December 2005	6
December 2008	3

Delivering the NHS Plan (2002)

Outpatient targets

Date	Maximum waiting time (weeks)
March 2002	26
March 2003	21
December 2005	14

Delivering the NHS Plan (2002)

Performance ratings: acute hospitals

★★★	Hospitals with the highest levels of performance
★★	Hospitals that are performing well overall, but have not quite reached the same consistently high standards
★	Hospitals where there is some cause for concern regarding particular key targets
!	Hospitals that have shown the poorest levels of performance against key targets

http://www.chi.gov.uk/eng/ratings/index.shtml

Star ratings – key targets 2003

1. no patients waiting more than 12 months for inpatient treatment
2. no patients waiting more than 21 weeks for outpatient treatment
3. no patients waiting for emergency admission for more than 12 hours
4. no patients waiting in emergency for more than 4 hours
5. all re-admissions within 28 days of a cancelled operation
6. no patients with suspected cancer waiting more than two weeks to be seen in hospital
7. improvement to the working lives of staff
8. hospital cleanliness
9. a satisfactory financial position

Plus…

… a satisfactory report by the Commission for Health Improvement

Each key target ranked as …

- Achieved (0 penalty points)
- Underachieved (2 penalty points)
- Significantly underachieved (5 penalty points)

Performance ratings – how a hospital's score is calculated

- 12 or more penalty points – zero star
- 7-11 penalty points – one star
- 3-6 penalty points – one/two stars
- less than 3 penalty points – two/three star

➢ Choice of one/two or two/three depends on a balanced scorecard of 28 additional indicators.

Correlation between five inpatient waiting measures, routine surgery

	mean wait	list length	3month wait	12month wait
meanwait	1.00			
listlength	0.39	1.00		
3monthwait	0.95	0.41	1.00	
12monthwait	0.84	0.23	0.66	1.00
timetoclear	0.74	0.55	0.75	0.55

Source: 32 Quarters' Acute Trust data, 1995-2002

Correlations between waiting times variables and free beds

Variable name	IP wait< 6months	OP wait< 13weeks	A&E < 4hrs
IP wait<6months	1.00		
OP wait<13weeks	0.81	1.00	
A&E < 4hrs	0.52	0.63	1.00
Free beds	0.69	0.66	0.50

Source: Analysis of 2001/02 NHS Acute Trust data

A model of supply

Manager's utility

$$u_t = u(S_t , w^m_t ; z^s_t)$$

where

$$w^m_t = f (S_t ; L_{t-1} , D_t \ (w^p_t \ , z^d_t))$$

leading to supply

$$S^*_t = S^*_t(L_{t-1} , w^m_{t-1} , w^p_t, z^s_t, z^d_t, \delta_t)$$

Source: Gravelle, H., Smith, P. and Xavier, A. (2003), "Performance signals in the public sector: the case of health care", *Oxford Economic Papers*, 55(1), 81-103.

Inpatient supply, routine specialities

Inpatient supply, routine specialities		
meanwait_4	0.081*	
listlength_4		0.105**
occupancy_rate_1	0.079	0.058
length_of_stay_1	-0.101	-0.106
transfers_in	0.044	0.042
transfers_out_1	0.036**	0.037**
prop_admiss_60+_1	0.048	0.054
casemix_1	-0.939**	-0.863**
research_spend_1	0.205	0.243
readmission_rate_1	-0.135	-0.159
death_ne_surgery	0.033	0.032
death_e_surgery_1	-0.164**	-0.163**
daycases_pc_1	0.156**	0.143**
continued		
private_beds	-0.328**	-0.342**
nurse_vacancy	-0.097*	-0.113*
staff_sickness_rate	-0.168	-0.195
delayed_discharge	0.006	0.003
constant	8.326**	8.200**
No of obs	2339	2339
R bar squared	0.906	0.907
RESET test: F =	4.300	5.240
Prob > F =	0.005	0.001

Source: Martin, S., Jacobs, R., Rice, N., Smith, P. (2003), *Waiting times for elective surgery: a hospital-based approach*, Occasional Paper, Centre for Health Economics, University of York.

A model of demand

The demand, D_t, for elective NHS care in period *t* will depend on:

- the expected waiting time for NHS treatment; and
- various demand shifters such as population morbidity, the cost of seeking care, the cost of private treatment, and the perceived quality and convenience of NHS care.

$$D_t = D(w^p_t , z^d_t)$$

Inpatient demand, routine specialities
(a)Current WT
(b)Lagged WT

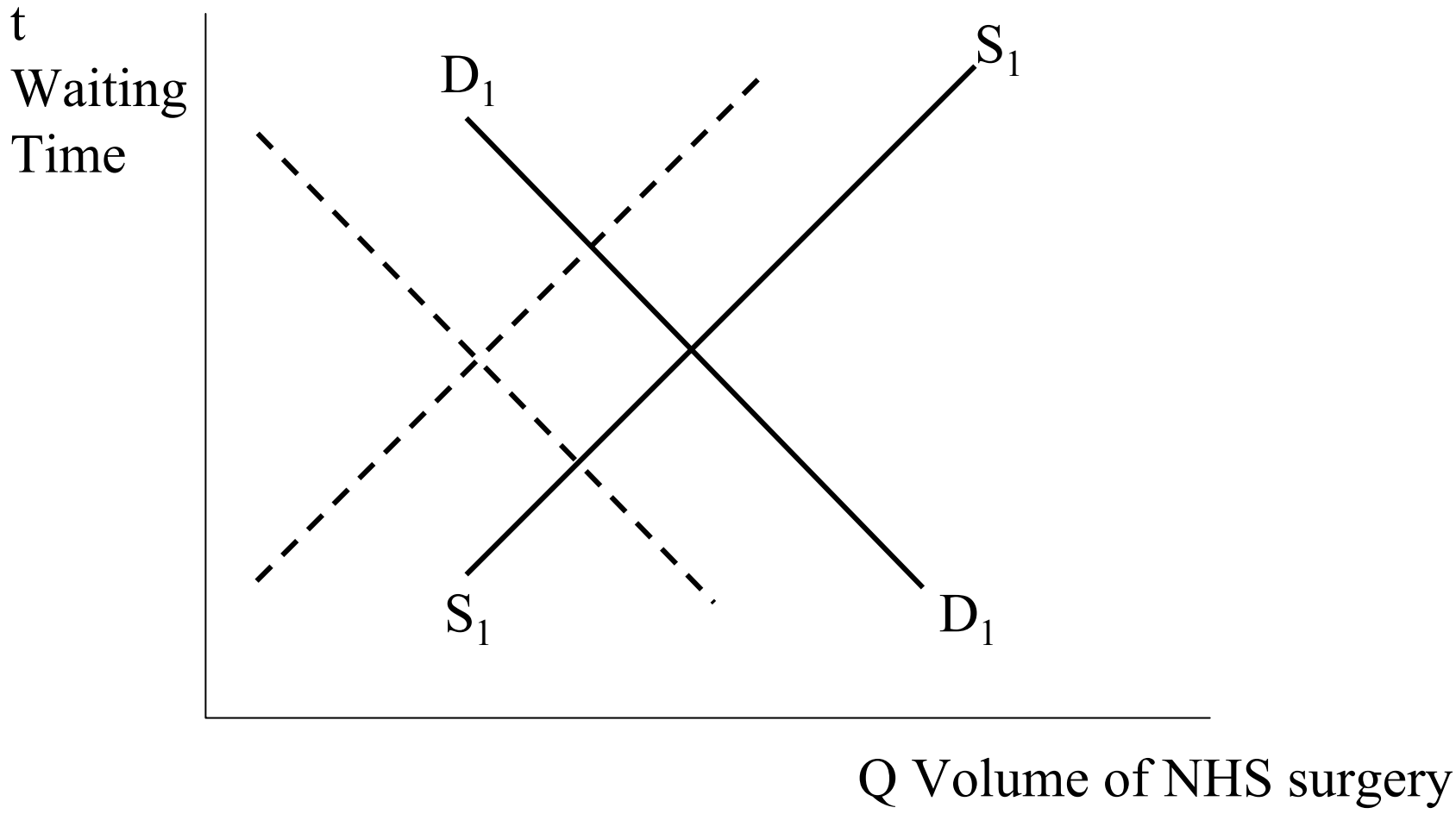
Inpatient demand, routine specialities		
Regression	Current	Lagged
meanwait	-0.198**	-0.122**
daycases	0.047	0.050
need	-0.369	-0.327
private_beds	-0.200**	-0.204**
GP_availability	-0.422	-0.425
constant	3.133**	2.907**
No of obs	3983	3824
R bar squared	0.920	0.921
RESET test: F =	0.790	2.580
Prob > F =	0.502	0.052

Source: Martin, S., Jacobs, R., Rice, N., Smith, P. (2003), *Waiting times for elective surgery: a hospital-based approach*, Occasional Paper, Centre for Health Economics, University of York.

Modelling waiting times: some conclusions

- Reporting waiting times has a material (but modest) impact on both supply and demand, as predicted.
- Numerous other influences on hospital productivity.
- There appear to be important interactions between NHS and private supply of surgery.

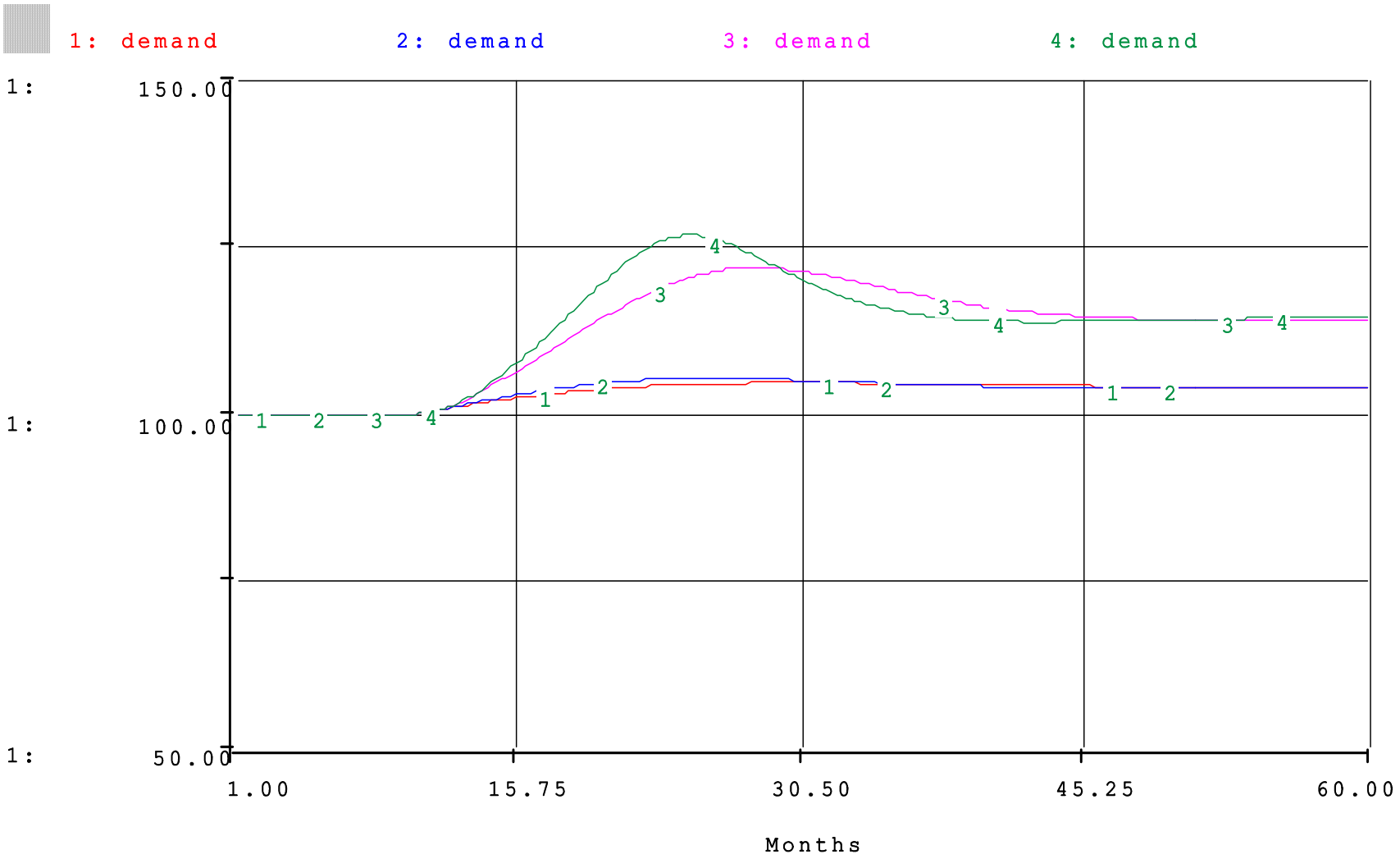
Supply of and demand for elective surgery: the impact of private supply?



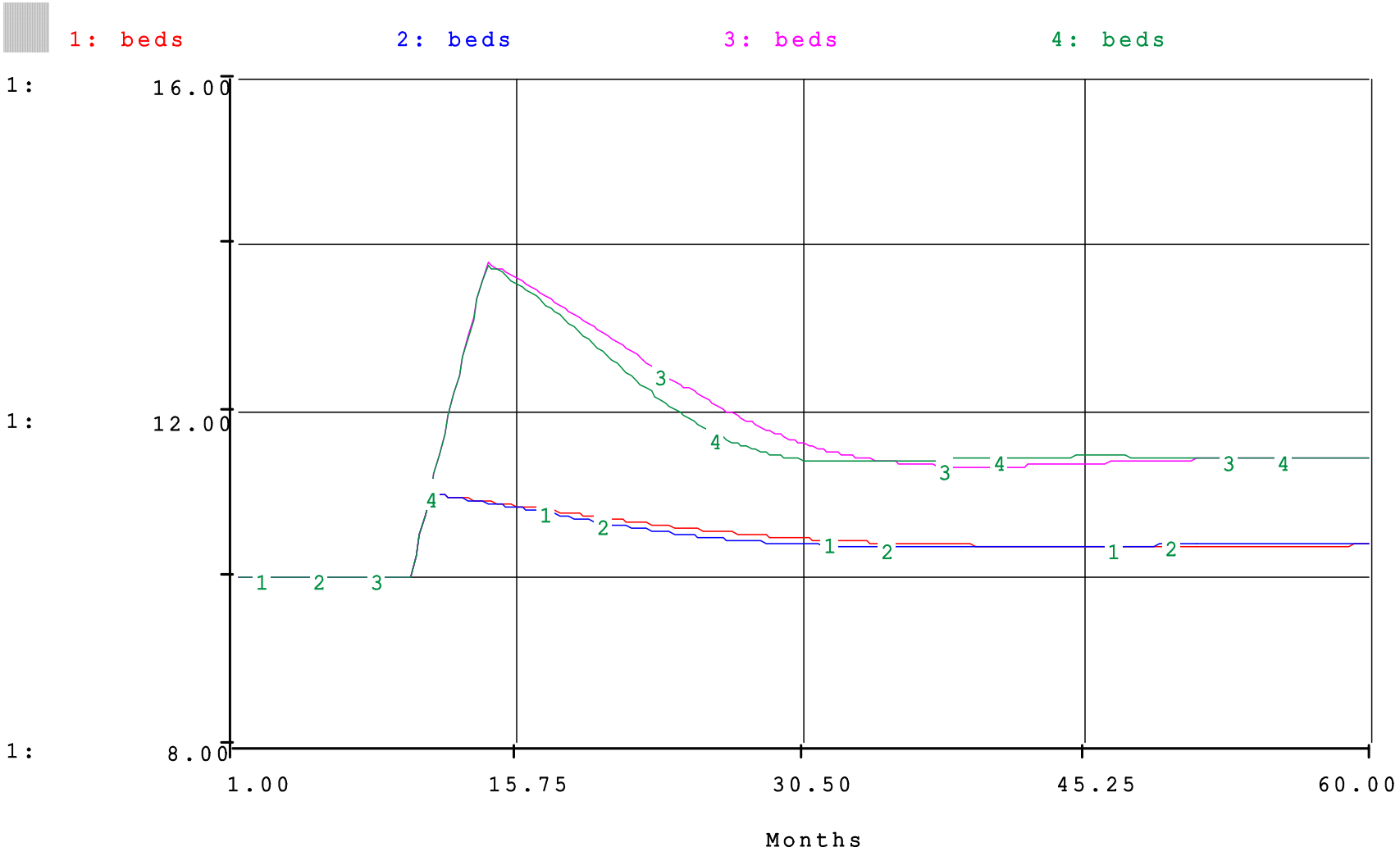
Four dynamic scenarios

- Initial WT 4.5 months, single resource increase
- Initial WT 3 months, single resource increase
- Initial WT 4.5 months, four successive resource increases
- Initial WT 3 months, four successive resource increases

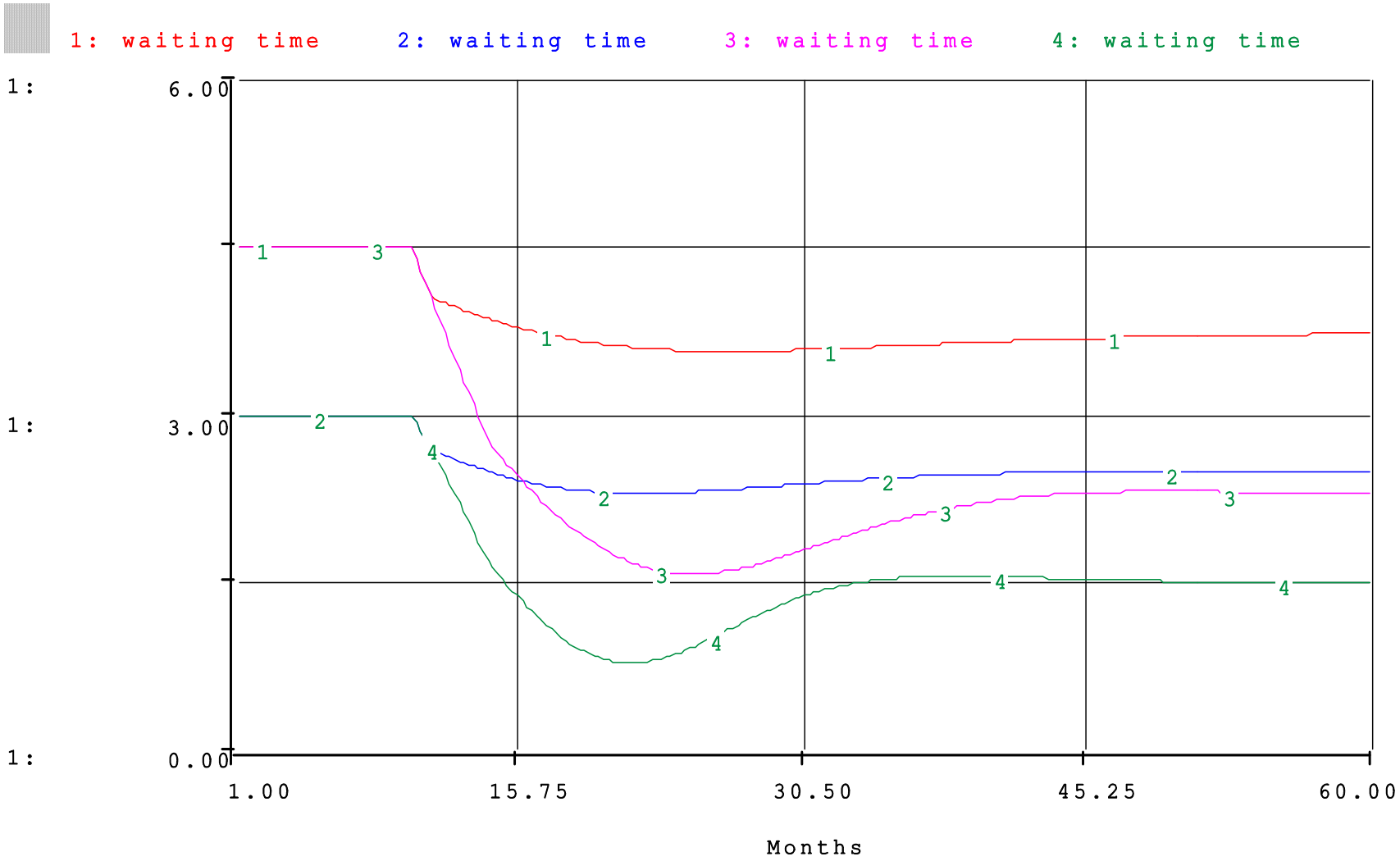
Simulation results: demand



Simulation results: surgical beds



Simulation results: waiting time

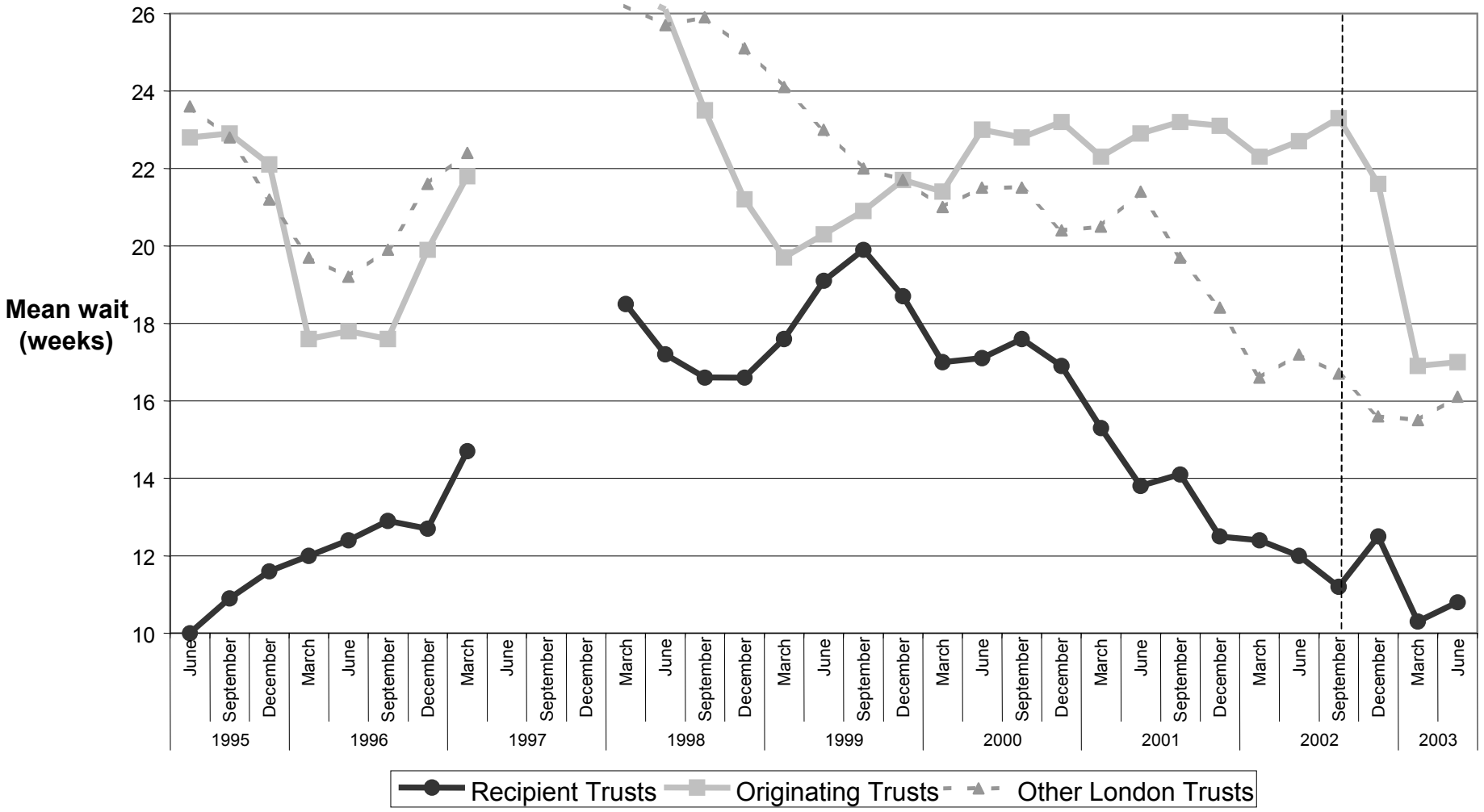


London Choice

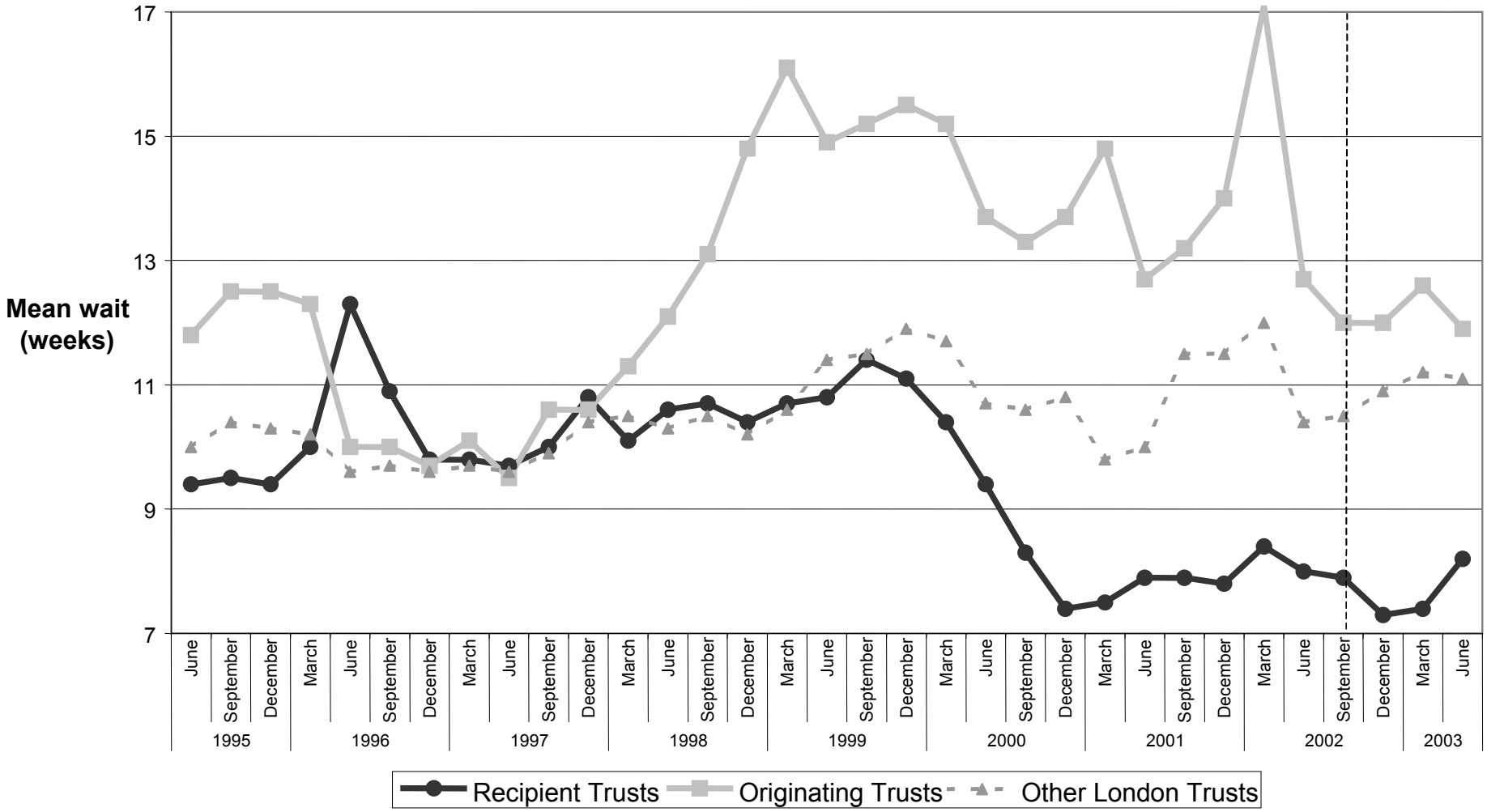
- ‘Originating’ hospital trusts ‘buddied’ with two other ‘receiving’ trusts
- Separate budget for receivers held by London Patient Choice Project
- Choice offered to patients expected to wait over 6 months for inpatient procedure:
  - ophthalmology from October 2002
  - orthopaedics, general surgery and ENT from April 2003
- Patient advisor facilitates choice.

http://www.london.nhs.uk/patientchoice/

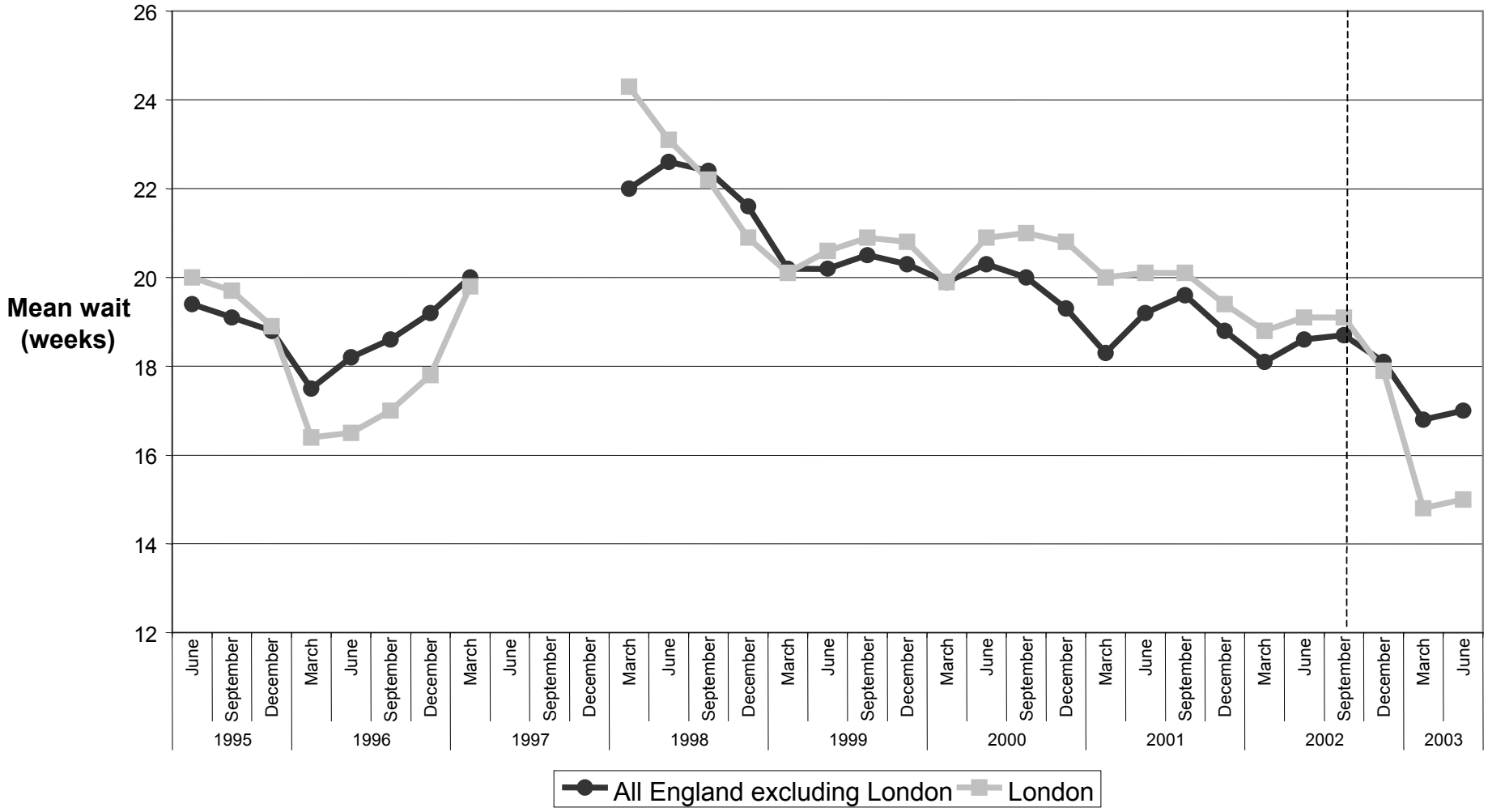
Waiting time, London ophthalmology inpatients



Waiting time, London ophthalmology outpatients



Inpatient waiting time for ophthalmology, London & Rest of England



Not to be confused with …

NHS Choice in England

- **"… by summer 2004** all patients waiting over six months for surgery will be offered a choice of moving to another hospital or provider
- **"… from December 2005** all patients who may require planned surgery will be offered a choice of four or five hospitals or providers when they are referred by their GP."

http://www.doh.gov.uk/choice/

Waiting times: conclusions

- Remarkably persistent policy problem
- Many policy initiatives, most have been ineffective or counter-productive
- Recent initiatives have had more sustained policy attention and are accompanied with real resources (star ratings; London Choice)
- Key evaluation issues:
  - Are initiatives effective?
  - What impact have they had beyond waiting times?