Determinants of Emergency Department attendance rates in the West Midlands Region

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Questions:

- **What are the geographical and socio-economic factors that predict how much a population uses its local Emergency Department (ED)?**

- **What are the relative strengths of the relationships between the various predictors?**

Why?

- Remarkably little work has been done in this area.
- Previously poor data have made this task impossible for large (>1M), contiguous populations.
- Data are more complete now.
- Demand management needs of the service.

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The chapter:

- ❑ **'First pass' of the problem.**
- ❑ **Some incomplete data.**
- ❑ **Euclidian distances only.**
- ❑ **This version has added data for out of area attenders.**
- ❑ **Imputed gender for one hospital that omitted it.**
- ❑ **Proximity to MIU as an extra variable.**

The method:

- ☐ **Multiple linear regression of a small number of variables captured from routinely collected data.**

- ☐ **Dependent variable is the ED attendance rate observed in small neighbourhoods across the region.**

- ☐ **The IVs were distance to provider, deprivation, and distance to MIU.**
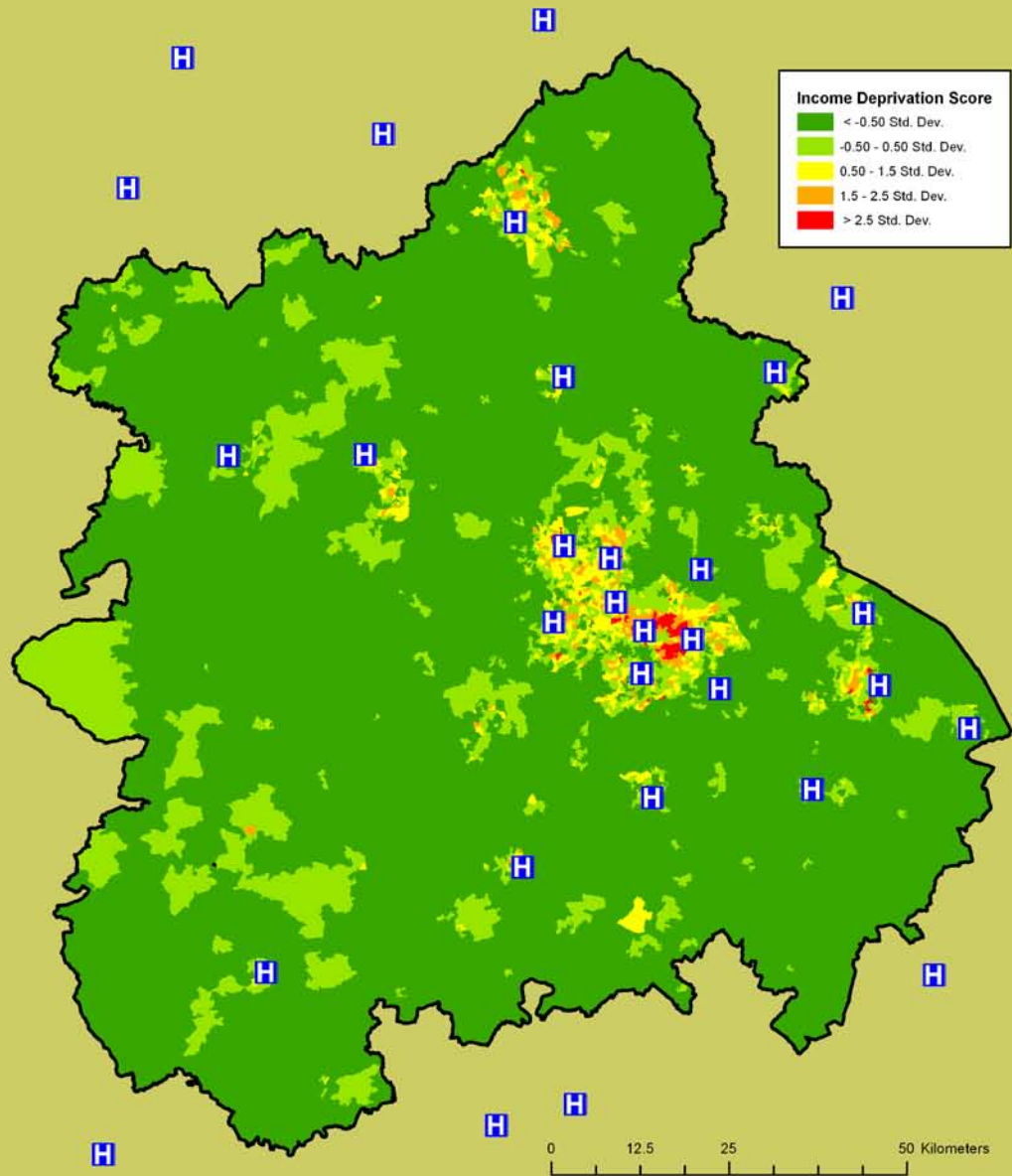
Some definitions & metrics:

- **Emergency Department (ED) = Type 1, consultant led 24 hour service.**
- **Neighbourhood = a lower level super output area, mean estimated pop'n of 1,559 people.**
- **Minor Injuries Unit = MIU with x-ray facilities.**
- **Distance to facility = population weighted distance of the output area centroids (within LSOA) to the nearest facility by road, observing one way and turn restrictions, in kilometers.**
- **Attendance rate = age sex standardised type 1 ED attendance rate in 2007/08 captured by NHS Commissioning Data Set.**
- **Deprivation = Income deprivation domain score of the Indices of Multiple Deprivation 2007 (by LSOA)**
- **Attenders limited to aged 15 and over**
- **Standardised co-efficients**

The tools:

- ☐ **Spatial data was processed using ArcGIS v9.2**

- ☐ **Road distances used Ordnance Survey integrated transport network**

- ☐ **Stats done using Stata v10.**

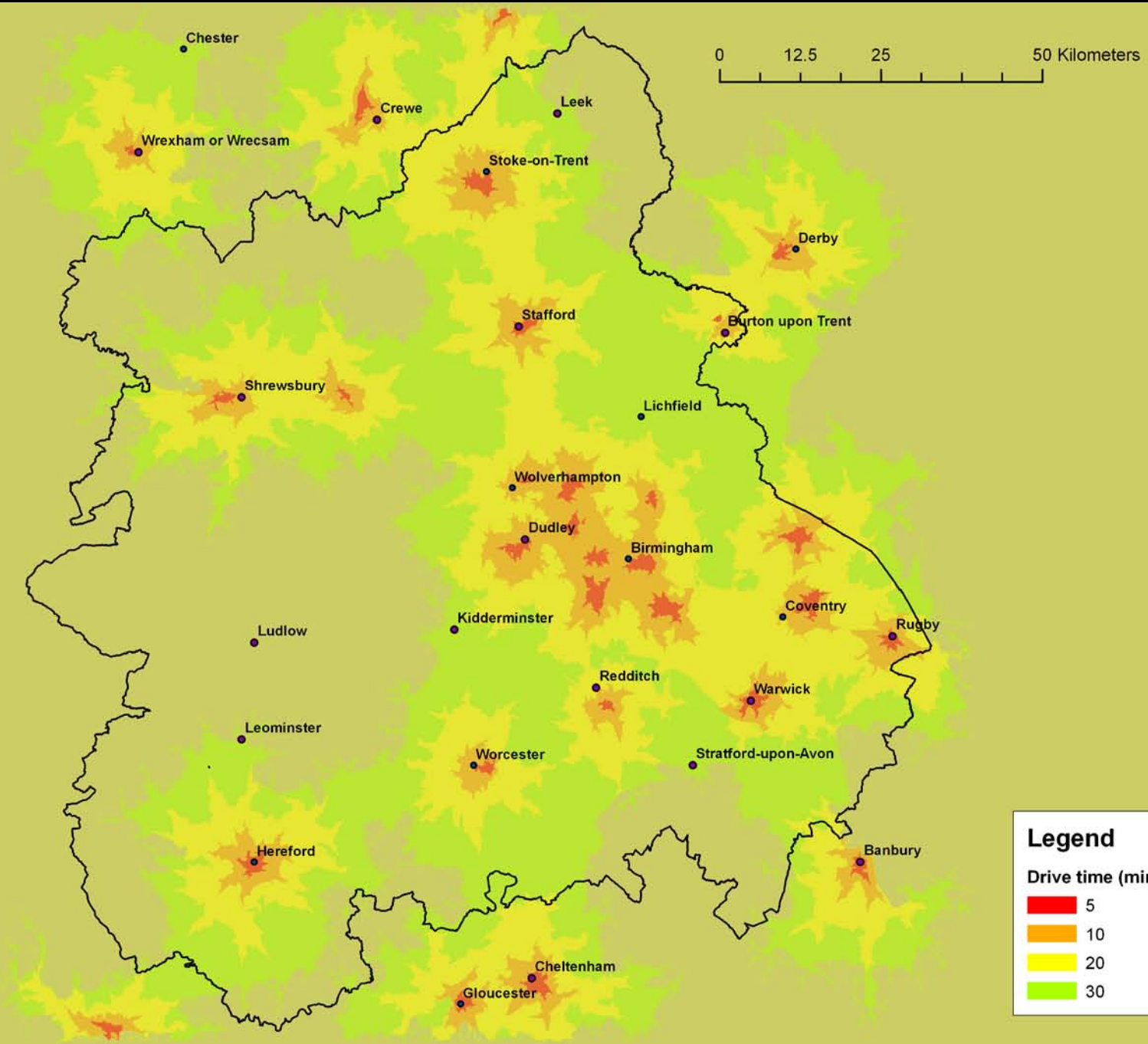- ☐ **Other data handling on Access / SQL / Excel as appropriate**

Hospital location and deprivation:

□ **Facilities tend to be near more populous (so more deprived) areas**

Income Deprivation Score

- < -0.50 Std. Dev.
- -0.50 - 0.50 Std. Dev.
- 0.50 - 1.5 Std. Dev.
- 1.5 - 2.5 Std. Dev.
- > 2.5 Std. Dev.

0   12.5   25   50 Kilometers

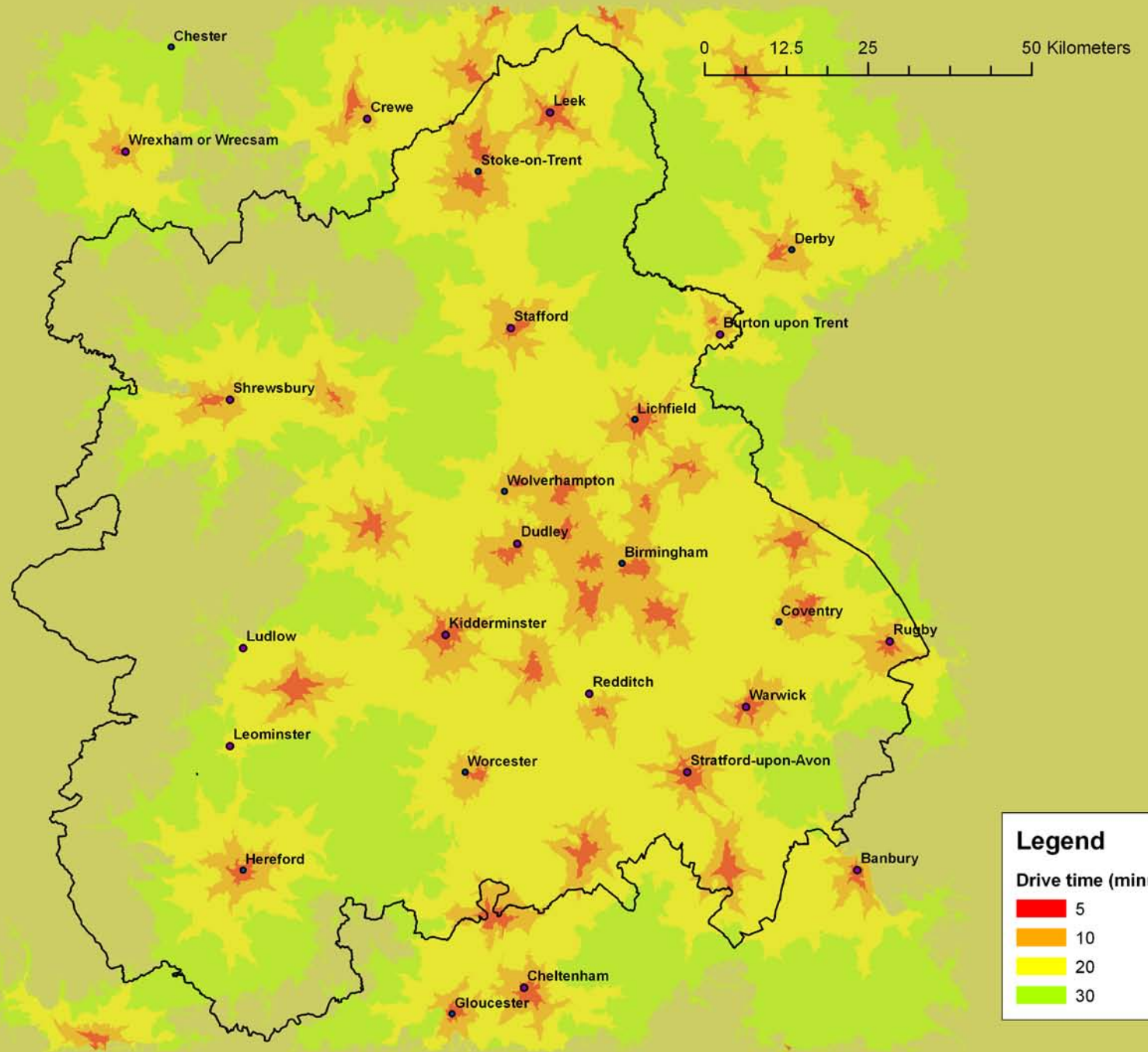# Hospital location and drive times:

- Mapped here to 5,10,20 and 30 minute drive time bands.
- As cars would go: u-turn restricted, speed restricted etc.
- Included out of region where units appear to have a pull on WM demand
- Compare type 1 only to type 1 + MIUs with X-ray facilities

Chester

Crewe

Leek

Wrexham or Wrecsam

Stoke-on-Trent

Derby

Stafford

Burton upon Trent

Shrewsbury

Lichfield

Wolverhampton

Dudley

Birmingham

Coventry

Rugby

Kidderminster

Ludlow

Redditch

Warwick

Leominster

Worcester

Stratford-upon-Avon

Banbury

Hereford

Cheltenham

Gloucester

0   12.5   25   50 Kilometers

Legend

Drive time (minutes)

5

10

20

30

The model results:

	Coef.	Std. Err.	t	P>t	95% UL	95% LL
Distance from ED	-57.59	1.59	-36.25	0.00	-60.71	-54.48
Distance from MIU	8.34	1.37	6.15	0.00	5.68	11.00
Income deprivation	56.65	1.62	34.95	0.00	53.47	59.83
Distance ED / Deprivation	-25.76	2.11	-12.16	0.00	-29.91	-21.61
Distance MIU / Deprivation	8.64	1.78	4.85	0.00	5.14	12.13
Constant	253.69	1.40	181.26	0.00	250.94	256.43

$R^2 = 0.64$

The model results:

	Coef.
Distance from ED	-57.59
Distance from MIU	8.34
Income deprivation	56.65
Distance ED / Deprivation	-25.76
Distance MIU / Deprivation	8.64
Constant	253.69

$R^2 = 0.64$

Distance attendance decay - quintile 1, least deprived
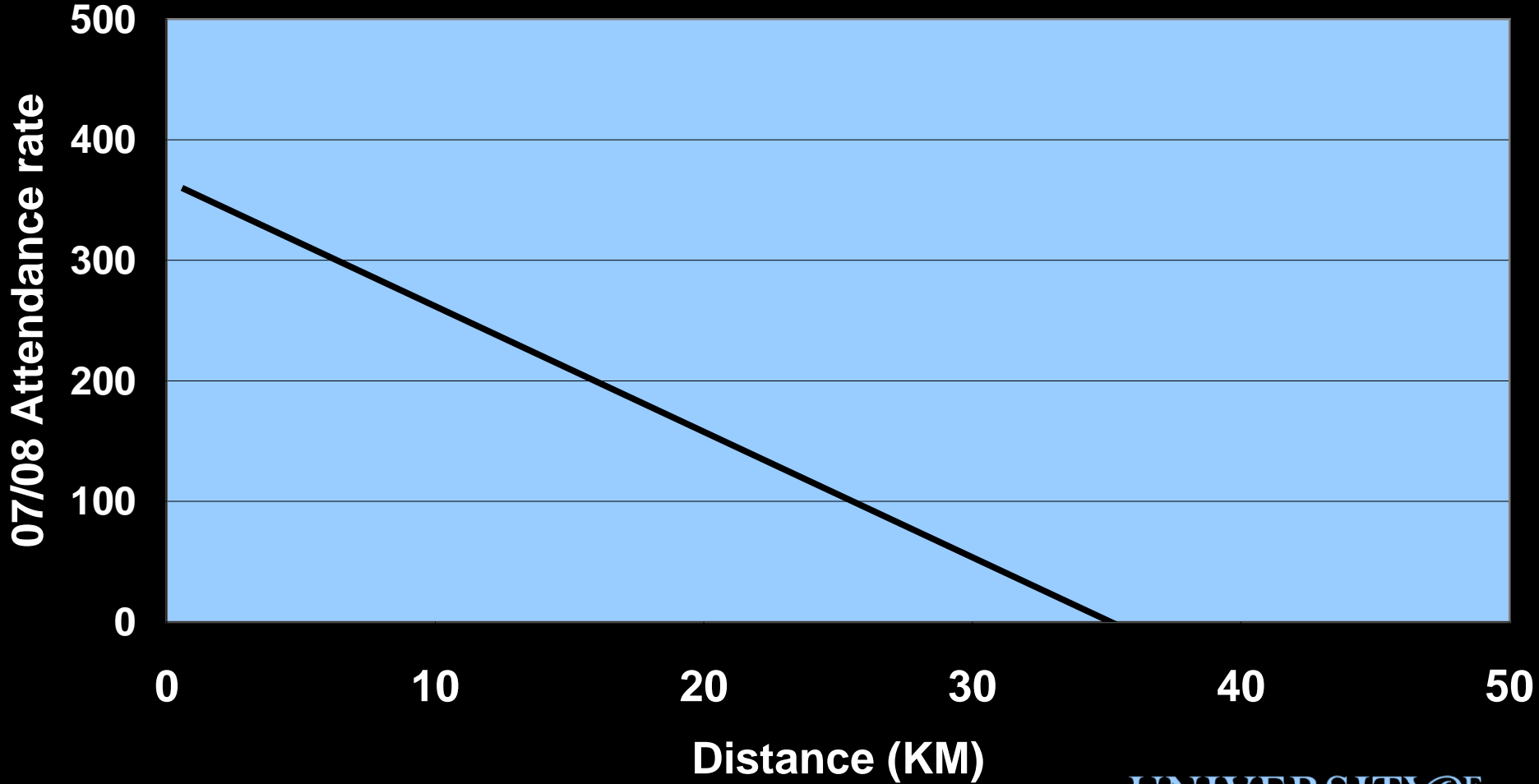
07/08 Attendance rate vs Distance (KM)
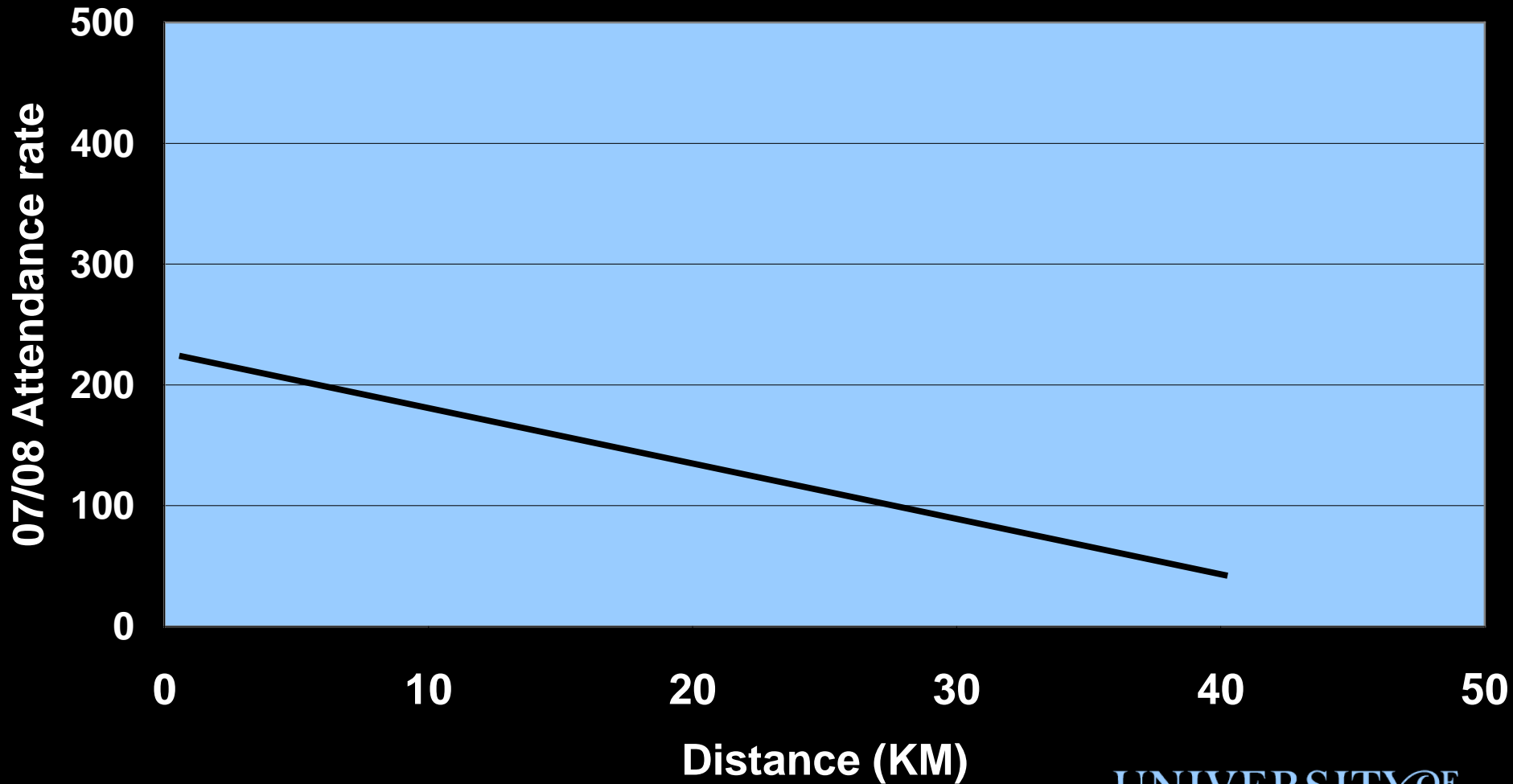
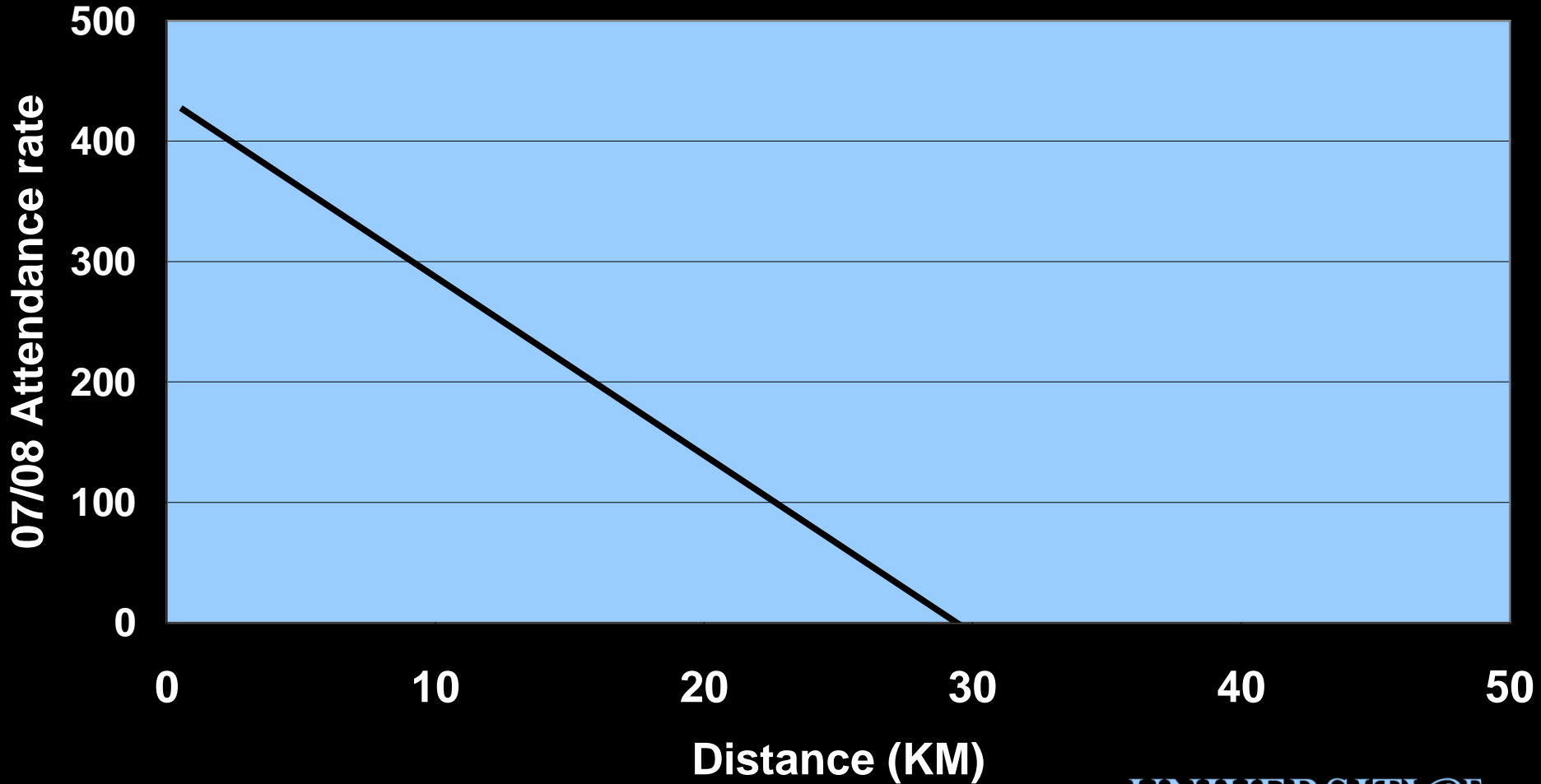Distance attendance decay - quintile 2, low deprivation
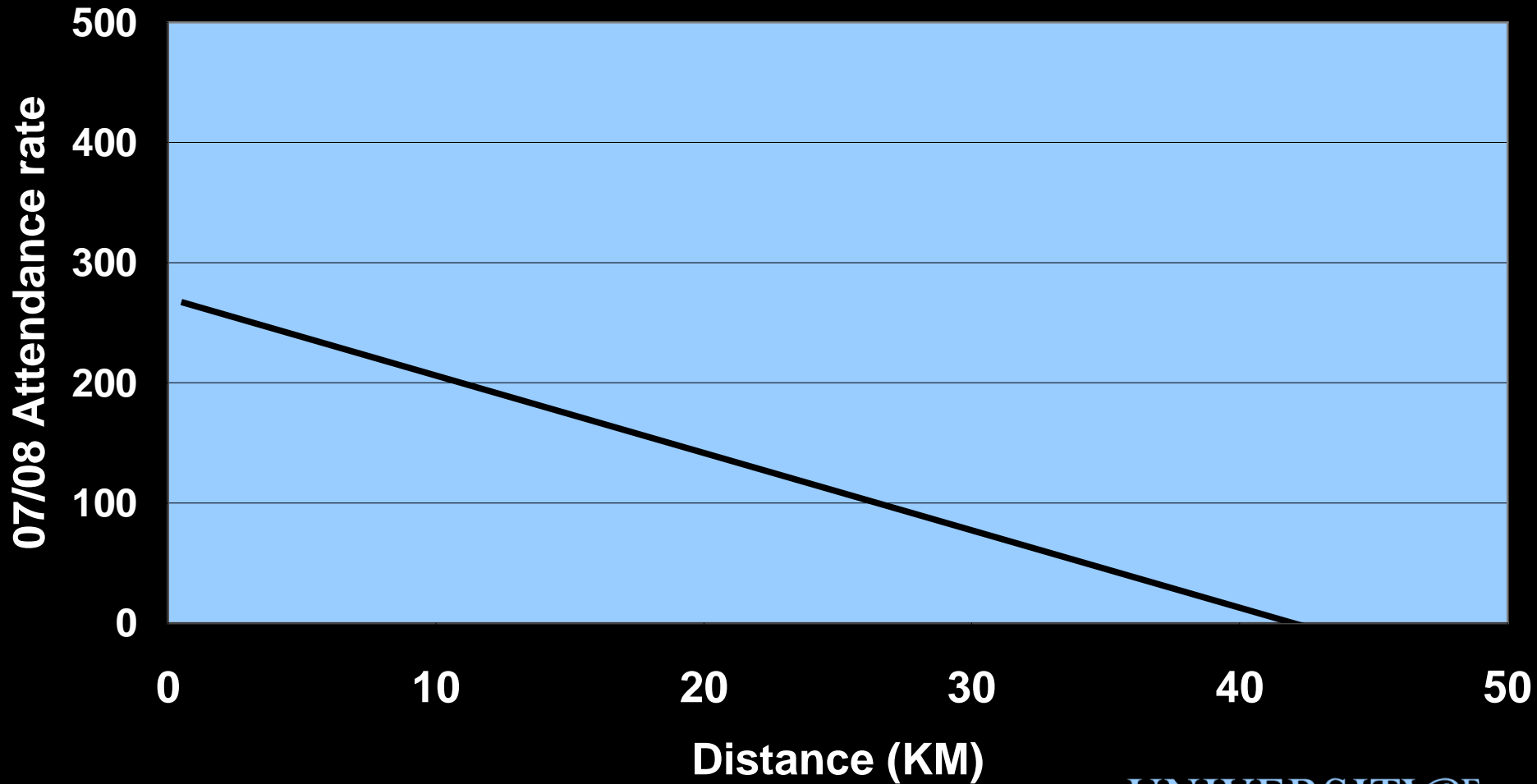
Distance attendance decay - quintile 3, average
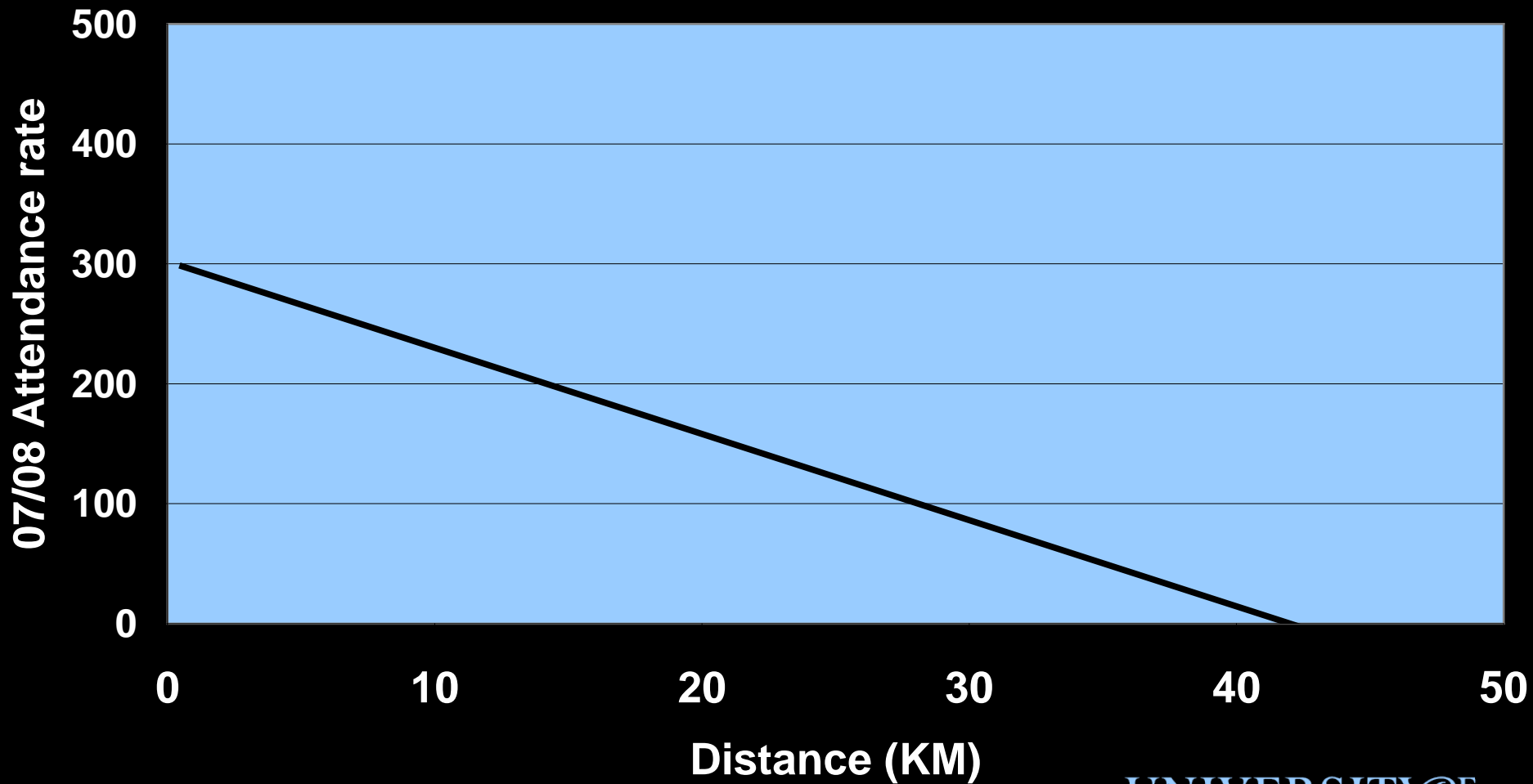
Distance attendance decay - quintile 4, deprived

Distance attendance decay - quintile 5, very deprived

Conclusions:

- **Distance and deprivation are important "independent" predictors of demand for A&E.**
- **These two factors do interact and the relationship is non-constant.**
- **MIUs do not appear to modify demand much, but where they do there is a deprivation effect here too.**

Uses:

- **Targeting of demand management initiatives.**

- **Helps us find control areas for comparative analysis.**

- **Choosing locations of new services.**

Credits:

- **Sally Fillingham, U of B.**
- **Dr. Mohammed Mohammed, U of B.**
- **Dr. Khesh Sidhu, NHS West Midlands.**
- **NHS Information Centre, Leeds.**