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.
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
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
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:

<table>
<thead>
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$R^2 = 0.64$
Distance attendance decay - quintile 1, least deprived

Distance (KM)

07/08 Attendance rate

Distance (KM)
Distance attendance decay - quintile 2, low deprivation

Distance (KM)

07/08 Attendance rate

Distance (KM)
Distance attendance decay - quintile 4, deprived

07/08 Attendance rate vs Distance (KM)
Distance attendance decay - quintile 5, very deprived

Distance (KM)

07/08 Attendance rate

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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.