

Modelling Health Services on the Island of Ireland

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CENTRE for CROSS BORDER
STUDIES



Outline

- Introduction, Aims & Objectives
- Data & Methodology
- Results
- Conclusion and future work

Aims & Objectives

- The aim of the research was to develop a methodology to model and measure accessibility to health services across the island of Ireland
- Objectives included applying this method to
 - Theoretically model supply and demand
 - Measure spatial inequities in supply and demand

Access to Hospitals

- To what extent do current and recent configurations of hospitals meet patient need in terms of broad spatial accessibility?
- What cross-border scenarios have the capacity to enhance or reduce access
- Very little evidence currently available
- Aim of this pilot study to test out a methodology which could be applied in a number of health-related service settings

Approach

- Modelling spatial accessibility among a number of early evidence-based studies for policy and strategic analysis
- Clearly difficulties can be identified as part of the process and not unproblematic.
- We will focus on spatial/geographical approaches in the first instance
- We will then relate these to a number of strategic planning/policy scenarios

Data & Methodology

- 3 Core Datasets
- Road centrelines
 - Navteq: All-Island
- Demography
 - RoI: Electoral Division Level
 - NI: Output Area level
- Hospitals
 - attribute data on bed size and occupancy

$$r_i = \frac{O_i}{\frac{P_i}{n} \sum_{k=1}^n O_k}$$

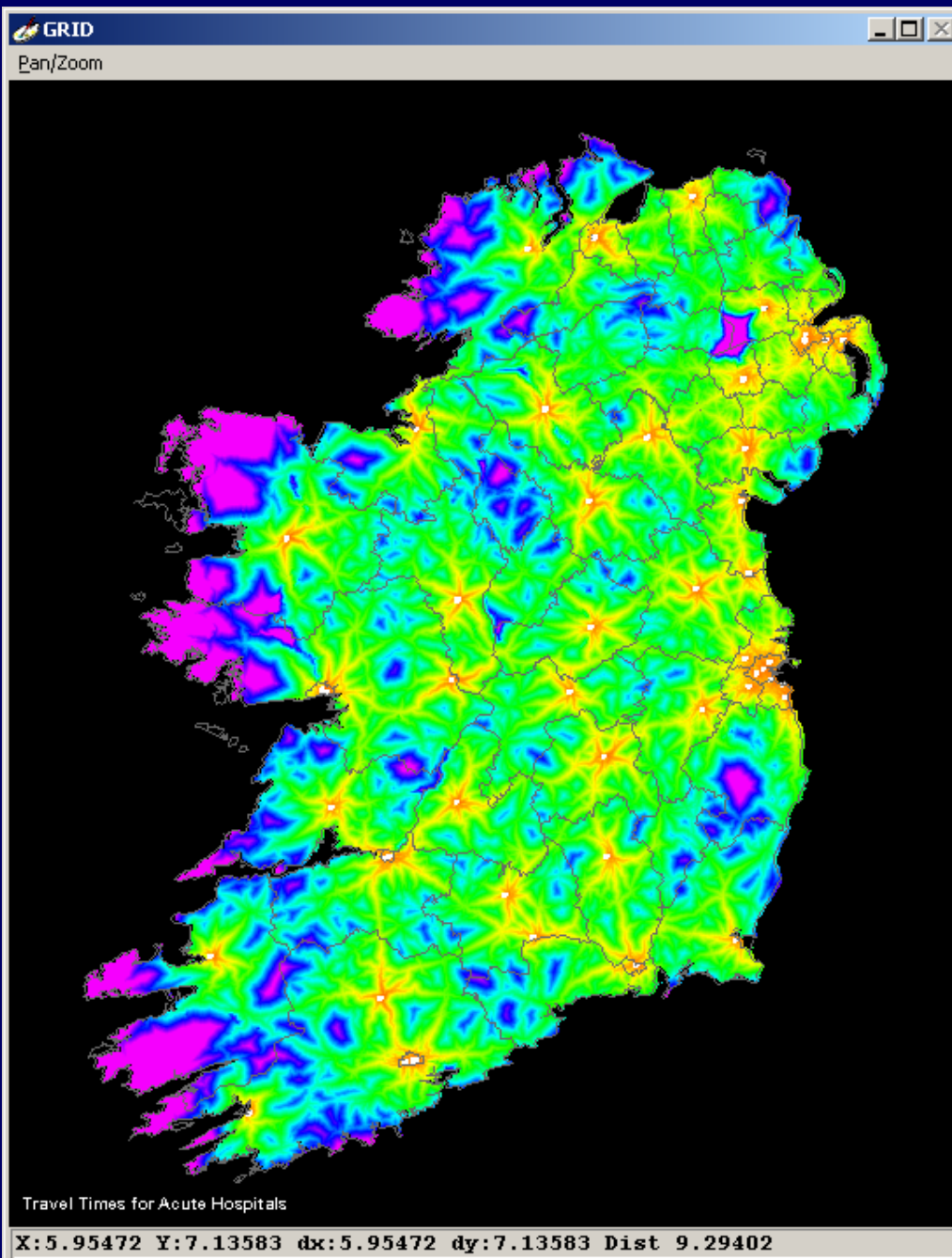
R_i – bed rate in catchment I
 O_i – enumerated beds in catchment I
 P_i – population of catchment I

The right hand expression in the denominator is the all-island ratio of beds per head of population

This is sometimes known as a ‘location quotient’

I - All-Island Analysis

- Examining the surfaces for the following reveals some interesting patterns
 - Time accessibility
 - Allocation of nominal catchments
 - Relative Supply: Bed provision

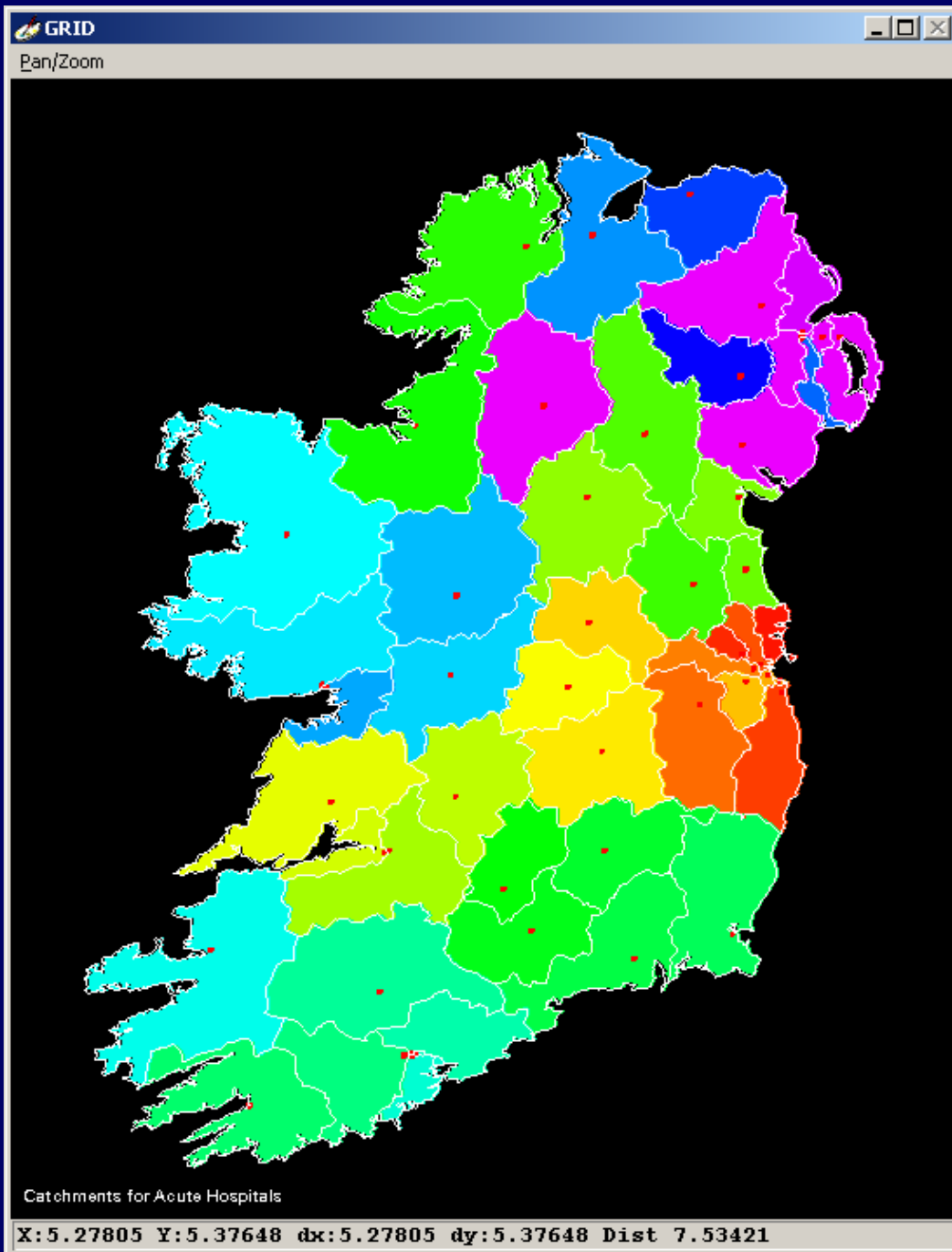


Acute Hospitals Access Time

The patterns tend to confirm and refine previous work by Foley and Kalogirou.

Long access times in the western periphery.

Mountainous areas (e.g. Wicklow in RoI, the Sperrins in NI) and lakes (Lough Neagh in NI) also have, as might be expected, lengthy access times



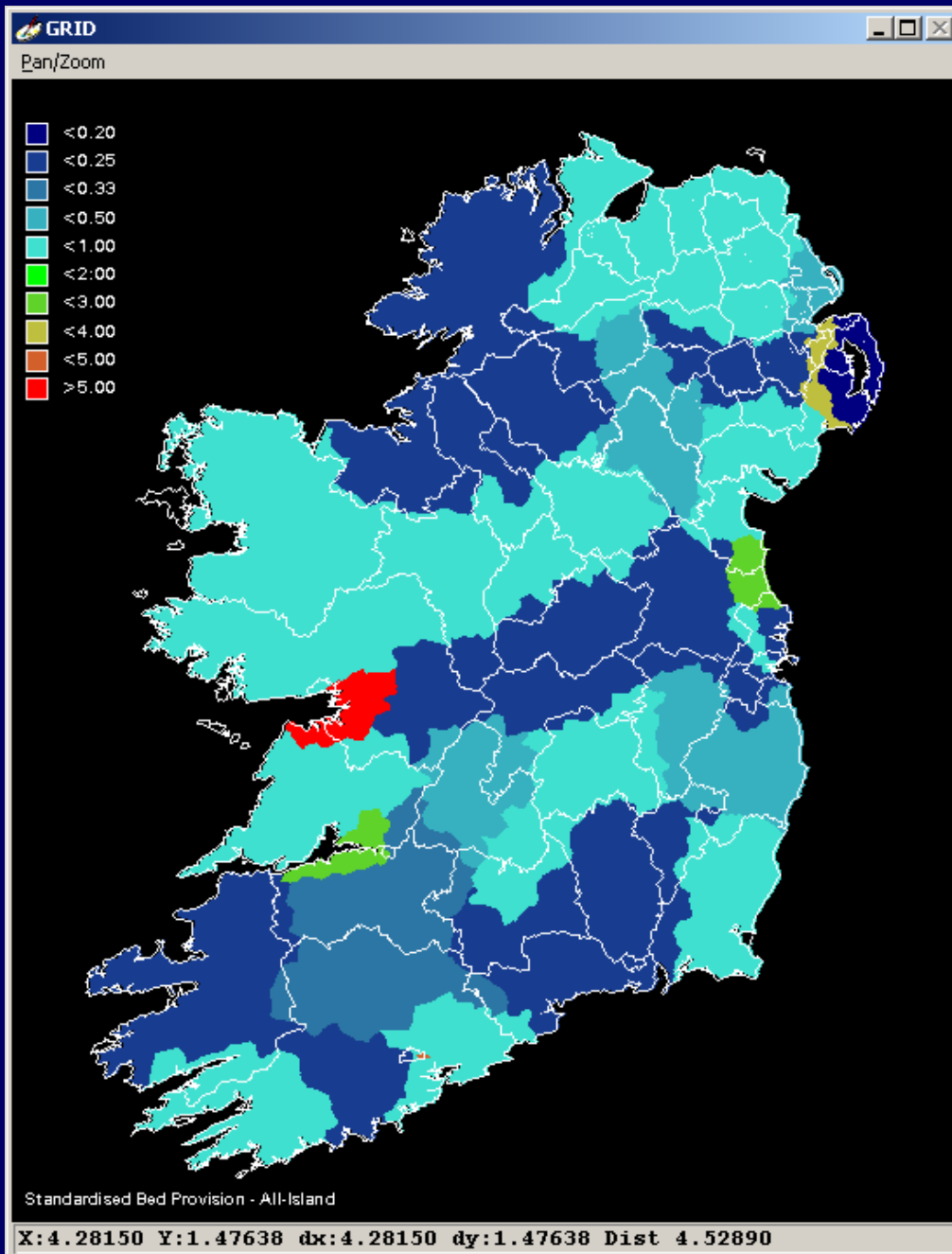
Nominal Acute Hospitals Catchments

Identifies high population density catchments in Dublin and Belfast

Some rural catchments more aligned along county boundaries

Noticeable cross-border leakage

- Monaghan hospital catchment includes part of County Tyrone
- Altnagelvin includes the Inishowen peninsula in Donegal



Acute hospitals bed ratio

This statistic includes the number of beds in each hospital as well as the population in each catchment

Galway, Limerick, Drogheda and parts of Belfast appear to well provided with above average bed counts.

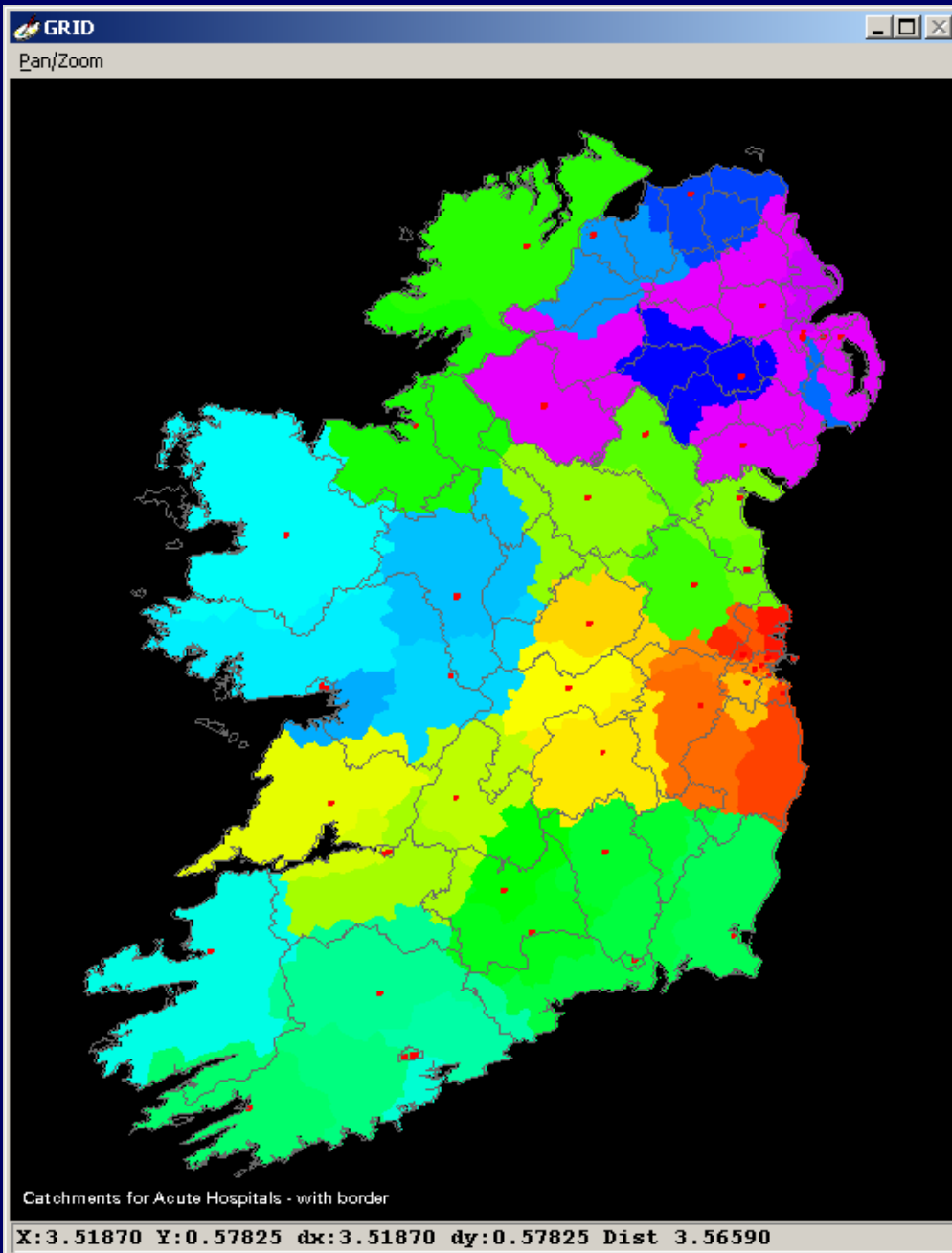
BUT – Galway has a 500 bed hospital as part of its medical school: this skews the all-island picture. More interesting to look at green/brown areas.

II - Border effects

- How does the RoI/NI border affect access to hospitals?
- The border can be included in the cost surface by changing the weighting to code in the border as a serious barrier
- This prevents any allocation across the border

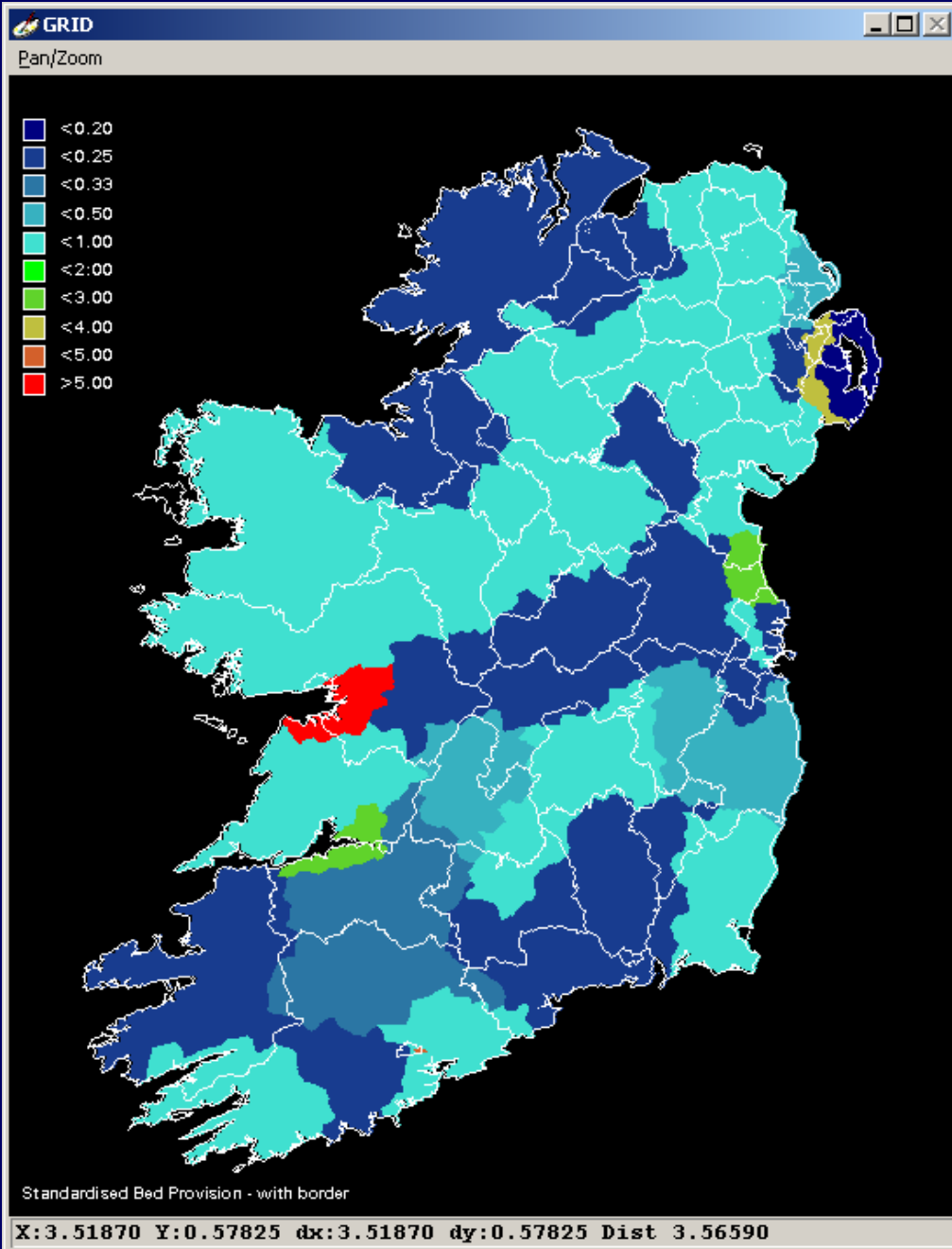
Cross Border comparison

- We recompute the allocation and access time surfaces for the new 'two-nation' scenario
- Then we can difference the all-island and two nation access time surfaces to examine its influence of the border...
- ... and compute time disadvantage bands



Catchments

Border is now co-terminous
with catchment boundaries



Bed ratios

Some intriguing changes to the pattern, not all of them intuitive.

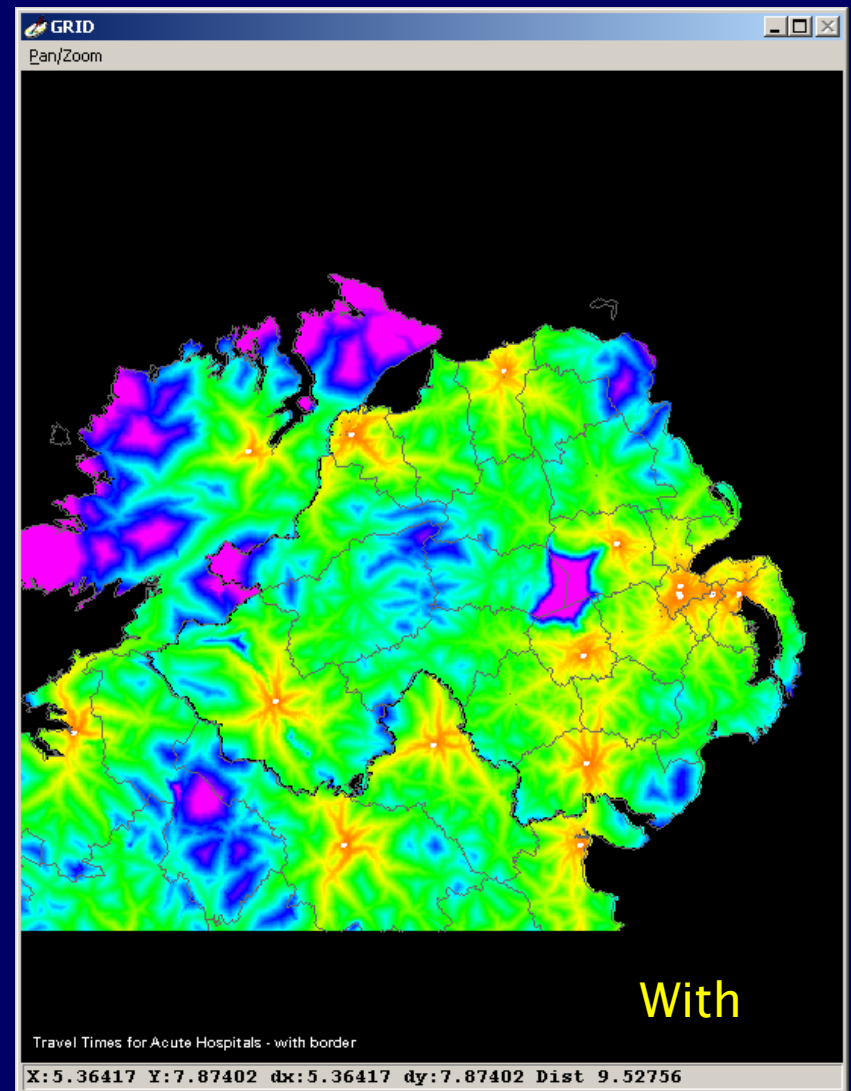
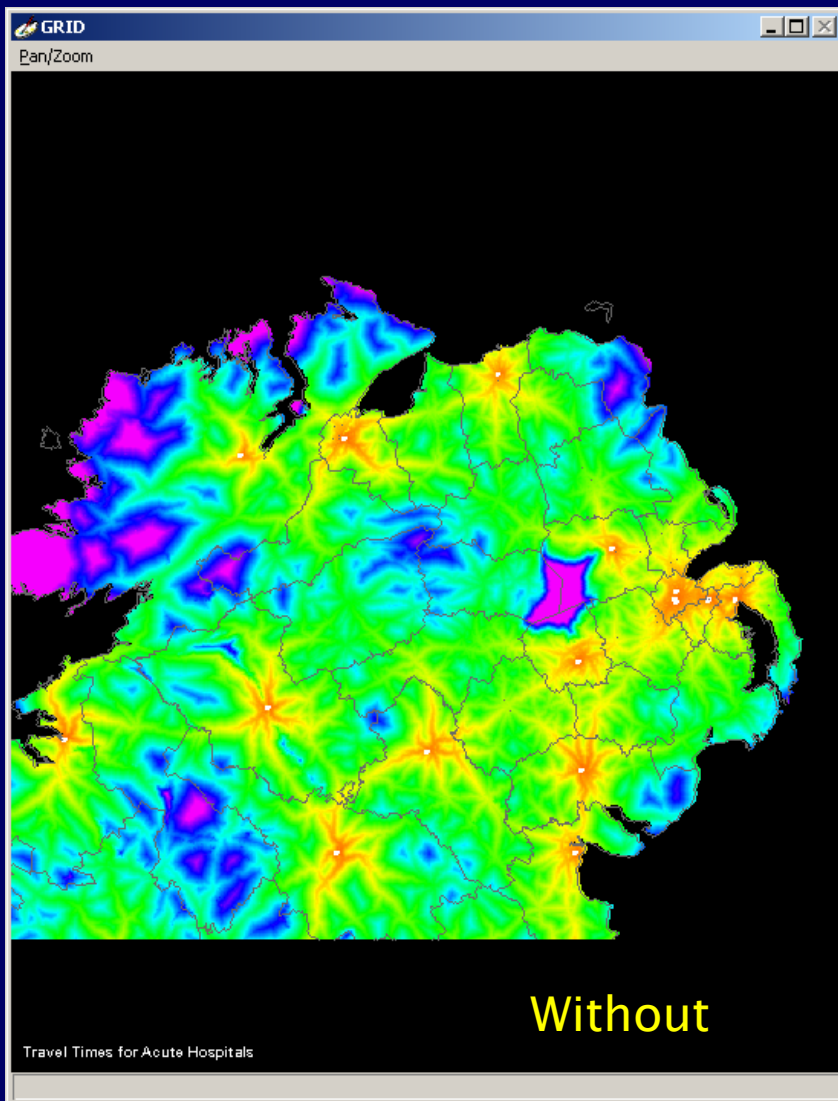
Most of the North improves slightly, with the exception of Altnagelvin in the north-west.

Interesting question is:

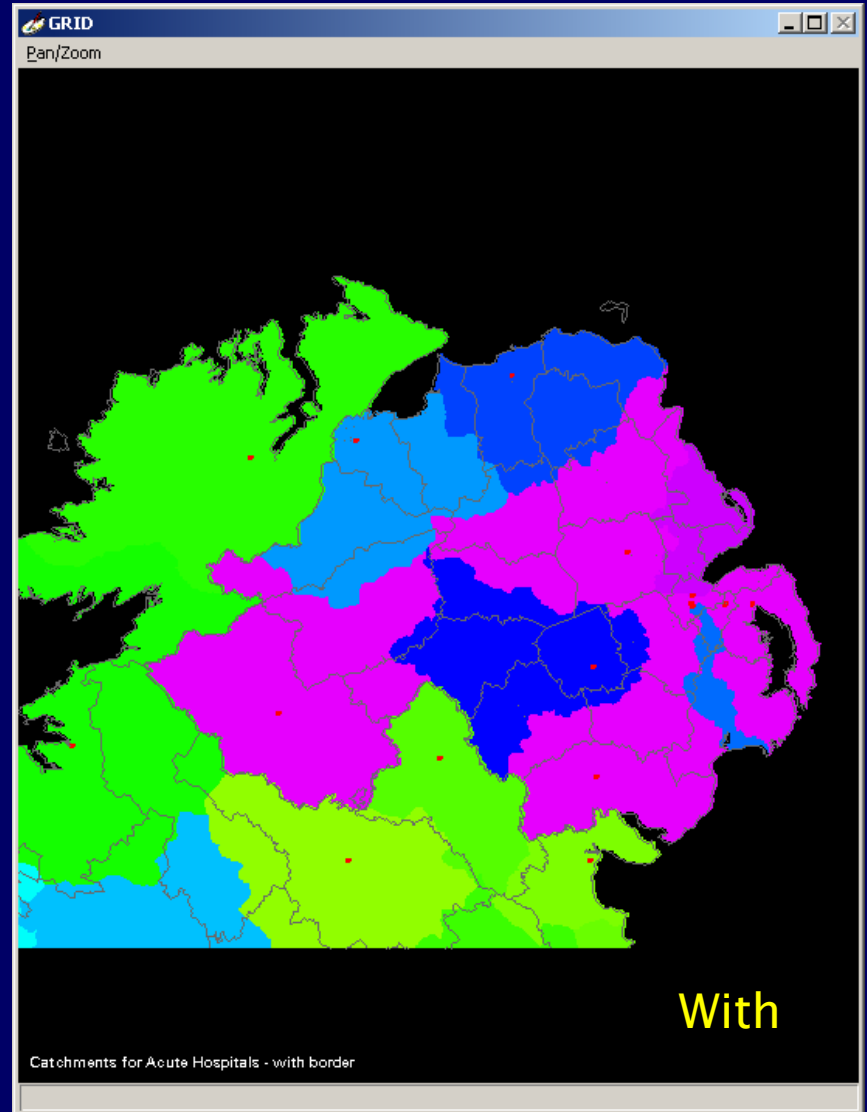
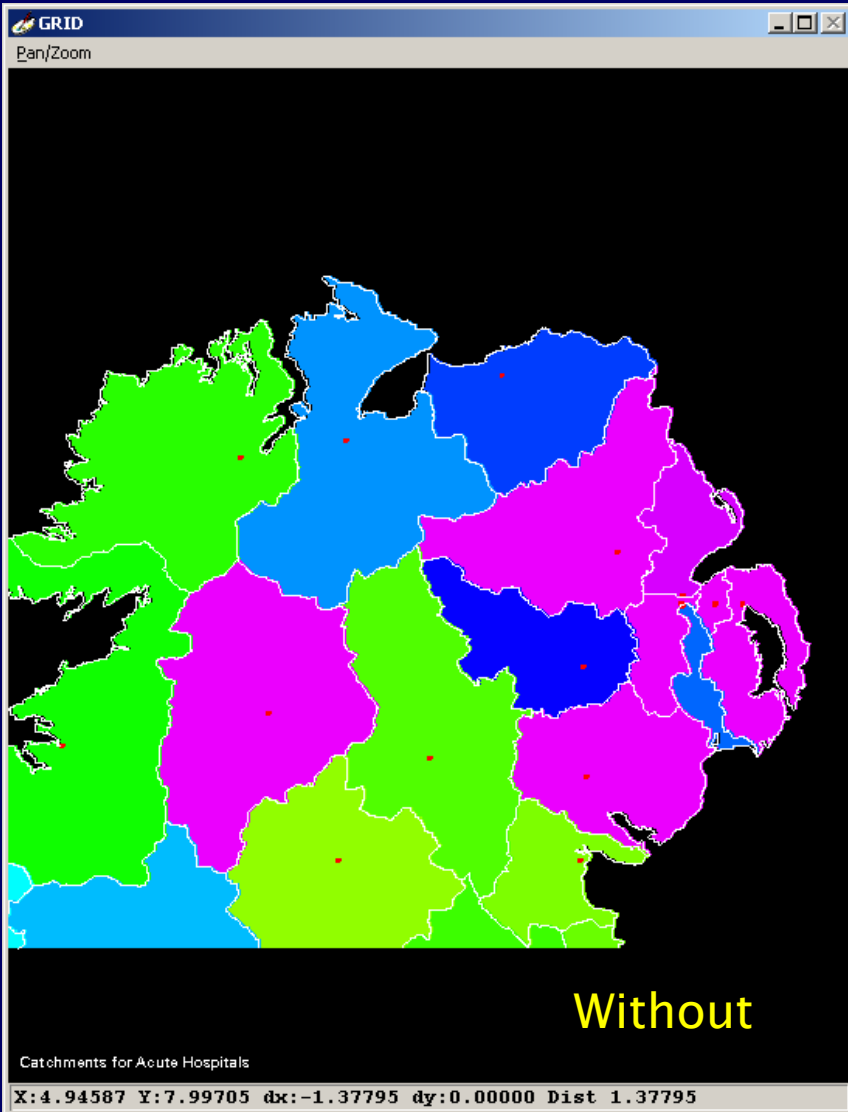
How many people are affected by the imposition of a 'hard' border

III- Cross-Border differences

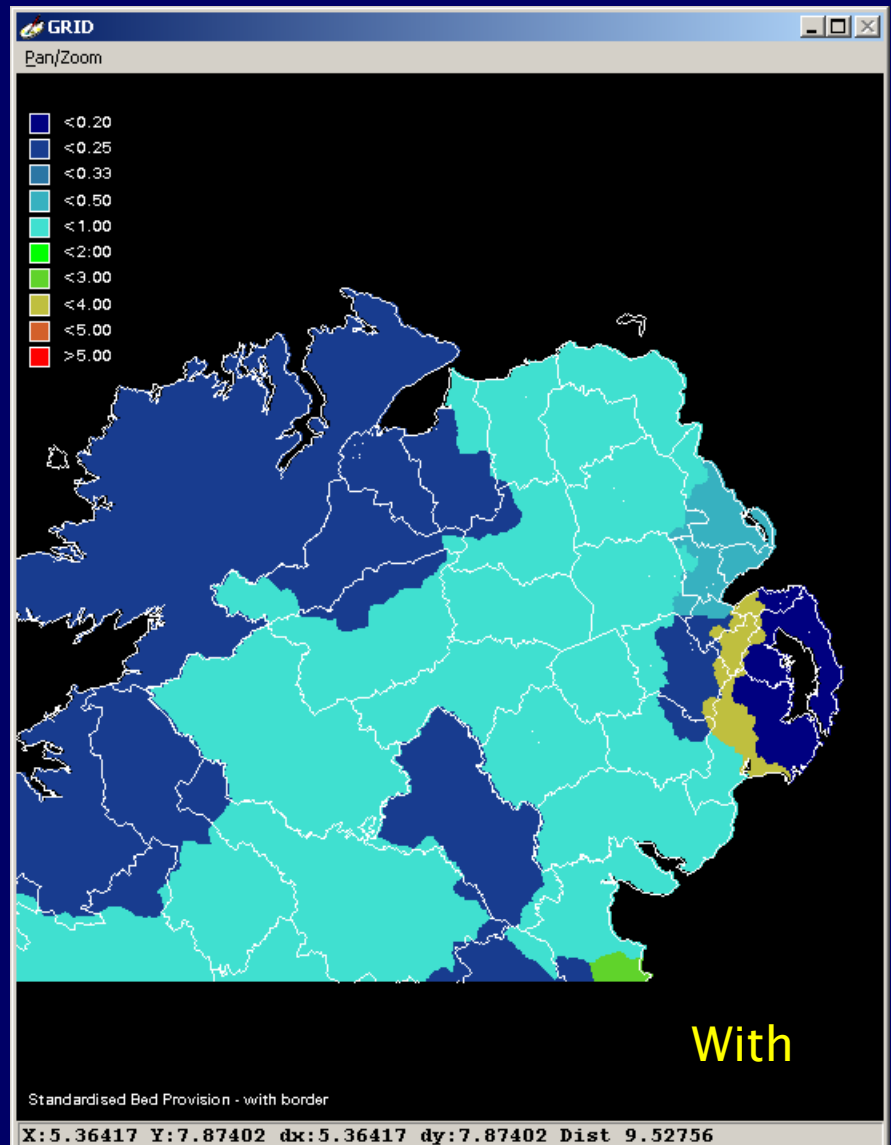
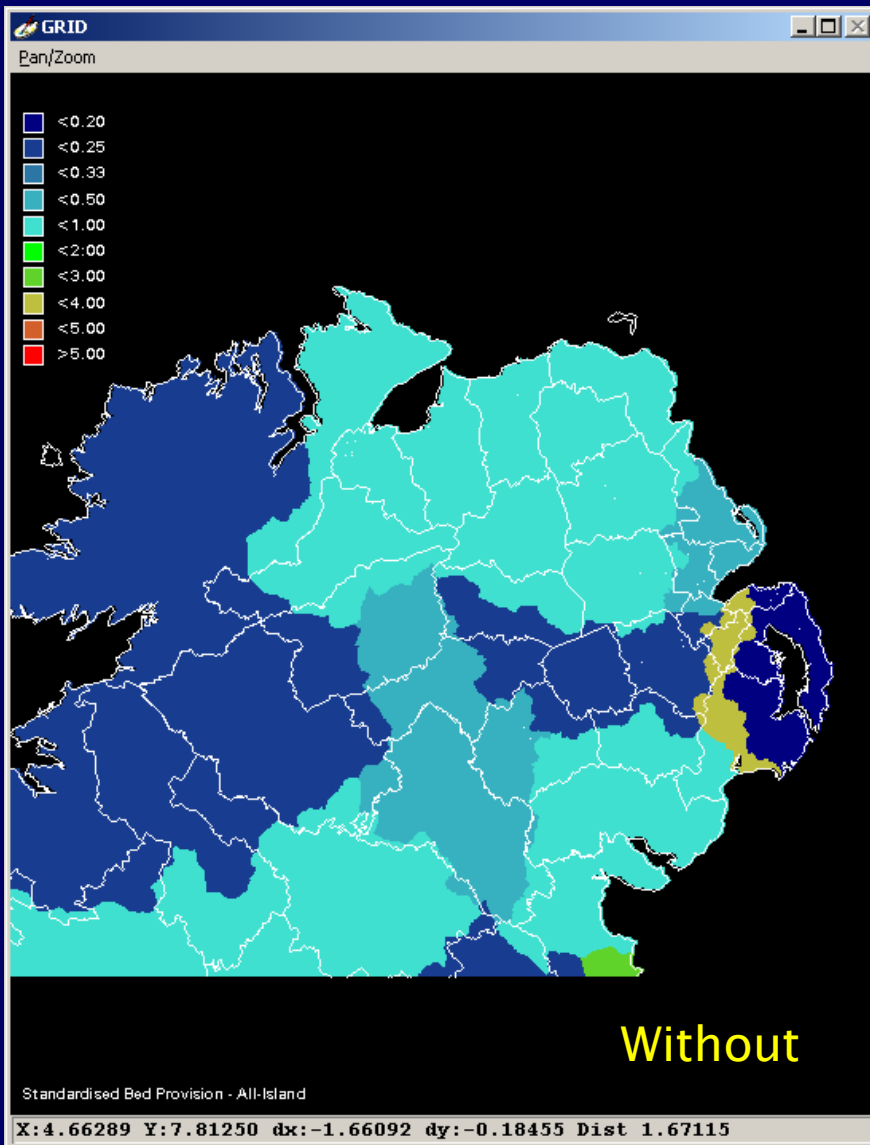
- We can compare the all-island and two-nation surfaces in the border area
- The same colour scheme is used for the following access time and bed ratio maps



The effect of the imposition of the border is clear –north east Donegal in particular



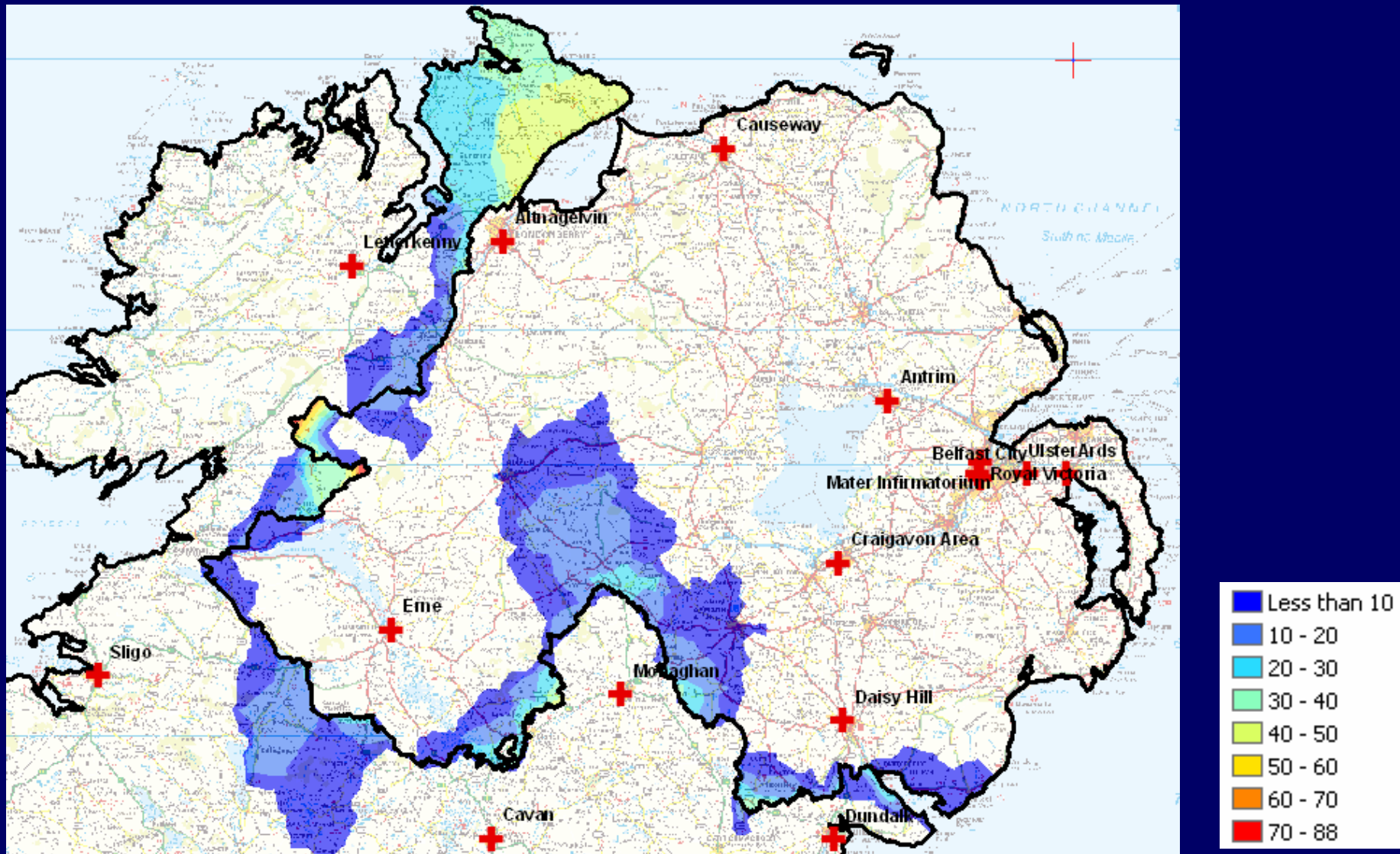
The catchments after the imposition of the border are constrained by it



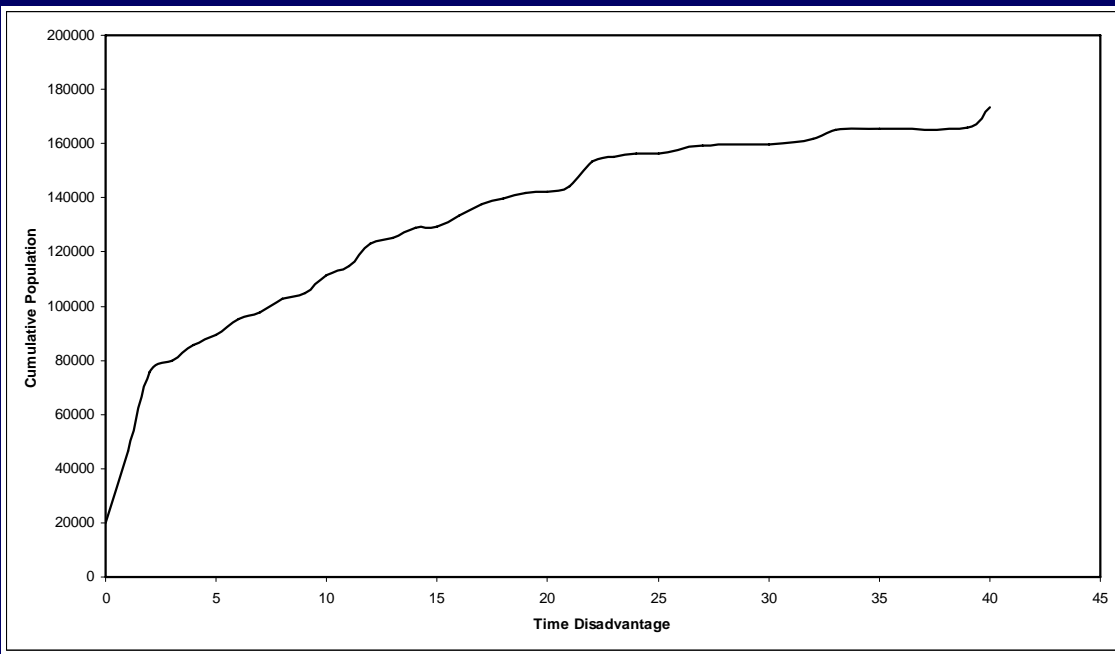
Counter-intuitively the relative bed provision generally improves in NI with the exception of Altnagelvin; in ROI Monaghan is disadvantaged

IV - Time disadvantage

- Subtracting the all-island and two nation time surfaces yields a time disadvantage surface
- This can be classed into time bands, vectorised and intersected with the population data to obtain proportions in each band.

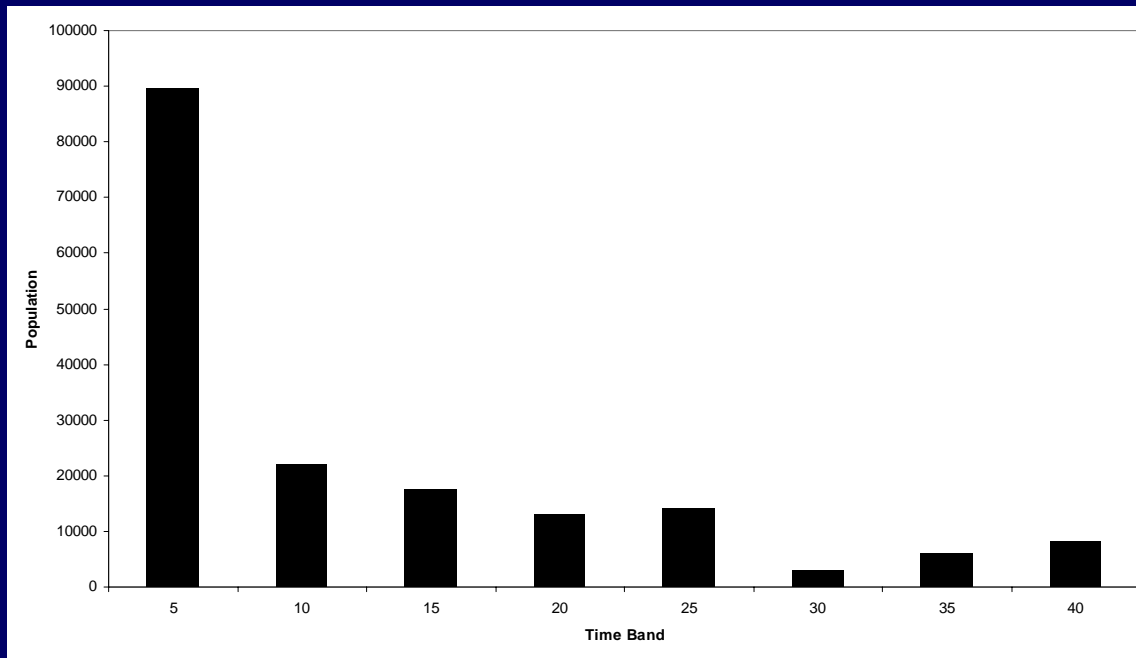


Time disadvantage in the border area – the worst affected area is in north-east Donegal



Reclassing the surface into 5 minute disadvantage bands reveals the extent of the border influence on access.

Time	Cumulative %
5	52
10	64
15	74
20	82
>20	100



Half those affected are disadvantaged by 5 minutes; 18% however are disadvantaged by more than 20 minutes

Observations

- The results here are based on a very simplified scenario
- However, it's quite clear that thinking in field terms to obtain time accessibility surfaces is convenient and flexible

Future Work

- Stage II of the pilot project will look at two further issues, changes over time and the modelling of two initial selected services
- Phase II of project would aim to assess in more depth accessibility is measured and mapped.
 - Aim to make GIS reflect more fully the complex reality of health care utilisation
 - Broaden the service specific models of accessibility, e.g. oncology, cardiology, nephrology
 - Incorporate utilisation data to better model expressed need/demand
 - Incorporate forecasting element in the form of planned hospital changes and population projections.