

# METHODS BRIEFING 1

## A Spatio-temporal analysis of the Great Irish Famine

**Dr Ian Gregory**, University of Portsmouth

**Dr Paul Ell**, Queen's University, Belfast

**Matthew Woollard**, University of Essex

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The Programme aims to develop qualitative and quantitative methods within the context of substantive research. It also aims to encourage effective dissemination of good practice.

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Manchester  
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There has been heavy investment in Geographical Information Systems but most use is confined to mapping. This project aimed to:

- Enhance the use of Geographical Information Systems (GIS) amongst historians and historical geographers by demonstrating the use of quantitative GIS techniques, in particular approaches to statistical spatial analysis
- Investigate the use of spatial statistics such as areal interpolation and Geographically Weighted Regression (GWR) to explore change over time and space simultaneously. The demographic impact of the Great Famine in Ireland in the mid-nineteenth century was used as a case study.

### **The value of GIS to historians**

The highly exploratory nature of spatial statistical approaches is well suited to historical research and the pedagogic approaches of historians. Statistical analysis of the limited and crude data that tend to be available to historians will rarely provide explanation on its own. A much more productive approach is to use it in a descriptive and perhaps provocative manner that challenges more conventional narrative approaches to explain why the pattern (whether a single variable on a map or multiple variables in a regression model) was like this in one place and one time, and not like this at another place and/or another time.

A course on 'Using GIS to analyse historical data', was held at the University of Portsmouth, April 1-2, 2004. Course materials can be downloaded from:

[http://ahds.ac.uk/history/news/gis\\_course\\_details.htm](http://ahds.ac.uk/history/news/gis_course_details.htm).

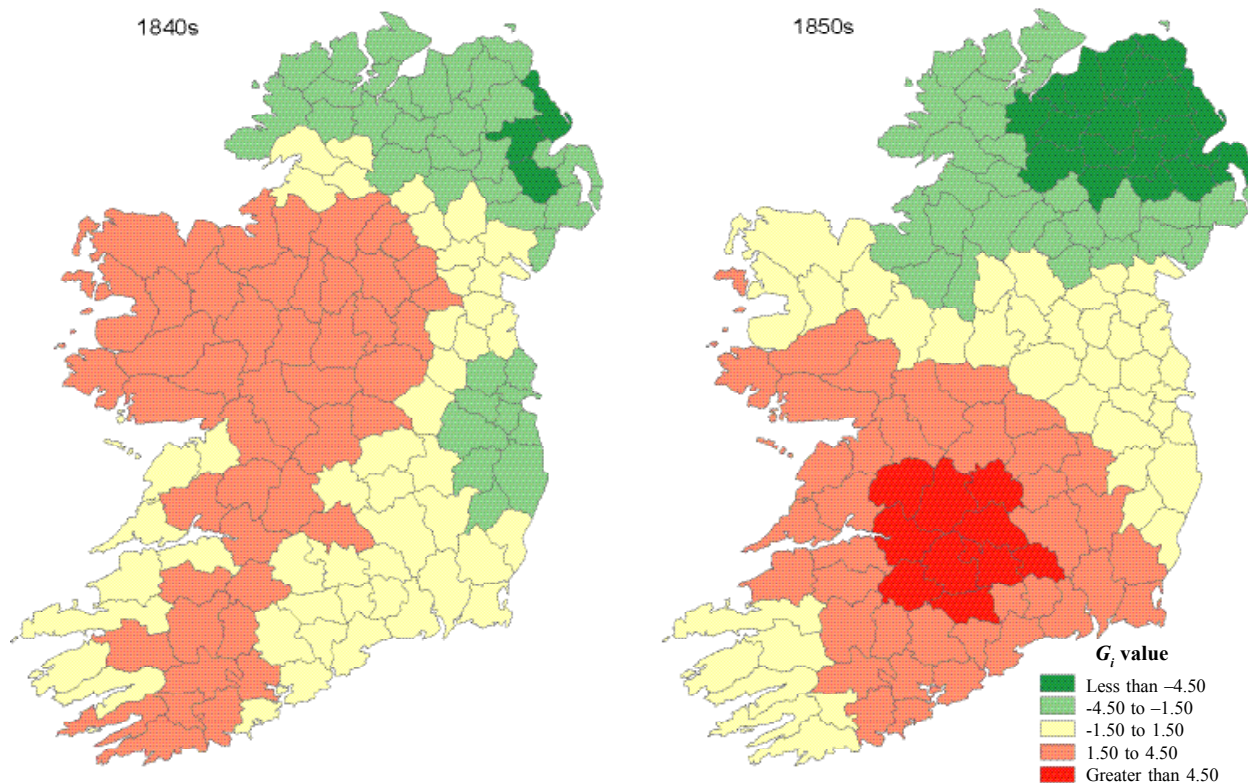
### **Working at an appropriate spatial scale**

Much work on the Famine's impact has been based on county-level estimates of mortality. These are undesirable both because they are potentially unreliable and because subdividing the country into only 32 counties heavily reduces the spatial detail. We calculated inter-censal population change at the level of the 163 Poor Law unions (as arranged in 1851) for the Famine and post-Famine period. Work at this scale allowed us to demonstrate that population loss over the Famine was not as concentrated in the west and south as had previously been assumed but was, if anything, concentrated in the Midlands. It also allowed us to explore the pattern of population loss after the Famine: it remained concentrated in the Midlands but was more prevalent in the south than the west. Ulster and the areas around it consistently benefited from the lowest levels of population loss.

### **Using Geographically Weighted Regression to explain the impact of the Famine**

Traditional explanations of the Famine suggest that its impact was highest amongst the poor. Conventional regression of the Poor Law union-level data suggested that the impact of the Famine was highest amongst the poor. However, analysis using GWR suggests that this relationship was most prevalent in the east, where population loss was relatively low. In the west the opposite seems to be the case with areas with relatively low levels of fourth class housing and illiteracy showing the highest rates of population loss. One reason for this, based on information from agricultural data, is that in the 1850s particularly, livestock agriculture may have been displacing people while the availability of potatoes, a crop that much of the peasant population still relied on after the Famine, ironically helped to reduce population loss.

## $G_i$ statistics of population decline



Statistics calculated using a distance decay function with a bandwidth of 70km

### Identifying where explanation is good

GWR has an additional advantage over conventional regression in that it allows us to explore where statistical explanation is good and where it is poor. In our models, explanation tended to be poor in the south. This is interesting because Skibbereen in west Cork is frequently used as a case study for the impact of the Irish Famine. This was in one of the areas of lowest explanation suggesting that it was far from a typical place.

### Identifying errors in interpolation

We have also devised a technique for spotting errors in interpolated data values by comparing inter-censal change for values that were known to be affected by boundary change to those that were known not to be affected. We can therefore estimate the possible impact of interpolation error on each individual data value in a time series. This is very important when using areal interpolation to explore long-run time series.

### Summary

Figure 1 summarises some of our work. To create it data from the 1841, '51 and '61 censuses were interpolated onto a single set of Poor Law unions. This allowed us to calculate inter-censal population change at this spatial level.  $G_i$  statistics have then been calculated to show where areas of high population loss are concentrated (shaded in red) and where areas of low population loss or population gain (shaded in green) are concentrated. This illustrates that the spatial and temporal dynamics of the Famine are far more complex than is sometimes thought.

### Key Publications

Gregory I N and Ell P S (in press) "Breaking the boundaries: integrating 200 years of the Census using GIS" *Journal of the Royal Statistical Society, Series A*.

Ell P S and Gregory I N (in press) "Demography, depopulation and devastation: exploring the geography of the Irish Potato Famine" *Historical Geography*.

Further details are available from  
Ian.Gregory@port.ac.uk, Tel: 023 9284 2492  
[www.envf.port.ac.uk/geo/gregoryi/ig.htm](http://www.envf.port.ac.uk/geo/gregoryi/ig.htm)