

# **The pits may be closed but adverse effects on health may still be evident: exploring the links between coal mine locations, socioeconomic deprivation and self-reported health in Great Britain**

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## **1. Summary**

Various studies in the UK have found associations between living in a coalfield area and poor health at both population and individual levels. A database of information on coal mines in Great Britain (GB) has recently become available and this enables the investigation of a more spatially disaggregate study than has previously been possible. In a context in which ‘traditional’ coal mining in GB no longer exists and the locations are invariably characterised by deep socioeconomic deprivation, the current study seeks to find:

- Whether including information on the location of coal mines in and near electoral wards (and equivalents) provides an improved explanation of small area variations in health;
- Whether time since pit closure has any observable influence;
- Whether regeneration schemes have any apparent effect on community health.

In 2001, for Census Area Statistics Wards in England and Wales and Postal Sectors in Scotland, the initial findings are that (controlling for socioeconomic deprivation) self-reported long-term limiting illness health is significantly worse at both small area and district level if a coal mine has been in that locality and especially if there are multiple pits. Poor health decreases with increasing distance from a coal mine.

In a case study focussing on North-East England, the longer a local pit has been closed, the better the long-term health of the community. However, regeneration grants are associated with relatively poor health, perhaps because these areas are the most deprived and / or because these locations have lost their relatively population by out-migration.

## 2. Background

The coal mining industry suffered great losses as demand for the resource decreased. The industry had become very central to many communities in GB, and when job losses of more than 95% hit (National Audit Office, 2009), it was not just the industry that was in trouble, but the people it left unemployed and their families. The closure of the industry meant replacement employment could not be found fast enough. The closures themselves were due to significant downsizing and reorganisation of industrial production of the coal industry (Riva *et al.*, 2011) and communities suffered economically as residents did not have money available to spend to keep the local economy afloat with single industry towns the worst hit (Turner & Gregory, 2007).

Coal miners were subjected to harsh working conditions and even if they did not suffer in terms of job loss, it was likely that they suffered the physical effects of mining. The exposure to particulate matter put miners at an increased risk of mortality due to cardiovascular and respiratory diseases (Pelucchi *et al.*, 2009). Communities surrounding a source of particulate matter (such as a coal mine), are also more likely to suffer cardiovascular and respiratory diseases. Miners are found to be more likely to suffer from a long term limiting illness (LLTI) than people in non-manual employment (Riva *et al.*, 2011). A likely situation in mining communities would be that older ex miners are in poor health due to the direct effects of mining and their families are in poor health due to deprivation caused by lack of employment (Coalfield Regeneration Board, 2010).

Previous health research has found coalfield related inequalities. Senior (1998) used 1991 Census variables to investigate area variations in LLTI and found that people in a manual or physical coal mining position to have significantly worse health than people with different employment, including desk based coal industry employees. Senior found that dummy variables for 'coalfield areas' (based on coalfield maps) were significant in contributing to poor health. Riva *et al.* (2011) looked at individual level health using similarly using dummy variables to indicate if a local authority was in a coalfield area. A 'coalfield health effect' related to LLTI was found but that some areas had recovered better than others. Morris and Colagiuri (2012) found environmental and social injustice affecting communities that surround coal mines and coal-fired power stations, and that these are linked to negative health impacts.

A detailed database of information on GB coal mines has recently become available (Gill, 2007) and this enables the investigation of a more spatially disaggregate study than has previously been possible. In a context in which 'traditional' coal mining in GB no longer exists and the locations are invariably characterised by deep socioeconomic deprivation, the current study seeks to find:

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### **3. Data and Methods**

*Coal mine data* have been obtained, including pit locations and opening and closing years of each pit (Gill, 2007). The data have been cleaned, updated and with new relevant variables added. More in depth variables were created for the North East, including grant eligibility and years since pit closure.

*Socioeconomic / demographic data* have been obtained from the Census. These data include long-term limiting illness (LLTI) and population by age for 2001. Deprivation has also been calculated using the Townsend Index for 2001 and for previous census time points. Population density has also been calculated.

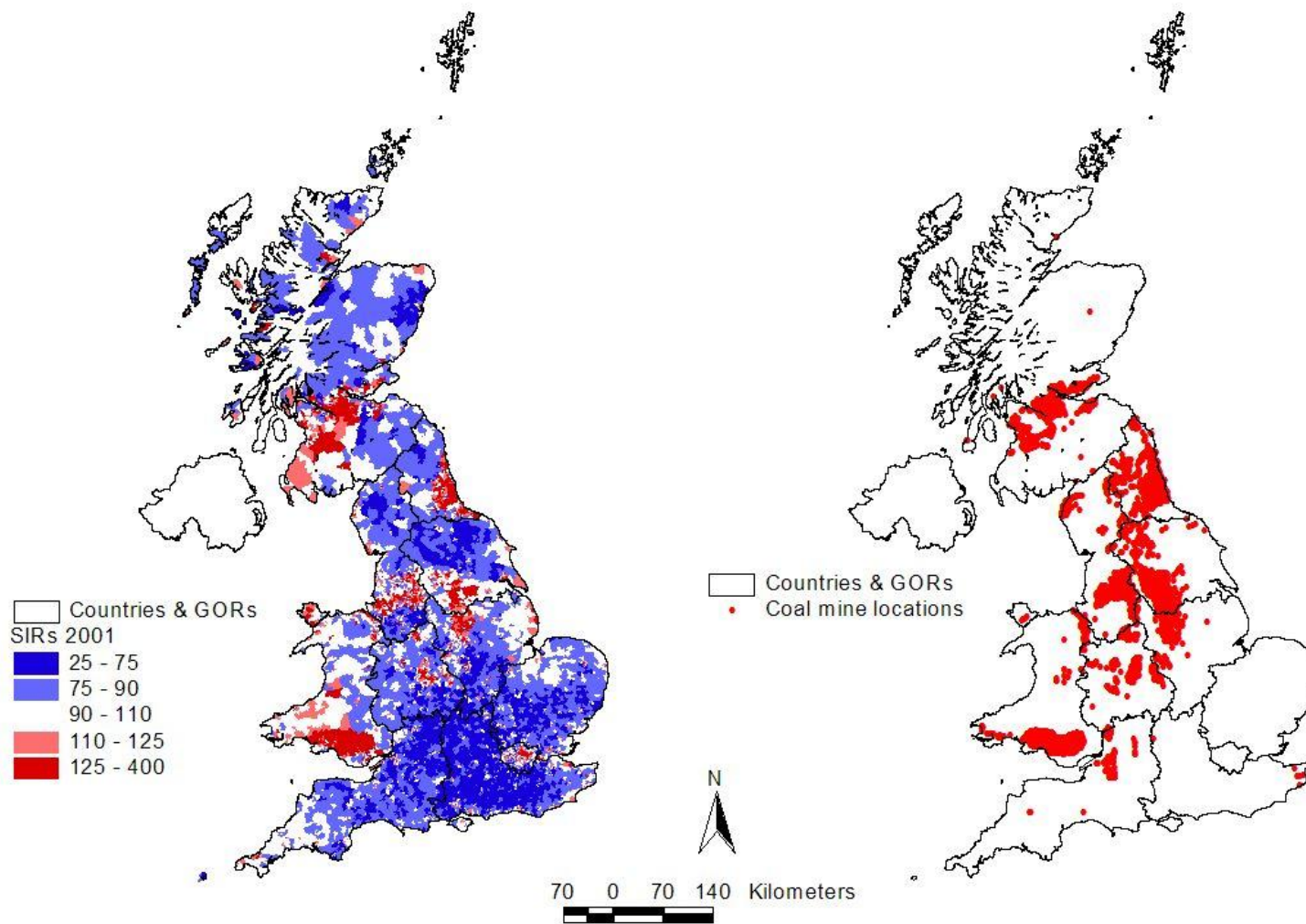
Using *Standardised Illness Ratios* (SIRs) of LLTI for 2001, *Ordinary Least Squares* (OLS) *regression* has been employed to determine the influence of the coal mine related variables, socioeconomic deprivation and population density on health variations. The models are more detailed in the North-East of England due to extra variables being available.

*Mapped distributions* in health variations and model residuals are used to determine improvement in model fit associated with the inclusion of the spatially disaggregate coal mine related information.

### **4. Initial results**

Figure 1 suggests a close correspondence of coal mine locations with those areas with the highest levels of standardised long-term limiting illness (mapped in red).

**Figure 1: Distribution of Standardised Limiting Long-Term Illness and Mine Locations**



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## 5. Conclusions to date

The presence and extent of coal pits in an area is strongly associated with poor community health. Time since mine closure indicates that health can recover to some extent but persistent socioeconomic deprivation in what were largely one industry settlements is preventing widespread health improvement.

## 6. Acknowledgments

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