The Actuarial Profession
making financial sense of the future

Health and Care Conference 2011
Jennifer Loftus, Ketiwe Nhende and Chris Reynolds

# Does where you live influence your critical illness claim rates?

20th May 2011



## Disclaimer

- The views expressed today are those of the presenters and do not necessarily reflect those of their employers, and thus, their employers accept no liability as a result of any reliance you may have placed or action taken based upon the information outlined in this document / presentation

## Overview

- **Introduction to the Working Party**
  - High Level Aims
- **Data Sources Identified**
  - Cancer Registry Data
  - HES Data requests / Issues encountered
- **Involvement of CACI and Experian**
- **Some analysis on incidence rates by geography**
  - Health Poverty Index
  - Cancer eAtlas
  - Deprivation Indices
- **Goldmine of Data? Our hopes and ambitions**



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## Geographical Variations CI Working Party

- **Working Party formed in October 2010**
- **Members**
  - Jennifer Loftus
  - Ketiwe Nhende
  - Christopher Reynolds
  - Daniel Ryan
  - Christine Fairall
  - Peter Banthorpe (PEC Representative)



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# Exploring the Critical Path

- This paper included a discussion on the variations in trends by region in order to understand key differences in trends by socio-economic groups

## England versus Scotland

- Scotland has higher proportion of deprived socio-economic groups than England
- Other regional factors include differences in NHS services, diet, alcohol consumption and smoking prevalence
  - Heart Attack: Higher level of improvement for Scotland
  - Cancer: More complex to understand
  - Stroke: Lower deterioration for Scotland

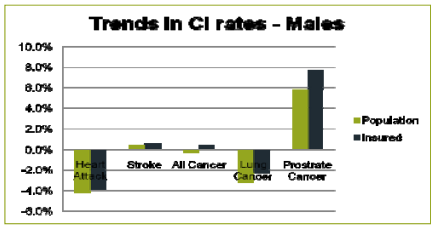


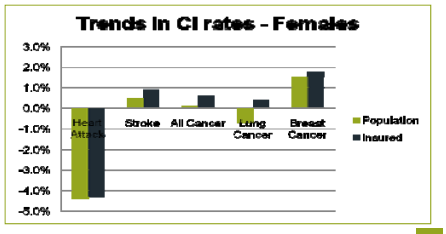


# Exploring the Critical Path

## Scottish population split by deprivation category

- Data was from “The Information Statistics Division NHS Scotland”
- Carstairs and Morris index used as a measure of deprivation
- The indicators at postcode level are: overcrowding, male unemployment, general social class, lack of car ownership
- Insured population proxy based on 100% category 1, 75% category 2, 50% category 3, 25% category 4, 0% for categories 5 to 7



## High Level Aims of Working Party

- **Analysis of the impact on CI Rates of proxy rating factors:**
  - Location (Postcode)
  - Socio-Economic Profile
  - Interactions thereof
- **Power of using these proxies for modelling mortality in the UK has already been proven**
  - Can we use the same proxies for modelling CI incidence rates?
- **Key CI Conditions:**
  - Cancer, Heart Attack, Stroke
- **We expect our results will be of interest to:**
  - Actuaries
  - Underwriters – Basis of a simplified underwriting tool?
  - Marketing and product development specialists
  - Healthcare professionals



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## Overview of Publicly Available Data Sources – General

- **Patient Level Data**
  - Hospital Episode Statistics (HES)
  - General Practice Research Database (GPRD)
  - The Health Improvement Network (THIN)
  - QRESEARCH
- **Population Group Data**
  - Information Services Division (part of NHS Scotland)
  - Office for National Statistics (ONS)
  - ONS Longitudinal Study



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## Overview of Publicly Available Data Sources – Illness Specific

- **Cancer**
  - Regional and National Cancer Registries
  - Cancer Research UK
- **Heart Attack**
  - British Heart Foundation
  - Oxford MI Incidence Study
  - MONICA
- **Stroke**
  - No useful UK data found
  - MONICA
  - Oxfordshire Community Stroke Project





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## Cancer Registry Data

## Cancer Registry Data

- **Cancer Registries**
  - compulsory cancer registries started in some countries during 1940s
  - 8 English regional cancer registries, Scotland, Wales and Northern Ireland
  - each cancer registry collects incidence, prevalence and survival data for cancers diagnosed in their area
  - individual cancer registries have taken lead status for specific sites.
- **United Kingdom Association of Cancer Registries**
  - formed in 1992 to bring unified voice and consistency across different cancer registries in UK
- **International Association of Cancer Registries**
  - formed in Tokyo in 1966



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## National Cancer Intelligence Network

- NCIN is UK-wide initiative to drive improvements in standards of care and clinical outcomes with ambition to be world-leading by 2012.
- **National Cancer Data Repository (NCDR)**
  - developed by NCIN with diagnoses up to and including 2008
  - key element of NCDR is the Merged English Cancer Registry Data (1990-2008)
  - data linked to HES and GPRD.
  - the repository contains over 8.5 million cancer registry records linked to 34 million hospital records
  - access to data is limited to research studies with ethical and information governance approvals



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## Goldmine of Data
### National Cancer Intelligence Network

- Merged English Cancer Registry Dataset provides information on **tumour staging**
- **Potential collaboration** with academic research group or individual cancer registry could provide:
  - grouped data by deprivation index for further analysis by Working Party
  - access to linked primary care data on underlying risk factors and prior diseases from General Practice Research Database
- **Discussions with cancer registries** identified that prepared to share incidence data by quinquennial age group and sex at the level of local authority




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## Hospital Episodes Data

## HES Data Request

- What is HES?
- Much data is freely available ... but we wanted more

| Information type | Does it need governance approval? | How long will it take? |
|---|---|---|
| Tabulated data | No | Available Now |
| Tailored summary tables | No | > 5 weeks |
| Tailored summary tables including sensitive data | Yes | > 6 weeks |
| Episode records | Yes | > 6 weeks |
| Episode records including sensitive data | Yes | > 8 weeks |
| **Patient-identifiable episode records** | **Yes** | **> 8 weeks** |

- Initially we intended to get patient-identifiable records



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## Identifiable Data

| Identifiable Data | Approved by |
|---|---|
| **NHS number**<br>Date of birth<br>**Postcode of patient**<br>Birth date - baby<br>Mother's date of birth | Ethics and Confidentiality Committee (ECC) |

- The dataset is supplied at episode level – one row per episode
- If the study requires any patient identifiers in the dataset to be supplied, then need to justify why you need the data and what you intend to do with it



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## Approvals Process (1/2)

- Getting Patient Identifiable Data is not easy
- Need to use Section 251 of the NHS Act 2006
- Ethics & Confidentiality Committee
  - Receives 90-100 applications per year
  - Meet 4 times per year – applications must be submitted 1 month before the meeting date
- Applicants strongly advised to contact ECC prior to submitting any applications



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## Approvals Process (2/2)

- To obtain section 251 support the following criteria have to be met:
  - The reason for using the information has to be for the purpose of improving patient care OR in the public interest
  - It has to be for a medical purpose
  - The purpose cannot be achieved using de-identified data
  - Seeking consent (from the individuals) for the use of identifiable data is not practicable



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## A Different Approach

- Speaking to HES provided a positive response on the two areas where we required patient identifiable data:
  - **Postcode**
    HES could map the record postcodes to geo-demographic profiles via their data linkage team. (Mappings have to be at a sufficiently high level)
  - **Duplicates**
    HES confirmed that NHS Number was sensitive data However, they could provide PatientID which is a generated unique ID per life per requestor





## Episode Record Request

| Patient Fields | Clinical | Geographical |
|---|---|---|
| Age @ start/end episode | Primary diagnosis | Census Output Area |
| Year of birth | External cause of injury | County of residence |
| Ethnic category | Main operative procedure | Current electoral ward |
| Patient identifier | Date of operation | Local authority district |
| Postcode district | Patient classification | |
| Sex | Main specialty | |

| Socio-economic |
|---|
| LSOA |
| IMD Overall Rank |

- Request sent to HES in February
- Dataset expected in May … any day now

## Demographic Profilers – CACI & Experian Background

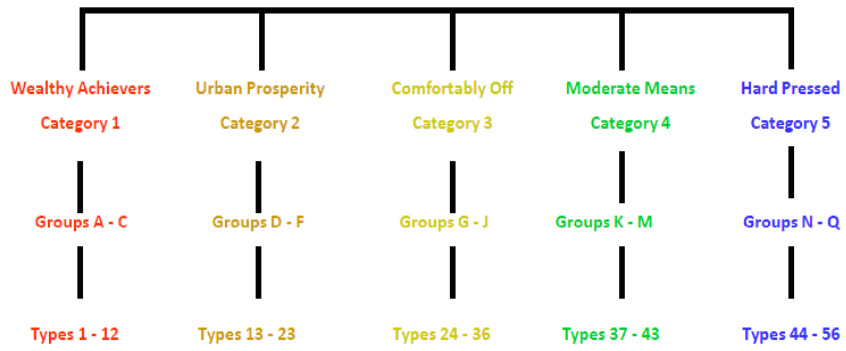
- **Leading providers of socio-demographic profiles in the UK (amongst six providers in the UK market)**
- **CACI**
  - Main segmentation tool is ACORN, classifies population into 5 categories, 17 groups and 56 types
  - Other ACORN indices exist, we are also looking at HealthACORN - 4 groups, 25 types
- **Experian**
  - Main segmentation tool is MOSAIC, classifies population into 15 categories, 67 groups and 141 types





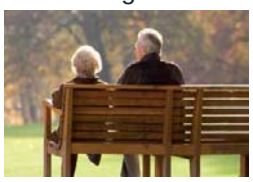
## Demographic Profilers – CACI

ACORN Structure:



## Demographic Profilers – CACI

- HealthACORN (4 Groups)
- A – Existing Problems



B – Future Problems

- C – Possible Future Concerns

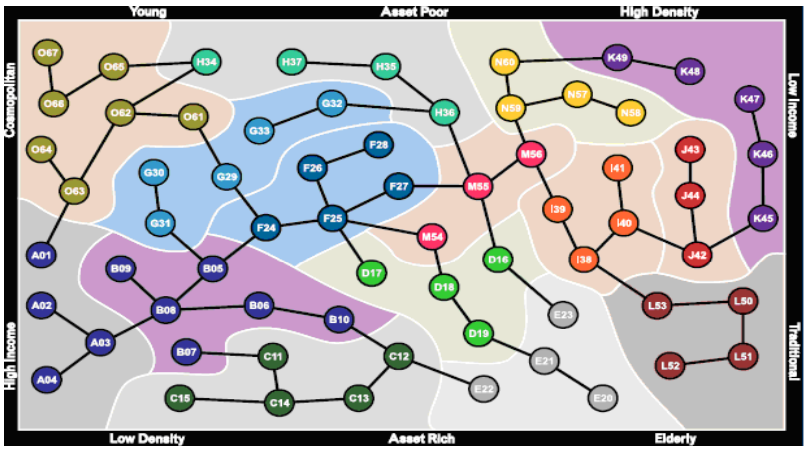
D – Healthy





## Demographic Profilers – Experian

- MOSAIC Family Tree



## A Different Approach – geo-demographic profilers and funding

- CACI and Experian very supportive and generous in offering the use of their profilers
  - Profilers provided free of charge
  - Bespoke Exposure Calculations provided at cost
- Contracts being concluded now
- Member Support Executive committee (MSEC) kindly provided funds from their research fund to pay for exposure calculations and for HES data





## Goldmine of Data
### Hospital Episode Statistics

- Benefitting from dramatic shift in accessibility to detailed patient level information – with UK in a privileged position
- Primary focus will be Hospital Episode Statistics as dataset provides information on both diseases and operations with detailed segmentation of information by patient address
- Initial analyses to consider geographical variation in experience by sex and by quinquennial age group for individual diseases/operations
- Further analyses to contrast geographical variations with socio-economic variations provided by Experian and CACI

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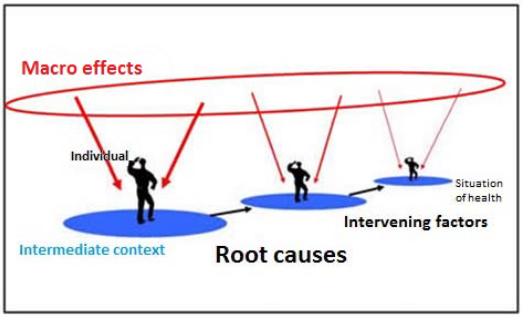
# Analysis to date



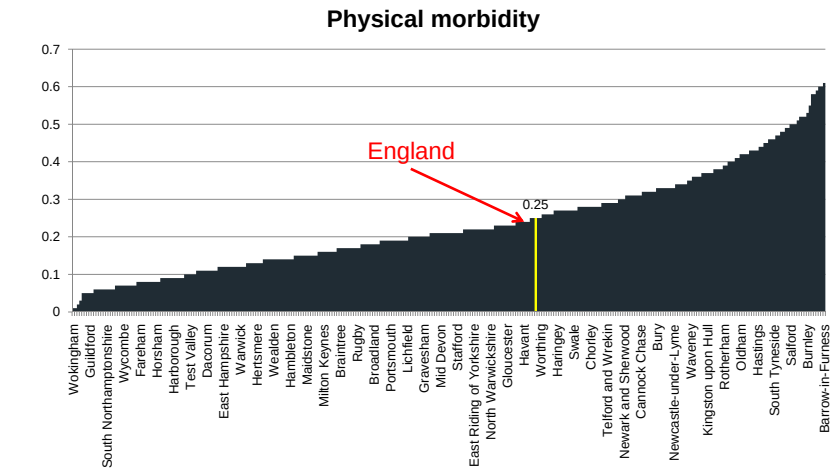


## Health Poverty Index - www.hpi.org.uk

- NHS Plan (2000) : "***no injustice is greater than the inequalities in health which scar our nation"***
- The HPI tool allows groups, differentiated by geography and cultural identity, to be contrasted in terms of their 'health poverty'.



# Health Poverty Index – Physical Morbidity



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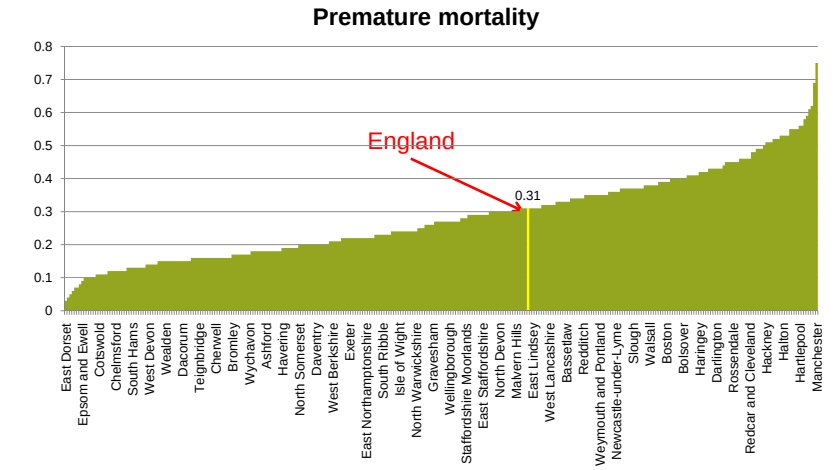
# Health Poverty Index – Premature Mortality



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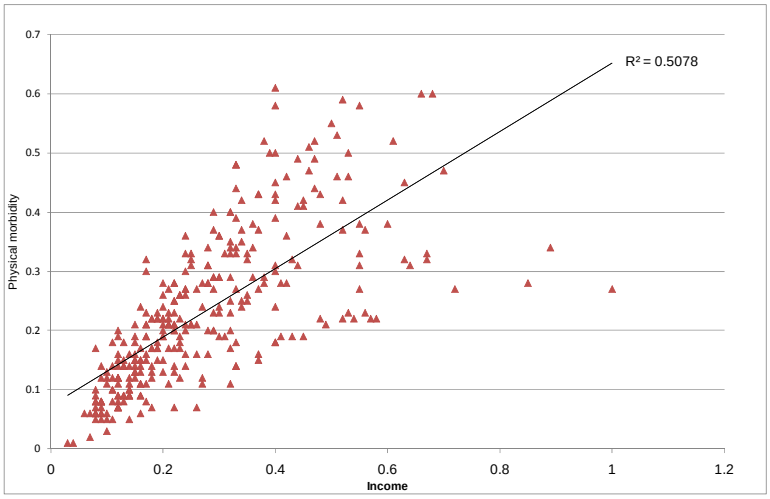
## Physical Morbidity v Income

- We can also look at the correlation between indicators



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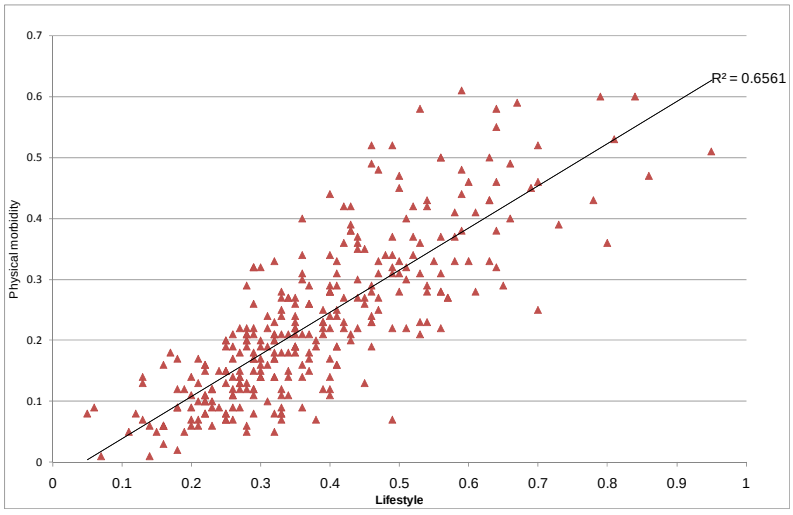
## Physical Morbidity v Lifestyle



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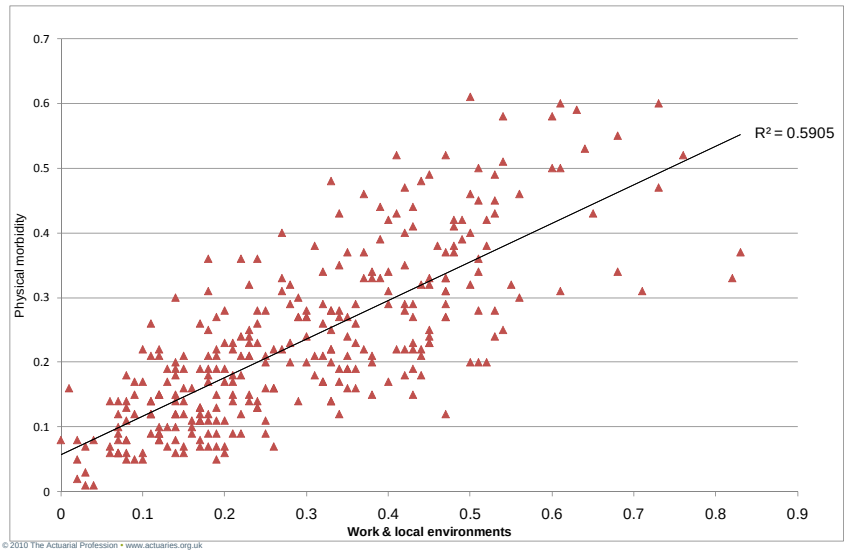
## Physical Morbidity v Work & Local Environments



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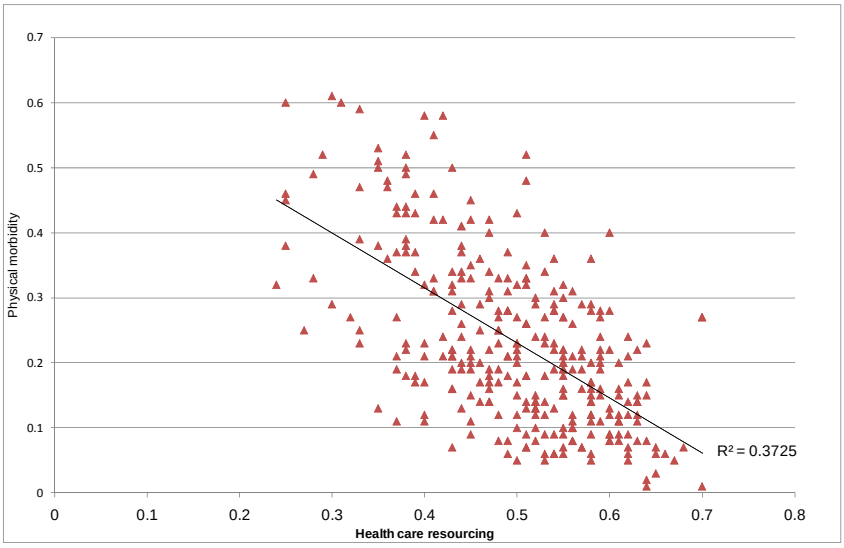
## Physical Morbidity v Health Care Resourcing



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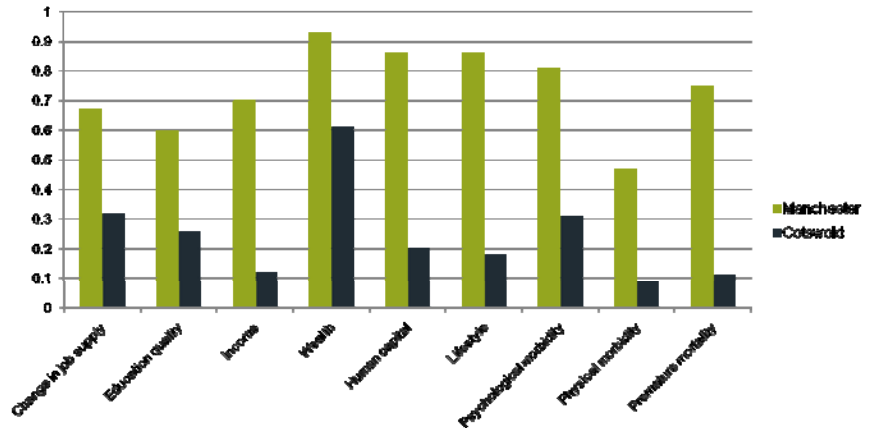
## HPI – Manchester v Cotswold



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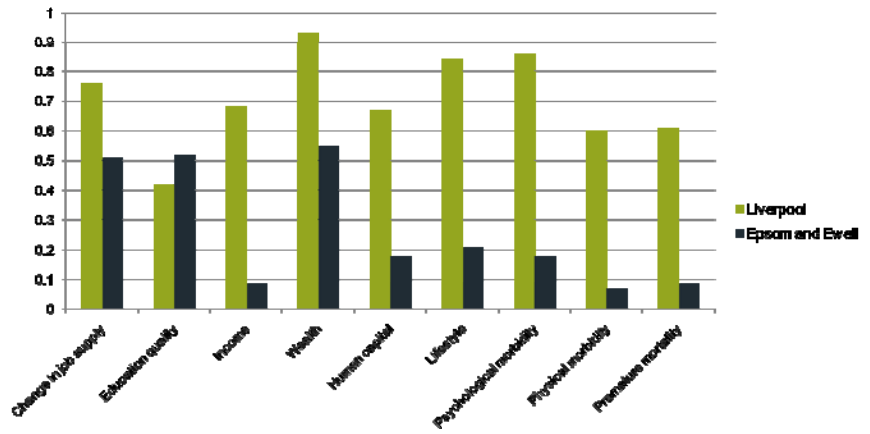
## HPI – Liverpool v Epsom and Ewell



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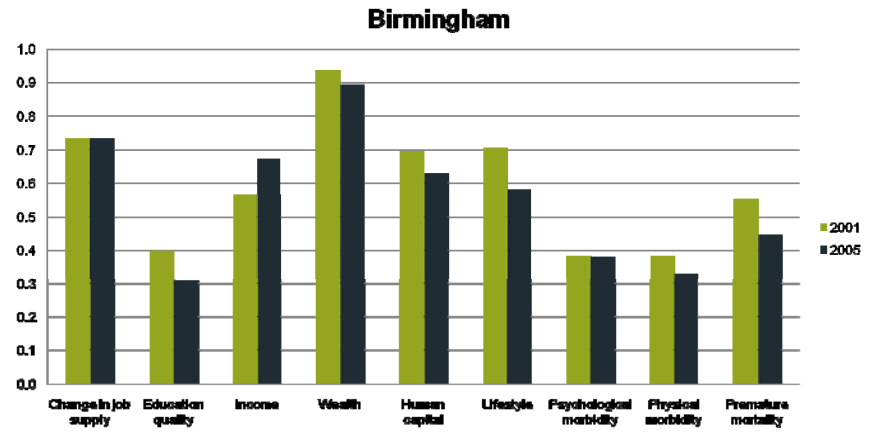
## HPI Changes over time








## IMD 2007 Scores

- **Index of Multiple Deprivation 2007**
  - Based on Small Area Geography – known as Lower Super Output Areas (LSOAs)
  - Average Population of an LSOA is 1,500 people
  - Majority of Data represents 2005
- **Brings together 37 different indicators covering:**
  - Income, Employment, Health & Disability, Education, Skills & Training, Living Environment and Crime
- **Identifies Concentrations of Deprivation**
  - BUT not all deprived people live in deprived areas AND not everyone living in a deprived area is deprived!!!

## Cancer E-Atlas - Background

- **Jointly Developed By:**
  - UKACR, APHO, CR-UK, NCIN
- **Incidence Data:**
  - Provided via National Cancer Registries
  - New Diagnoses Only
  - Reported by calendar year in which cancer was diagnosed
- **Incidence Rates:**
  - DSRs derived using aggregated LSOA population estimates provided by the ONS
  - Expressed as events per 100,000 European Standardised Population
  - Allows comparison of incidence rates across populations with different age-sex profiles
  - We looked at 3 year DSRs for 2003 to 2005



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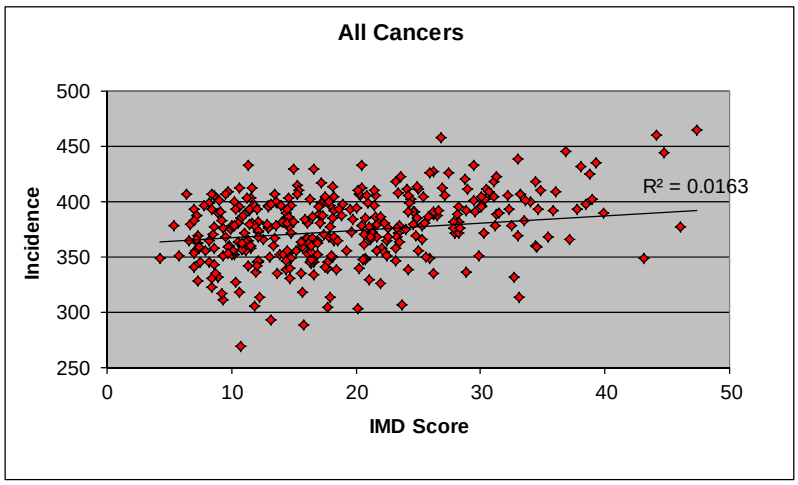
## Cancer E-Atlas/IMD Scores



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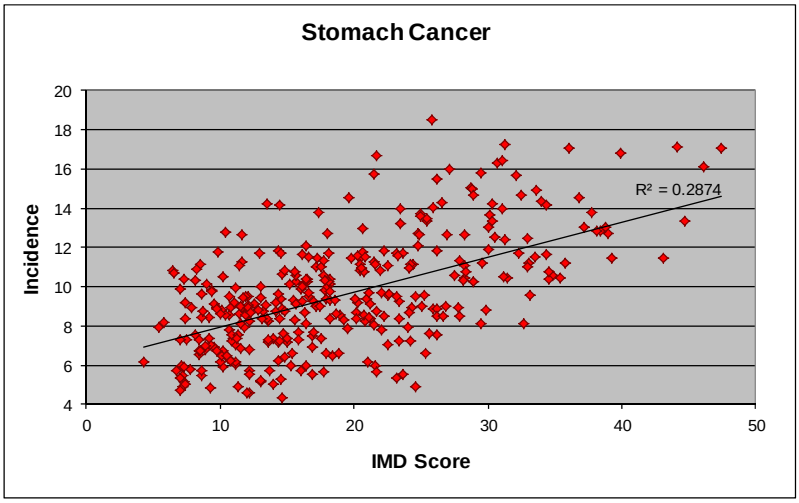
## Cancer E-Atlas/IMD Scores



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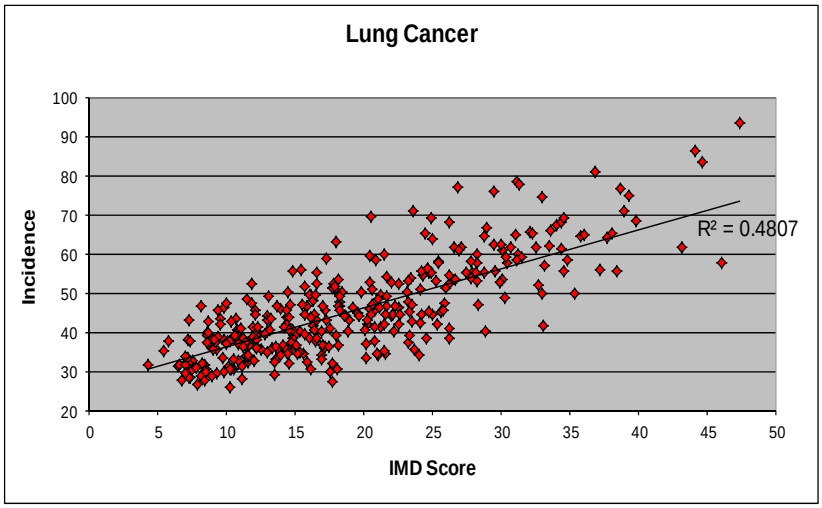
## Cancer E-Atlas/IMD Scores



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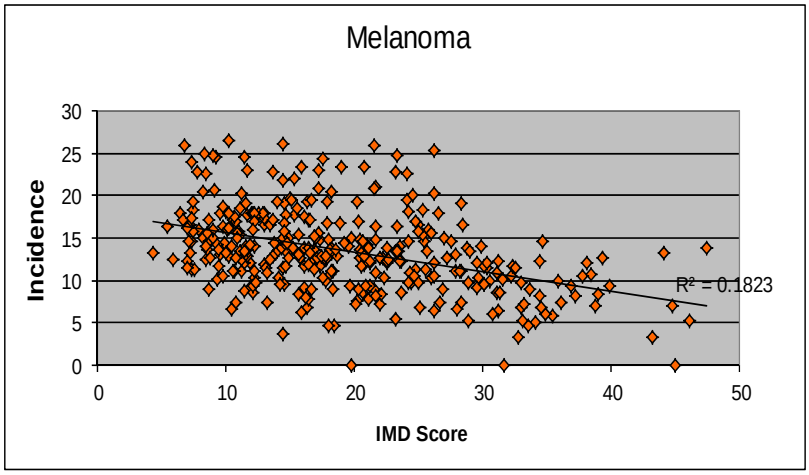
## Cancer E-Atlas/IMD Scores



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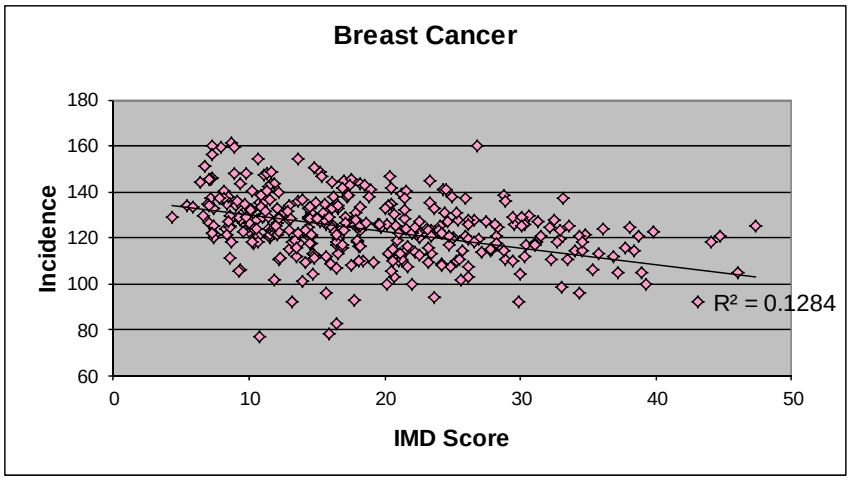
## Cancer E-Atlas/IMD Scores



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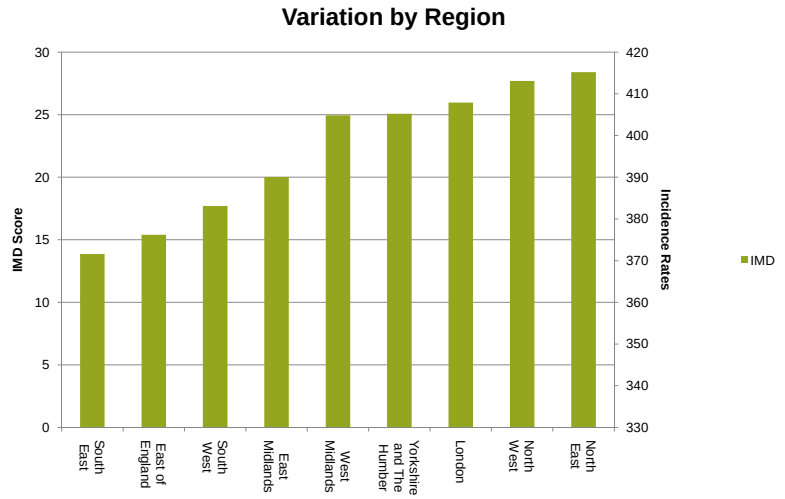
# Cancer E-Atlas/IMD Scores



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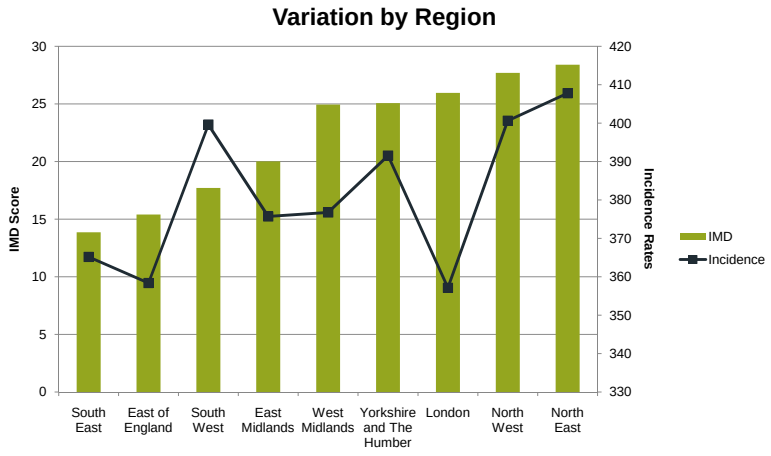
# Cancer E-Atlas/IMD Scores



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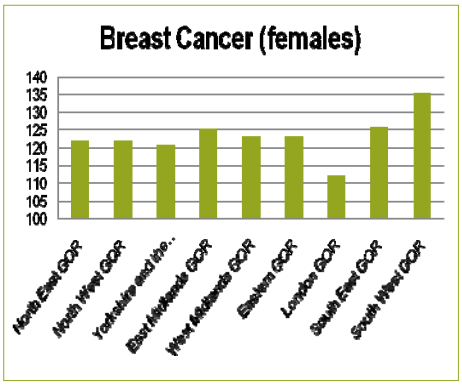
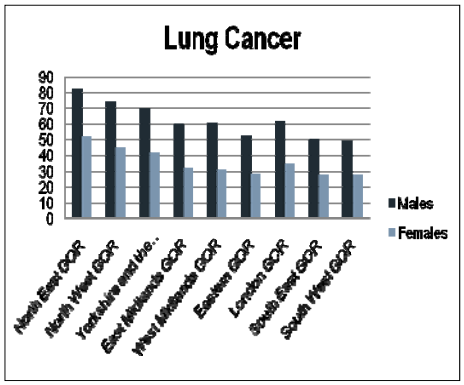
## E-Atlas – 3 year DSR by GOR

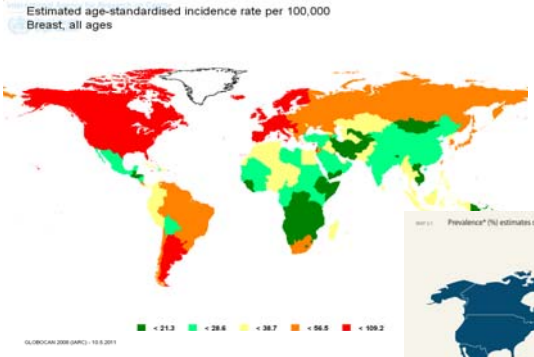


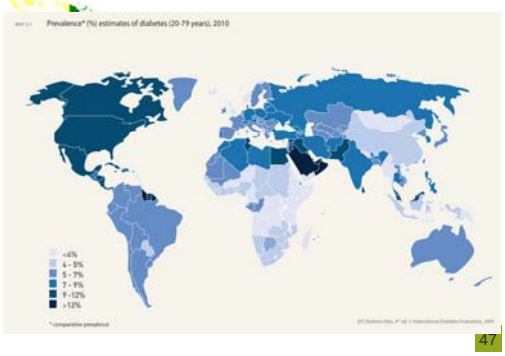





## International Comparisons
## GLOBOCAN & International Diabetes Federation

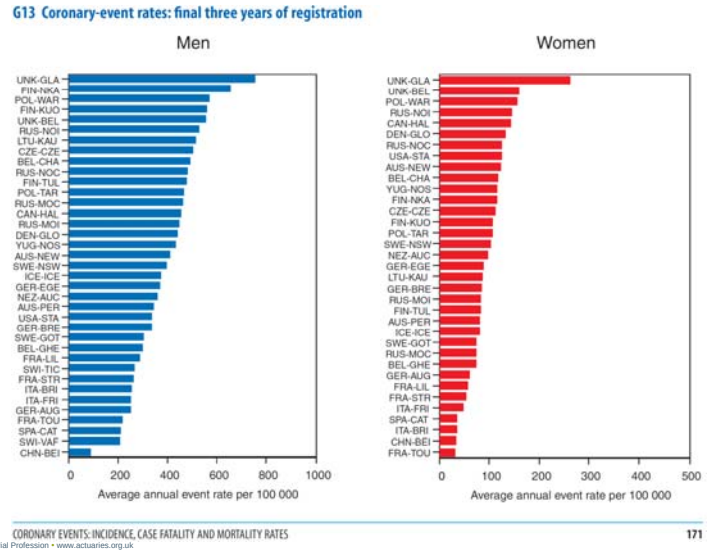



**GLOBOCAN**
**- Breast cancer incidence**




**International Diabetes Federation**
**– Prevalence of diabetes**

## International Comparisons
## WHO MONICA study – Coronary events incidence



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## Conclusion

- High level aim is the analysis of the impact on CI Rates of proxy rating factors
- Primary focus will be Hospital Episode Statistics – the data is expected in May 2011
- **Goldmine of Data**
- See you next year when:
  - This presentation **will** include a postcode analysis of CI rates



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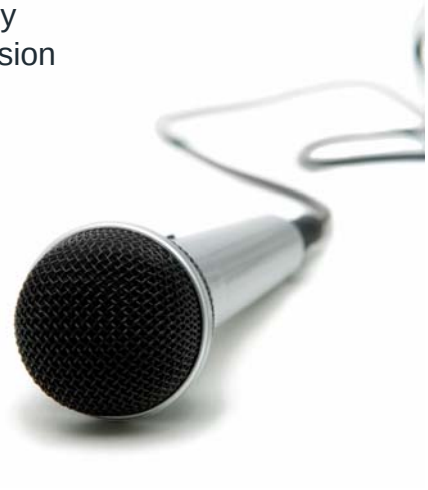
## Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged







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# Appendix: Term of Reference

## Taking the Analysis to the Next Level
### Objectives and TOR

The Geographical Variations Working Party's main objectives and terms of reference:

- To analyse and understand how the incidence of certain critical illness vary according to geographical location in the UK
- To perform detailed postcode analysis of the impact of socio-economic profile and location on the critical illness (CI) incidence rates
- To build upon work already done in the SIAS papers (Exploring Critical Path, 2006; A Critical Review, 2000)
- Would be interesting to Pricing Actuaries / underwriters / actuary performing experience analysis





## Terms of Reference
### Regional variations in coverage and incidence rates

- The Working Party's research proposal:
  - to perform a detailed analysis of the impact of socio-economic profile and location on the CI incidence rates for the key CI conditions of Cancer, Heart Attack and Stroke
  - to analyse CI incidence rates using readily available proxies for socioeconomic categories
- The research work will involve analyses of the effectiveness of **the use of postcode in conjunction with geo-demographic profilers** as a proxy for socio-economic profile
- No such analysis has been carried out or at least known to the Working Party at present
- Already analysed and identified available data sources in the UK – HES (Hospital Episode Statistics) and the UK's cancer registries
- Taking the analysis to the next level would need to involve **effective mapping of population data into geo-demographic profilers' categorisations** by socio-economic factors, i.e. into categories and sub-groupings split by social status, wealth etc.

# Terms of Reference
## International variations in coverage and incidence rates

- The Working Party's research proposal:
  - a comparison of the development and coverage of CI in the established international markets. This will include the UK, South Africa, Australia, Japan, Canada and the USA
  - a high-level comparison of the incidence rates for the CI conditions of Cancer, Heart Attack and Stroke across the main international markets
  - detailed analysis on the impact of the socio-economic profile and location on CI incidence rates (as for the regional variations)
- International comparison to consider differences in the CI cover in each market, the rationale for these products, product features and characteristics
- The Working Party intends to undertake analysis to investigate product reputation at different international markets, including the use and acceptance of tiered benefits, non-disclosure and declined claims