SHIP
Scottish Health Informatics Programme

Longitudinal Studies Centre - Scotland
Home of the Scottish Longitudinal Study


# Research Programme 4: Demographic, Socio-Economic and Environmental Data Linkage

Scottish Health Informatics Programme
Annual Retreat

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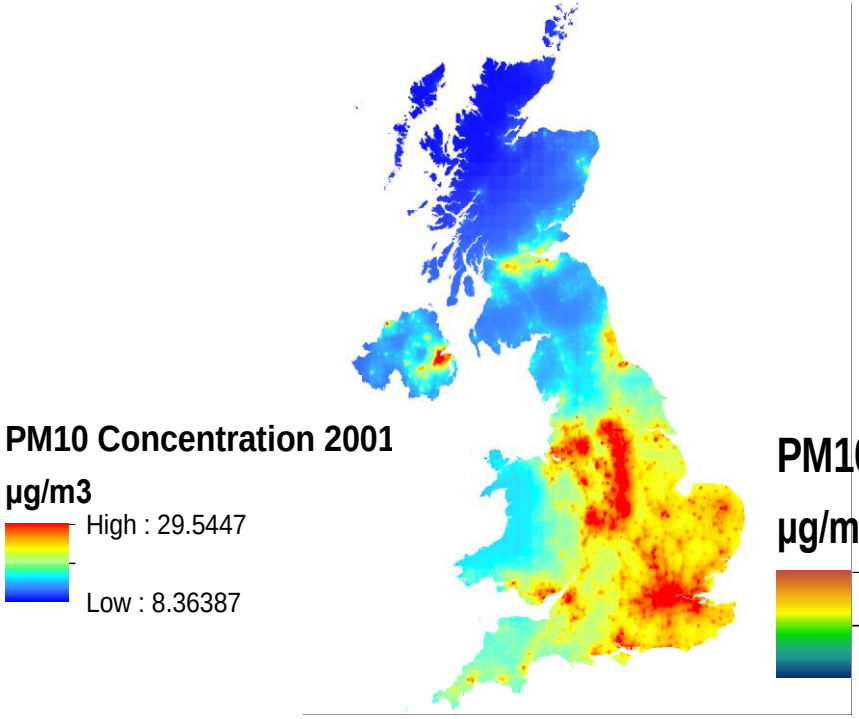
# Strands of RP4

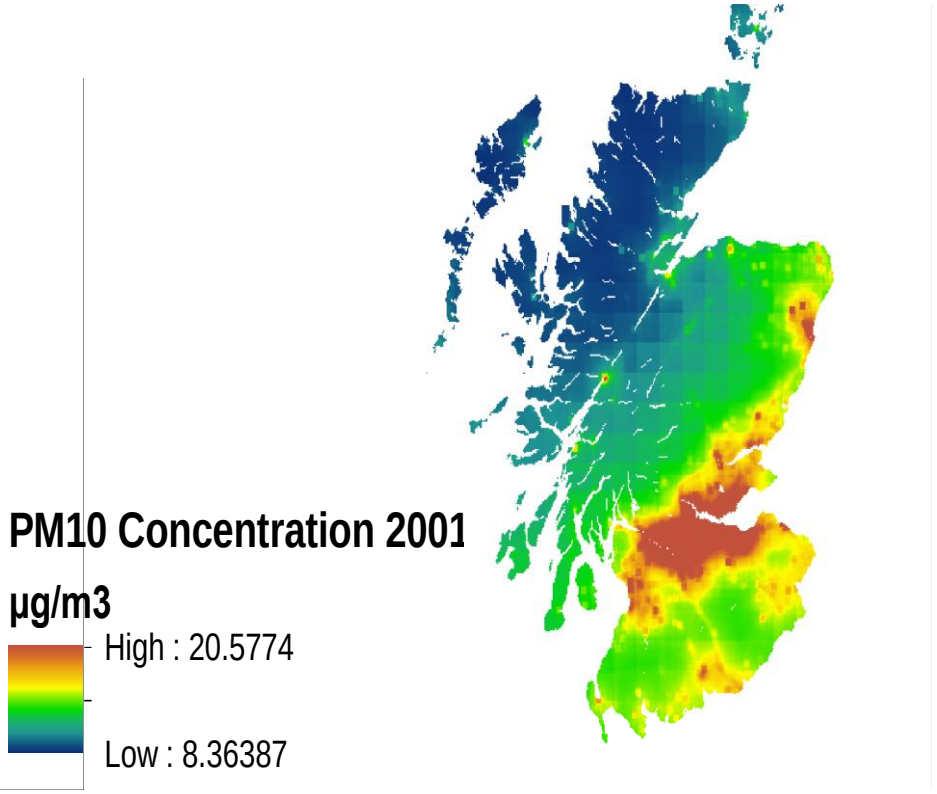
- (1) To estimate and validate complex time-space exposures to various environmental agents through a linkage between environmental datasets, hospital admissions and the Scottish Longitudinal Study (SLS) and also to investigate the utility of a synthetic income estimate based on occupation information.

- (2) To explore the use of vital events data for epidemiological and genetic research. Including developing the potential for taking major genetic studies in Scotland back through time by linking historical vital events data.

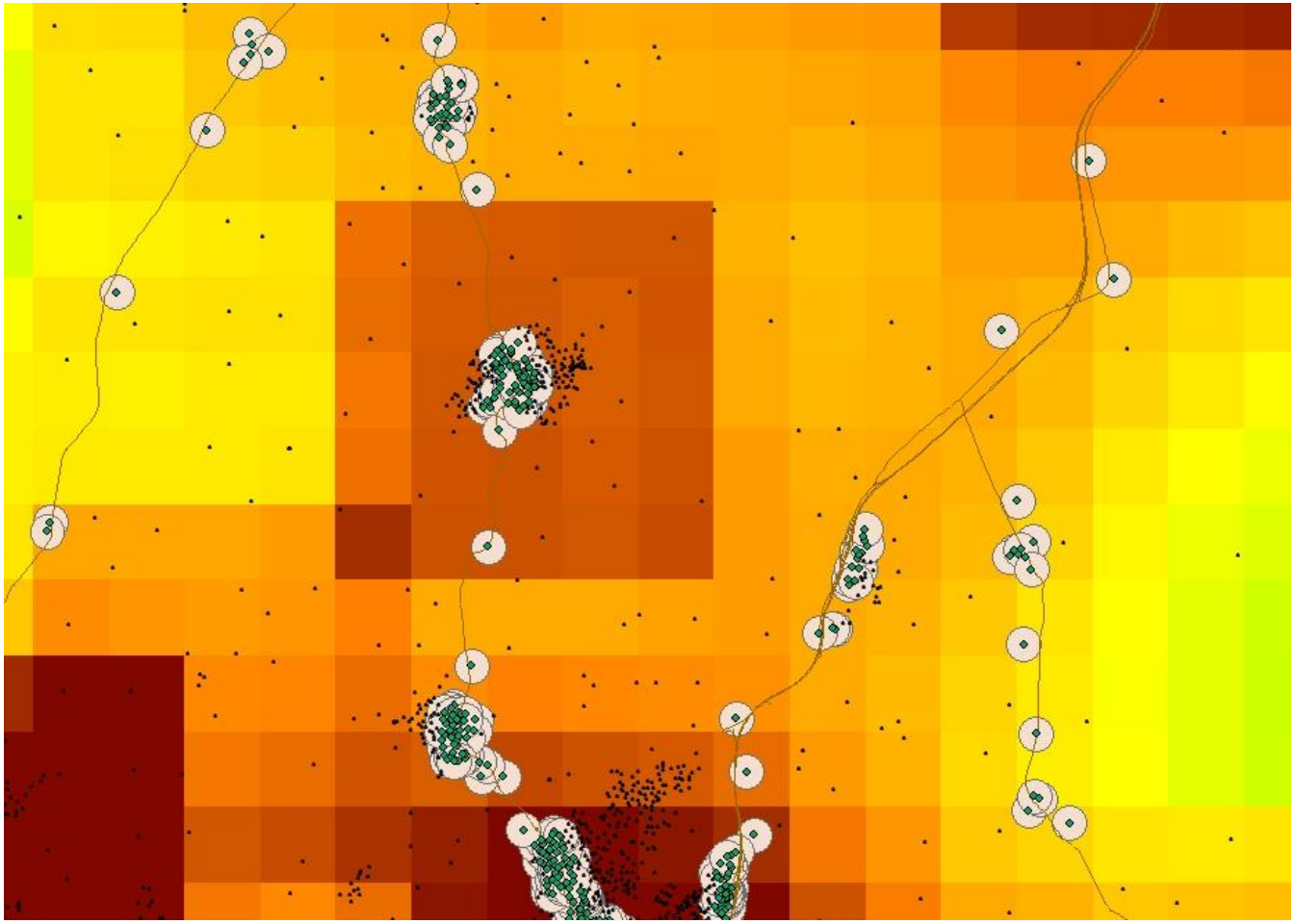
# Sources of environmental data

- Annual modelled air pollution concentration estimates provided at a 1x1 km resolution



- Road network data incorporating traffic density information
  - Postcodes near Kilmarnock - overlaid with PM10 concentrations (Darker colours, higher concentrations).
  - Buffer zones around properties indicate areas outside of which traffic related pollution disperses.



# Other potential sources

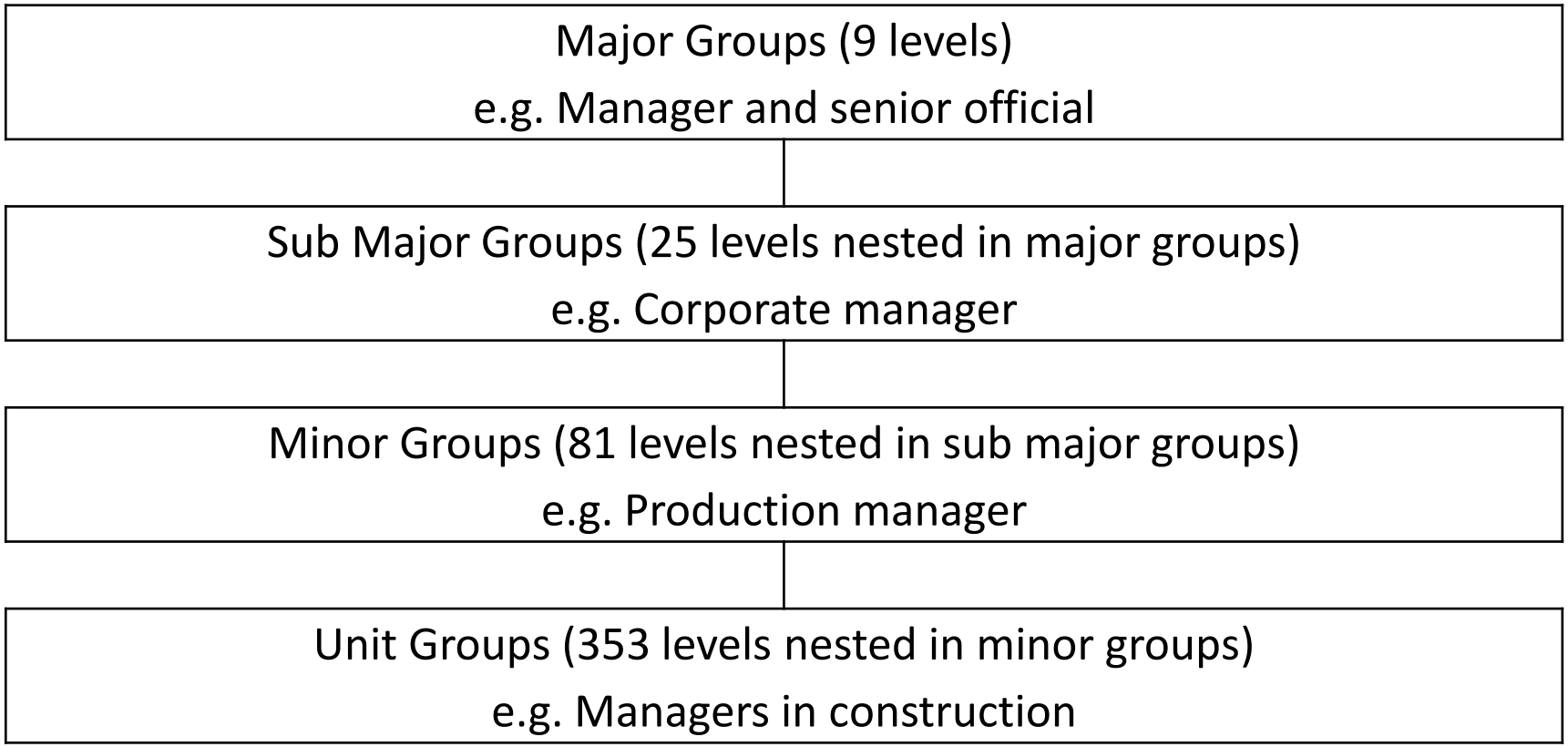
- Radon exposure
- Landfill
- Climate data
- Pollen

# Key research findings to date

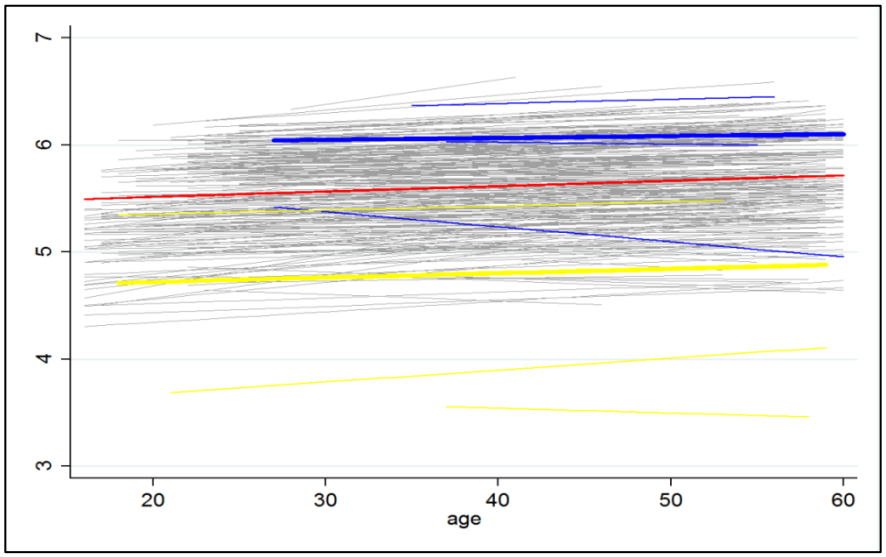
1. Estimation of synthetic income
2. Links between air pollution and birth-weight
3. Fertility history and mid-life outcomes

# 1. Income estimation

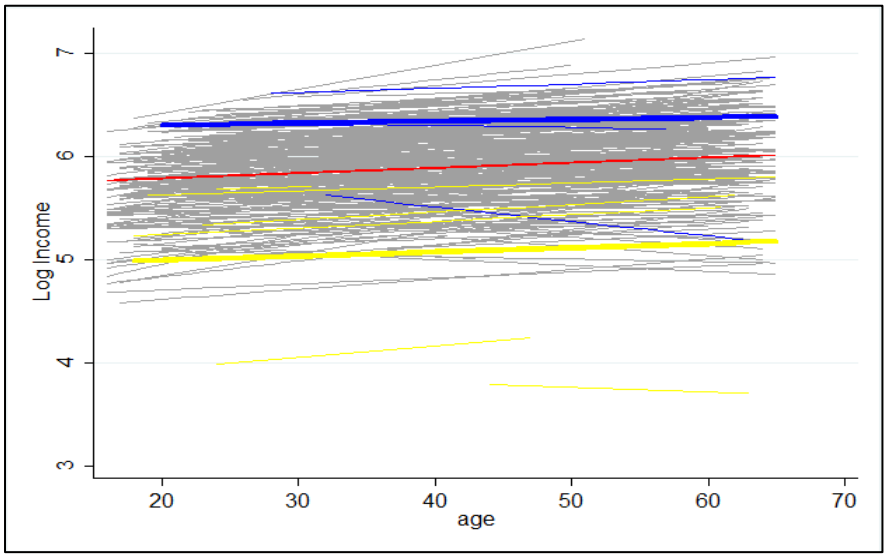
- Important confounder in health research but often differentially poorly measured, often missing information and unmeasured in the census and therefore SLS
- Estimated mean log income within levels of hierarchical occupation 2000 variable using a multi-level model adjusted for age and sex and incorporating random effects (age slopes and intercepts for each level)



# Deriving the estimates and their relationship to self-rated health




Random intercept and age slope model (women)




Random intercept and age slope model (men)

| | Predicting self rated health | | | |
|---|---|---|---|---|
| Compared to household income (SHS) | N | Odds ratio | CI | Correlation |
| Synthetic estimates | 7749 | 0.997*** | 0.997-0.998 | 0.2906 |
| Survey measured household income | 6865 | 0.998*** | 0.998-0.998 | 0.3364 |
| | | | | |
| Compared to individual income (UKHLS) | N | Odds ratio | CI | Correlation |
| Synthetic estimates | 12457 | 0.998*** | 0.998-0.999 | 0.1207 |
| Survey measured individual income | 9459 | 1.000*** | 1.000-1.000 | 0.0981 |

*** p > 0.01, ** p > 0.05, * p > 0.1, ns not significant

# 2. Air Pollution and birth weight

- Links between Air pollution and birth weight:
  - Birth weight has links to later health
  - Past studies suggest a strong association between exposure to pollution and low birth weight
  - A potentially important mechanism for spatial health inequalities
  - Potentially modifiable risk factor (i.e. measures/interventions to improve air quality)
  - Some argue that in UK, effects are confounded by unmeasured ethnicity and smoking (Jackson et al. 2009)

# Effect of PM10 and NO2 for mean birth-weight

| Variable (referent category) | Coefficient NO2 (Sig) Change in Birth weight (grams) per unit increase in each characteristic | Coefficient PM10 (Sig) Change in Birth weight (grams) per unit increase in each characteristic |
|---|---|---|
| Pollution exposure | -1.16(**) | -4.209967(**) |
| Smoking (no) | | |
| Yes | -267.28(***) | -267.74(***) |
| Mothers age (17-18) | | |
| (19-24) | -1.18(ns) | -0.58(ns) |
| (25-29) | -44.16(*) | -42.90(*) |
| (30-34) | -57.79(**) | -56.89(**) |
| (35-39) | -85.57(***) | -85.03(***) |
| (39+) | -149.82(***) | -149.55(***) |
| Ethnicity (non South Asian) | | |
| South Asian | -282.78(***) | -286.40(***) |
| Parity | 75.79414(***) | 75.78(***) |
| Weighted household Income (estimated from mothers and fathers occupation) | 0.14(***) | 0.13(***) |

n = 15521

*** p > 0.01, ** p > 0.05, * p > 0.1, ns not significant  Coefficients for social class not reported

## 3. Understanding impact of fertility history on outcomes in mid-life in Scotland, a longitudinal approach using the Scottish Longitudinal Study (SLS)

- The research draws on and extends work on reproductive histories and outcomes. It is known that either not having children or the number of children (parity) can be linked to specific health outcomes at mid and later life for women (Grundy 2009; Grundy & Kravdal 2007; Grundy & Tomassini 2005).
- SMR02 is only available from 1975, meaning for unbiased complete fertility history the sample must be born after 1959 (1975-16).
- Thus we are not able to follow-up SLS members to old ages, the ***cohort born 1959-1964***, are aged ~27-32 in 1991 and aged ~45-50 in 2009.
- Nevertheless, the SLS allows us to ***follow-up from age 40*** (~approx. end of childbearing ages) for 10,693 females ***until 2009 (death or censor)***.
- Using 1991 Census information for the discrete event history modelling (based on a person-period file).

# Model building – based on relationship status

## married, single (including single parent) & cohabiting

| ALL WOMEN | Odds Ratio | P>z | | [95%Conf | Interval] | Odds Ratio | P>z | [95%Conf | Interval] | Odds Ratio | P>z | [95%Conf | Interval] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | model 1 (parity only) 89,775 | | | | | model 2 89,775 | | | | model 3 89,775 | | | |
| ***parity of 2 (Ref Cat)*** | | | | | | | | | | | | | |
| None | 1.534 | 0.037 | * | 1.03 | 2.30 | | | | | | | | |
| parity of 1 | 1.288 | 0.353 | | 0.75 | 2.20 | | | | | | | | |
| parity of 3 | 1.297 | 0.312 | | 0.78 | 2.15 | | | | | | | | |
| parity of 4 | 1.331 | 0.484 | | 0.60 | 2.97 | | | | | | | | |
| parity of 5 & over | 2.869 | 0.010 | * | 1.29 | 6.41 | | | | | | | | |
| ***Married (Ref Cat)*** | | | | | | | | | | | | | |
| Single (including single parent) | | | | | | | | | | | | | |
| Cohabiting | | | | | | | | | | | | | |
| **Year of Birth** | | | | | | | | | | | | | |
| ***Low or None (Ref Cat)*** | | | | | | | | | | | | | |
| Other Higher Qualifications (non-degree) | | | | | | | | | | | | | |
| First Degree and Higher Degree | | | | | | | | | | | | | |

- Initially findings are in line with previous research where either having no children or 5+ increases your likelihood of death

# Model building – based on relationship status

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| ALL WOMEN | Odds Ratio | P>z | | [95%Conf | Interval] | Odds Ratio | P>z | | [95%Conf | Interval] | Odds Ratio | P>z | | [95%Conf | Interval] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | model 1 (parity only) 89,775 | | | | | model 2 89,775 | | | | | model 3 89,775 | | | | |
| ***parity of 2 (Ref Cat)*** | | | | | | | | | | | | | | | |
| None | 1.534 | 0.037 | * | 1.03 | 2.30 | 1.168 | 0.473 | | 0.76 | 1.79 | 1.168 | 0.474 | | 0.76 | 1.79 |
| parity of 1 | 1.288 | 0.353 | | 0.75 | 2.20 | 1.100 | 0.730 | | 0.64 | 1.89 | 1.085 | 0.767 | | 0.63 | 1.87 |
| parity of 3 | 1.297 | 0.312 | | 0.78 | 2.15 | 1.255 | 0.378 | | 0.76 | 2.08 | 1.243 | 0.398 | | 0.75 | 2.06 |
| parity of 4 | 1.331 | 0.484 | | 0.60 | 2.97 | 1.274 | 0.555 | | 0.57 | 2.84 | 1.245 | 0.593 | | 0.56 | 2.78 |
| parity of 5 & over | 2.869 | 0.010 | * | 1.29 | 6.41 | 2.525 | 0.025 | * | 1.13 | 5.66 | 2.388 | 0.035 | * | 1.06 | 5.36 |
| ***Married (Ref Cat)*** | | | | | | | | | | | | | | | |
| Single (including single parent) | | | | | | 2.099 | 0.000 | * | 1.47 | 2.99 | 2.080 | 0.000 | * | 1.46 | 2.96 |
| Cohabiting | | | | | | 1.492 | 0.177 | | 0.83 | 2.67 | 1.495 | 0.175 | | 0.84 | 2.67 |
| **Year of Birth** | | | | | | 1.020 | 0.710 | | 0.92 | 1.13 | 1.023 | 0.669 | | 0.92 | 1.14 |
| ***Low or None (Ref Cat)*** | | | | | | | | | | | | | | | |
| Other Higher Qualifications (non-degree) | | | | | | | | | | | 0.734 | 0.288 | | 0.41 | 1.30 |
| First Degree and Higher Degree | | | | | | | | | | | 0.418 | 0.037 | * | 0.18 | 0.95 |

- Initially findings are in line with previous research where either having no children or 5+ increases your likelihood of death

- **However**, when adding in other explanatory variables *parity* is no longer significant
- Being single in 1991 (aged ~26-32) has a significantly higher risk of death at ages 40-50 (after the end of childbearing ages) than being married.

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1903. BIRTHS in the (1.) Districts of (2.) Rathven in the (3.) County of (4.) Banff

| No. | Name and Surname. | When and Where Born. | Sex. | Name, Surname, & Rank or Profession of Father. Name, and Maiden Surname of Mother. Date and Place of Marriage. | Signature and Qualification of Informant, and Residence, if out of the House in which the Birth occurred. | When and Where Registered, and Signat. of Registrar. |
|---|---|---|---|---|---|---|
| 130 | George Coutts Borrie | 1903. June Sixteenth 2 h 0 m P.M. 22 Wilson Land Buckie | M. | James Borrie Cooper. Barbara Borrie M.S. Winchester 1890 April 26 Elgin | James Borrie Father (Present) | 1903. June 16 At Buckie John Webster Registrar. |
| 131 | Anne Anderson Campbell | 1903. May Twenty Sixth 3 h 0 m a.m. 90 Chin Society Rathven | F. | George Campbell Fisherman. Hellie Campbell M.S. Blott 1900 December 14 Rathven | Matilda Flett Aunt (Present) | 1903. June 16 At Buckie John Webster Registrar. |
| 132 | Caroline Geddes | 1903. May Thirty First 8 h 30 m P.M. 182. Portessie Buckie | F. | Alexander Geddes Mason Carpenter. Elizabeth Geddes M.S. Robertson 1902 August 22 Seafield | Alexander Geddes Father (Present) | 1903. June 18 At Buckie John Webster Registrar. |

John Webster Registrar.