Using the Linked Scottish Health Survey to Predict Hospitalisation & Death

An analysis of the link between behavioural, biological and social risk factors and subsequent hospital admission and death in Scotland.

- Main Report -

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1 Introduction

The factors which determine demand for health services are complex and interacting. They include the levels of disease in a population, the volume and nature of health service supply, the behaviour of key "gate keepers" (e.g. General Practitioners), the expectations and help-seeking behaviours of the population, demographic factors, social capital and much else. The manner in which these many factors interact to create changing patterns of demand have been much studied within the context of health services research. For example, it is well understood that the demand for inpatient services within Scotland has risen over the past twenty-five years (1). However, the pattern of that rise and demand for inpatient care is interesting. The number of admissions has risen year on year. However, over the same time period the length of stay has fallen – thus, the total number of bed days utilised in any one year has changed much less. The pattern of rising admissions shows a wide spread of diagnoses rising principally in parallel. In other words it is not the case that a single disease entity or a small number of disease entities is becoming more common and thus driving demand (1).

The conclusion that has to be drawn is that there is a complex system of interactive causation that gives rise to demand and determines patterns of hospital utilisation. Politically, in the short term, this manifests itself in debates about waiting times, waiting lists and delayed discharges. For health service managers and clinicians there is an increasing pressure to meet targets and satisfy population and individual patient expectations. For researchers the challenge is to understand this complex system to allow more effective long-term management for population and individual outcomes.

Much work has been done in Scotland to examine patterns of hospital utilisation (2,3). Individual, organisational and societal factors that drive hospital utilisation have also been examined. For example, Summerton (4) confirmed an increase in self-reporting of the practice of defensive medicine among GPs, a response that is often been cited as a possible factor underlying increased emergency referrals to hospital. Kendrick (3) discusses the potential impact of changes in social capital and the provision of informal social care on hospital admission in the elderly.

Looking to the future, it is anticipated that the rising levels of obesity in Scotland will lead to increasing numbers of people with compromised glucose tolerance and clinical diabetes (5, 6). This shows that lifestyle factors such as obesity have a direct impact on demand for hospital care. However, very little work has been done on the overall pattern of interaction between risk factors like obesity, blood pressure, cholesterol, smoking etc. and the pattern of hospital utilisation that is associated with these risk factors. The purpose of this study is to take advantage of the new ability to link national lifestyle and hospital utilisation data across

Scotland on a prospective (and retrospective) basis to understand this relationship and to examine it within the broader context of the many factors that influence hospital usage.

The aforementioned linkage, achieved by probability matching techniques (7), is between Scottish morbidity records (including hospital discharges, cancer registrations and deaths) and two waves of the Scottish Health Survey (1995 and 1998).

The Scottish Morbidity Record (SMR) system, among other functions, records details of all admissions to Scottish NHS hospitals. This includes information on demographic factors (e.g. age, sex, address), diagnoses, clinical procedures and means of discharge. Using patient identifying information, acute hospitalisation records (SMR1) are routinely linked to mental health hospital records (SMR4), cancer registrations (SOCRATES (formerly SMR6)) and Registrar General death registrations, resulting in a linked database of all such patient records covering the period 1981 to the present day.

The Scottish Health Survey is a national survey which collects in-depth information covering a wide range of health and behavioural topics, socio-demographic information (social class, housing tenure, car ownership, state benefits, etc.) and physiological measurements taken by nurses for a large representative sample of the Scottish population; at the time this project was initiated, there had been two waves to date, the first in 1995 in which 7932 adults (aged 16-64) were interviewed and the second in 1998 in which 9047 adults (aged 16-74) were interviewed. The results from the third Scottish Health Survey, conducted in 2003, have recently been released.

In 2004 a record linkage exercise was undertaken by the Information Services Division (ISD) of NHSScotland to link both the 1995 and 1998 Scottish Health Survey data to the linked Scottish hospital admission and mortality database. This is the first time that such a linkage has been undertaken on a national basis: it therefore provides an ideal opportunity to add to our understanding of the relationship between the broad range of factors measured in the Health Survey and subsequent hospital utilisation and, moreover, it provides a practical application in allowing us to plan more effectively for future health service provision in the light of rapidly changing lifestyle factors.

In order to exploit this new resource a project group[2] was set up consisting of researchers and analysts from NHS Health Scotland, Information Services (NHS NSS), University of

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Glasgow and University of Aberdeen. This group has met regularly over the last 24 months and has planned and executed the research described in this report.

The following chapters describe the research aims (Chapter 2), the linkage process (Chapter 3), data used in the regression analyses (Chapters 4-6), methods (Chapter 7) and the results of single-predictor[3] (Chapter 8) and multivariate (Chapter 9) analyses of the association between behavioural, biological, social and health status risk factors and outcome (hospital admission/ mortality).

Note: A technical report is available to accompany this report - www.scotpho.org.uk/linkedshesreport - in which the work to create the new linked dataset is described. The report also discusses a number of issues relevant to analysis: the impact of emigration; the creation of a 'serious' hospitalisation outcome variable; methods (including survey design); missing values; and representativeness of survey samples.

[3] Age & sex standardised association models

2 Aims

Using the newly created linked data resource, the research aim was as follows:

- To determine the relative impact of a range of risk factors on likelihood of hospital admission & death and in particular to test whether deprivation[4] is an independent predictor of hospital admission & death or whether instead it is a factor whose effect can be explained in terms of cross-correlations and interactions with other well-known risk factors.

[4]As defined by the Carstairs & Morris measure. Carstairs deprivation scores were originally developed by Vera Carstairs and Russell Morris. See the MRC Social and Public Health Sciences Unit website for more details - http://www.msoc-mrc.gla.ac.uk/sitepage.php?page=carstairs

3 Linkage of 1995 & 1998 Scottish Health Survey Records to Scottish Morbidity Records

Consent was granted for 15,668 Scottish Health Survey (SHeS) responses including person-identifiable information to be made available to ISD. 7,363 responses were from the 1995 survey and 8,305 from the 1998 survey. Internal linkage of this dataset identified 23 repeat respondents i.e. participants who were surveyed in 1995 and again in 1998. As a result there is a combined total of 15,645 respondents.

The linkage of the SHeS data to the September 2004 version of ISD's linked SMR01 'catalogue'[5] successfully linked 73% of the survey records i.e. 11,396 respondents (or 11,417 responses as this included 21 repeat respondents). An extract was taken, for each respondent, of details of SMR01 hospital admissions, SMR04 psychiatric admissions, and GRO death records up to 31 March 2004 and cancer registrations up to 31 December 2001, amounting to a total of 58,913 records. Each record comprises a standard set of dates, clinical information (including all diagnoses) and deprivation scores[6], with a total of 30 variables per record.

For a full overview of the results of the Linkage of 1995 & 1998 Scottish Health Survey Records to Scottish Morbidity Records, please consult the '**Technical Report**' – *Chapter 2.*

[5] The SMR01 catalogue is a linked file that includes SMR04 psychiatric admission records, cancer registrations and death records in addition to SMR01 hospital discharge records

[6] As defined by the Carstairs & Morris measure. Carstairs deprivation scores were originally developed by Vera Carstairs and Russell Morris. See the MRC Social and Public Health Sciences Unit website for more details - http://www.msoc-mrc.gla.ac.uk/Publications/pub/Carstairs_MAIN.html

4 Data Analysed

The Scottish Health Survey Linkage file enables 4 options for analysis; these are as follows:

- Option 1 - 1995 Survey (16-64), Follow-up - April 1995 to March 2004
- Option 2 - 1998 Survey (16-74), Follow-up - April 1998 to March 2004
- Option 3 - 1998 Survey restricted to 1995 age groups (16-64) to allow comparison with 1995 survey
- Option 4 - 1995 & 1998 Surveys combined, restricted to 1995 age groups (16-64) and follow-up beginning from April 1998.

Table 1 below details the strengths and limitations of each option against the others. This was used to help decide which option/options would be best suited for this proposed analysis:

Table 1 – Survey Options	**Strengths**	**Limitations**
Option 1 Sample size = 7,363 Age band = 16 to 64 Follow-up Period = April 1995 to March 2004	**1.** 9 year follow-up period	**1.** Lacks older age band (65-74) **2.** Lacks C-Reactive Protein risk factor
Option 2 Sample size = 8,305 Age band = 16 to 74 Follow-up Period = April 1998 to March 2004	**1.** Broader range of age groups - inclusion of older 65-74 age band **2.** Ability to assign derived cost variable to post 1998 records[7] **3.** Inclusion of C-Reactive Protein **4.** Physical Activity measurement has internationally accepted revised guideline.	**1.** Follow-up period (6 years)
Option 3 Sample size = 7,010 Age band = 16 to 64 Follow-up Period = April 1998 to March 2004	**1.** Allows comparison with 1995	**1.** Lacks older age band (65-74) **2.** Lacks C-Reactive Protein risk factor **3.** Physical Activity not directly comparable between surveys[8] **4.** Follow-up period (6 years)
Option 4 Sample size = 14,373 Age band = 16 to 64 Follow-up Period = April 1998 to March 2004	**1.** Much increased sample size	**1.** Lacks older age band (65-74) **2.** Lacks C-Reactive Protein risk factor **3.** Physical Activity not directly comparable between surveys[8] **4.** Follow-up period (6 years) **5.** Adds uncertainty into analysis due to 3 year data gap i.e. 1995-1998

[7] For details on how cost variable was assigned see - 'Technical Report', *Chapter 4 – Serious Hospital Admission based on Healthcare Resource Groups.*

[8] Differing questions to quantify levels of 'physical activity' used in both surveys

It was decided that Option 2 - 1998 full follow-up (16-74) - would be used in favour of the other options for a number of reasons: firstly, it allowed us to look at a broader range of age groups due to the inclusion of the older 65-74 age group; secondly, C-Reactive Protein was introduced into the 1998 survey. C-Reactive Protein measures the concentration of a protein in serum that indicates acute inflammation, and is of particular interest; thirdly, the physical activity measurement has the internationally accepted revised guideline; lastly and most importantly, we were able to create a Cost Variable for post 1998 records, defined from:

- Health Care Resource Groups (HRGs)[9]
- 2001/02 Department of Health Reference Costs

The benefits of this were that it allowed us to:

- Assign a cost for every non-psychiatric SMR record (post 1998 survey)
- Calculate a 'total' and 'average annual cost per respondent'
- Predict variables that drive costs
- Use the costs as a 'guide' to categorising the 'severity' of an admission

For full details of how the cost variable was derived consult the '**Technical Report**', *Chapter 4 –Serious Hospital Admissions based on Healthcare Resource Groups.*

[9] Healthcare Resource Groups (HRGs) are standard groupings of clinically similar treatments, which use common levels of healthcare resource. They can be considered as 'units of currency' within the health service, allowing for costings across services.

5 Main Events

There are 4 main areas of interest that we wish to analyse in our 6-year follow-up period, and these are as follows:

- First Hospital Admission – survey respondents first such hospitalisation following survey interview i.e. acute hospitalisation (SMR1), mental health hospitalisation (SMR4).

- First Serious Hospital Admission – respondents' first such hospitalisation following survey interview. The seriousness/complexity of an admission was measured by analysing Healthcare Resource Groups (HRGs), and an admission was classified as serious or complex if it is at least as serious as an acute myocardial infarction – For full details of how this was defined, consult the '**Technical Report**', *Chapter 4 - Serious Hospital Admissions based on Healthcare Resource Groups*

- Death – respondents' resulting death (GRO death)

- Cause Specific Admissions[10] – All Malignancies, Lung Cancer, Colorectal Cancer, Breast Cancer, Cerebrovascular Disease, Chronic Heart Disease (CHD), Diabetes, in particular Type II.

[10] Initial descriptive analysis identified that the number of admissions associated with specific causes was generally too small to provide robust modelling results.

6 Risk Factors

This chapter identifies the 37 risk factor variables examined in terms of their influence (if any) on our chosen outcome events, namely: First Hospital Admission, First Serious Hospital Admission and Death. Of these 37 risk factors, 31 were selected from 1,839 available from the 1998 Scottish Health Survey, and the remaining 6 are derived measures sourced from various other health/government organisations i.e. Scottish Household Survey (SHS), Scottish Executive (SE) Website, Scottish Neighbourhood Statistics (SNS) and Information Services (National Services Scotland).

The risk factors were categorised into 5 main headings, and can be seen in Table 2 below. For a brief description of each risk factor and how they are categorised, see **Appendix 1 – Risk Factor Descriptions**, and for frequency tables of each, presented by gender combined and gender split, see **Appendix 2** – **Risk Factor Frequencies** (Frequency table numbers run from 3 to 35, and are stated along side each risk factor description).

Table 2 - Risk Factors chosen for analysis

Behavioural	**Biological**
Smoking status	Body mass index (BMI)
Alcohol consumption	Waist hip ratio
Physical activity	Blood pressure
Diet	Total cholesterol
	HDL cholesterol
	Gamma-GT
	Fibrinogen
	C-reactive protein
	Forced expiratory volume (FEV_1)
Social	**Estimates of Health at Survey**
Income related benefits[11]	Self-assessed general health
Social class	Psychosocial health (GHQ-12)
Car ownership	Longstanding illness
Highest educational qualification	Number of longstanding illnesses
Economic activity	Incapacity benefits
Unemployment benefit	
Housing tenure	**Prior Hospital Admissions**
Overcrowding	Number of admissions 5 years prior to survey
Central heating	
Area deprivation	
Rurality	
Access to the nearest GP practice	
Access to the nearest main hospital	
Drive time to nearest hospital	

[11] One composite variable was created to represent the respondent being in receipt of any income related benefit. The income related benefits that make up this variable are: income support, family credit, unemployment benefit, housing benefit & council tax benefit.

7 Analysis & Methods

7.1 Model Choice

'Normal' multiple regression analysis is based around the risk of an outcome/event (e.g. death) at a given time. Cox's proportional hazards regression instead looks at the cumulative risk over time - it 'adds up' the hazards (risks) up to the time of the outcome, and is thus more suitable for studies with a reasonably long follow-up period. The follow-up period in our data set is 6 years and it is for this reason that Cox's proportional hazards regression was used for all modelling. The statistical package 'STATA' version 8.0 was used to run all hazard models. For further details on the Cox's proportional hazards regression, consult the '**Technical Report**', (*Chapter 5 – Cox's Proportional Hazard Model*)

7.2 Survey Design

Methods that are used to select a survey sample often incorporate stratification, clustering and unequal probability of participating (weighting). These characteristics should be addressed in the modelling process to ensure that unbiased estimates representative of the whole population are obtained. Failure to account for these usually leads to under-estimating standard errors and false-positive statistical test results. Models in this report account for both clustering and unequal probability of participating (weighting), but not stratification. A detailed explanation of how these design elements were incorporated into the modelling is outlined in the '**Technical Report**', *Chapter 6 – Survey Design*).

7.3 Emigration

Emigration is an important issue to address due to the fact that those people emigrating may be a significantly different group of people than those who have consented to follow-up. This may therefore produce a bias in the data, commonly referred to as the '**healthy emigrant effect**'. However a recent report (8) produced by the London Health Observatory demonstrated that mortality among Scots living in England and Wales was higher than that of residents born in England and Wales, and higher than most other ethnic populations living in England and Wales with the exception of the Irish. To get a feel for the extent of emigration in Scotland see **Appendix 3**, which gives some key emigration/migration statistics from the GRO Scotland 2003 Annual Review and data from the 2001 Census. The following sections introduce us to the scale and extent of emigration in both the Linked Scottish Health Survey samples.

7.3.1 Emigrants Identified in Survey Samples

To identify the extent of emigration in both the 1995 & 1998 survey data sets, respondents were linked to the monthly CHI download in March 2005 – Consult '**Technical Report**', *Chapter 3 – Emigration - Linkage of Scottish Health Survey data to Community Health Index (CHI),* for full details of emigrant identification process.

Table 3 below shows from this process the number of emigrants identified in each survey:

Table 3 – Emigrants present within Survey Samples

Health Survey	Survey Sample (N)	Emigrants N(%)
1995	7,363	524 (7.1%)
1998	8,305	331 (4.0%)

The issue in relation to these emigrants is whether or not they should be excluded from the analysis. However, given the small number of emigrants present, one would expect the effect of their exclusion to be minimal.

7.3.2 Potential impact of Emigrants in Modelling

To gauge the potential impact of including emigrants in the modelling, two Cox's Proportional Hazard Models were run, one including emigrants and the other excluding emigrants. The dependent variable used was First Hospital Admission and the independent variables were age, sex and Self Reported General Health. Full details of this can be viewed in the **Technical Report**, *Chapter 7 - Emigration – Impact on Modelling*. In summary, the modelling suggested that whether emigrants are included or excluded from the modelling has minimal impact on the results. It was therefore decided to exclude the known 331 emigrants from all modelling.

7.4 Missing values

Among our chosen risk factors from the 1998 SHeS, there were many missing values present. Due to the extent of the many missing values present, it was important to investigate the impact of missing values on modelling and how best to deal with them.

Three Logistic regression-modelling scenarios were considered as follows:

Model 1: All missing values per variable are included as an extra "Missing" category.

Model 2: Exclude all cases having missing values in any of the variables included for selection.

Model 3: Exclude the variables with large numbers of missing values (>=1,000), and exclude missing values (<1,000) from the model

From this analysis, Model 1 was deemed to be the best option and hence all modelling would adopt this approach in dealing with the missing values. For modelling results and discussion of these, consult **'Technical Report'**, *Chapter 8 - Missing values*).

8 Age & Sex Standardised Association Between Risk Factors and Outcome (Hospital Admission or Death)

Each of the 33 risk factors were modelled individually to determine their influence (Hazard Ratio) on a respondent experiencing an outcome of interest. Table 4 below, shows these outcomes of interest and the numbers of respondents in the 7,974 sample experiencing such an outcome.

Table 4 – Number of respondents experiencing each outcome of interest

	Respondents	
Outcomes of interest	**N**	**(%)[12]**
First Hospital Admission	3,566	41.4
First Serious Hospital Admission	1,415	15.0
Death	417	4.0

Each model was controlled for both age (5 year age bands) and sex, emigrants were excluded from the analysis and models were 1. weighted using the allocated survey weightings and 2. adjusted for clustering using the primary sampling units. To examine any differences between males and females, models for the lifestyle and biological risk factors were run for both sexes combined, as well as for males and females separately.

When considering specific risk factors[13] for the outcomes of 'First Serious Hospital Admission' and 'Death', the 'missing' risk factor categories were excluded from the modelling, and in the case of the 'Death' modelling, specific age groups were also excluded (16 to 24). This was due the lack of admissions/deaths occurring in these missing risk factor categories and younger age groups.

Results of the modelling can be viewed in **Appendices 4(a) – (e)** and are shown in the following order:

- Behavioural – *Appendix 4a*
- Biological – *Appendix 4b*
- Social – *Appendix 4c*
- Health Status at Survey– *Appendix 4d*
- Prior Hospital Admissions – *Appendix 4e*

[12] Percentages weighted by survey weightings (weighta)
[13] Smoking, housing tenure, ruality, access to nearest main hospital, access to the nearest GP practice and area deprivation.

The following sections summarise the main findings from the modelling.

8.1 Behavioural/Lifestyle

Appendix 4a

- Generally, hazard ratios increase as event seriousness (*First Hospital Admission, First Serious Admission & Death*) increases (except for physical activity) – e.g. see smoking example below:
- Results mainly as expected:

➢ **The heavier the smoker, the increased risk of hospital admission and death:**

Reference category (Never regularly smoked) vs. Heavy smoker

First Hospital Admission

Heavy smoker: Hazard ratio: 1.73, 95% CI: 1.54 to 1.94, p-value: 0.000

First Serious Hospital Admission

Heavy smoker: Hazard ratio: 2.15, 95% CI: 1.78 to 2.60, p-value: 0.000

Death:

Heavy smoker: Hazard ratio: 3.85, 95% CI: 2.76 to 5.36, p-value: 0.000

➢ **Moderate drinkers at less risk of hospital admission than light drinkers (protective factor), while ex-drinkers are associated with greater risk of any hospital admission and male heavy drinkers with greater risk of serious admission**

Reference category (Light drinker) vs. Moderate drinker

First Hospital Admission

Moderate drinker: Hazard ratio: 0.88, 95% CI: 0.79 to 0.98, p-value: 0.021

Female

Moderate drinker: Hazard ratio: 0.85, 95% CI: 0.74 to 0.98, p-value: 0.028

First Serious Hospital Admission

Female

Moderate drinker: Hazard ratio: 0.81, 95% CI: 0.66 to 1.00, p-value: 0.049

Reference category (Light Drinker) vs. Ex-Drinker

First Hospital Admission

Ex-drinker: Hazard ratio: 1.29, 95% CI: 1.08 to 1.53, p-value: 0.004

First Serious Hospital Admission

Ex-drinker: Hazard ratio: 1.38, 95% CI: 1.10 to 1.72, p-value: 0.005

Males

Reference category (Light drinker) vs. Ex-drinker

First Hospital Admission

Ex-drinker: Hazard ratio: 1.41, 95% CI: 1.09 to 1.82, p-value: 0.009

First Serious Hospital Admission

Ex-drinker: Hazard ratio: 1.59, 95% CI: 1.12 to 2.24, p-value: 0.009

Reference category (Light drinker) vs. Heavy drinker

First Serious Hospital Admission

Heavy drinker: Hazard ratio: 1.46, 95% CI: 1.06 to 2.02, p-value: 0.021

- **Increased physical activity associated with decreased risk of hospital admission and death:**

Reference category (Low activity) vs. Medium & High activity

First Hospital Admission

Medium activity: Hazard ratio: 0.78, 95% CI: 0.70 to 0.86, p-value: 0.000

High activity: Hazard ratio: 0.89, 95% CI: 0.81 to 0.98, p-value: 0.016

First Serious Hospital Admission

Medium activity: Hazard ratio: 0.70, 95% CI: 0.60 to 0.82, p-value: 0.000

High activity: Hazard ratio: 0.66, 95% CI: 0.56 to 0.79, p-value: 0.000

Death

Medium activity: Hazard ratio: 0.46, 95% CI: 0.34 to 0.61, p-value: 0.000

High activity: Hazard ratio: 0.43, 95% CI: 0.29 to 0.63, p-value: 0.000

- **Not reaching the daily fruit & vegetable 5 a day target is associated with increased risk of hospital admission and death (particularly for females):**

Reference category (Reaching Daily Guideline) vs. Not Reaching Daily Guideline

First Serious Hospital Admission

Not reaching guideline: Hazard ratio: 1.24, 95% CI: 1.06 to 1.45, p-value: 0.009

Death

Not reaching guideline: Hazard ratio: 1.85, 95% CI: 1.25 to 2.72, p-value: 0.002

Females:

First Serious Hospital Admission

Not reaching guideline: Hazard ratio: 1.27, 95% CI: 1.04 to 1.56, p-value: 0.018

Death

Not reaching guideline: Hazard ratio: 2.78, 95% CI: 1.72 to 4.47, p-value: 0.000

- **Smoking has highest hazard ratios of all behavioural/lifestyle risk factors**

8.2 Biological

Appendix 4b

Generally, results as expected

- Generally, hazard ratios increase as event seriousness increases
- Total Cholesterol – no real impact on hospital admission or death.

- **Note: Obesity measures (body mass index & waist hip ratio) are important biological risk factors for disease. For body mass index, expected results were obtained in relation to outcomes of hospitalisation, however not death.**

  - Respondents underweight or obese at greater risk of hospitalisation, in particular females.
  - Lower risk of mortality was observed for those who were obese compared to someone of a desirable weight[14]. This was the case for both sexes together, and for males separately.

Body mass index (BMI)

First Hospital Admission - Reference category (Desirable Weight) vs. Obese

Obese: Hazard ratio: 1.18, 95% CI: 1.06 to 1.31, p-value: 0.002

First Serious Hospital Admission - Reference category (Desirable Weight) vs. Underweight & Obese

Underweight: Hazard ratio: 1.64, 95% CI: 1.20 to 2.23, p-value: 0.002

Obese: Hazard ratio: 1.27, 95% CI: 1.05 to 1.52, p-value: 0.012

Death - Reference category (Desirable Weight) vs. Underweight & Obese

Underweight: Hazard ratio: 2.55, 95% CI: 1.65 to 3.95, p-value: 0.000

Obese[14]: Hazard ratio: 0.66, 95% CI: 0.47 to 0.93, p-value: 0.018

Males

Death - Reference category (Desirable Weight) vs. Underweight, Overweight & Obese

Underweight: Hazard ratio: 2.00, 95% CI: 1.06 to 3.81, p-value: 0.034

Overweight[14]: Hazard ratio: 0.65, 95% CI: 0.45 to 0.95, p-value: 0.028

Obese[14]: Hazard ratio: 0.58, 95% CI: 0.36 to 0.93, p-value: 0.024

[14] Findings not significant in other versions of models. Significance probably a chance finding related to length of follow-up period and statistical power. These issues will be examined in subsequent analyses to be undertaken by the group in due course.

Females

First Hospital Admission - Reference category (Desirable Weight) vs. Overweight & Obese

Overweight: Hazard ratio: 1.17, 95% CI: 1.03 to 1.34, p-value: 0.018

Obese: Hazard ratio: 1.32, 95% CI: 1.16 to 1.51, p-value: 0.000

First Serious Hospital Admission - Reference category (Desirable Weight) vs. Underweight, Overweight & Obese

Underweight: Hazard ratio: 1.82, 95% CI: 1.21 to 2.74, p-value: 0.004

Overweight: Hazard ratio: 1.25, 95% CI: 1.01 to 1.55, p-value: 0.038

Obese: Hazard ratio: 1.37, 95% CI: 1.08 to 1.73, p-value: 0.010

Death - Reference category (Desirable Weight) vs. Underweight

Underweight: Hazard ratio: 3.30, 95% CI: 1.62 to 6.70, p-value: 0.001

Waist hip ratio

Reference category (Normal) vs. Raised

First Hospital Admission

Raised: Hazard ratio: 1.22, 95% CI: 1.12 to 1.33, p-value: 0.000

First Serious Hospital Admission

Raised: Hazard ratio: 1.35, 95% CI: 1.18 to 1.54, p-value: 0.000

Death

Raised: Hazard ratio: 1.31, 95% CI: 1.03 to 1.67, p-value: 0.028

Significant for both Males and Females for each event outcome, except in the case of the Male death model.

- **Blood pressure: Hypertensive and Normotensive 'Treated', associated with higher risk of hospital admission and death:**

Reference category (Normotensive untreated) vs. Hypertensive & Normotensive 'treated'

First Hospital Admission

Hypertensive treated: Hazard ratio: 1.31, 95% CI: 1.13 to 1.53, p-value: 0.001

Normotensive treated: Hazard ratio: 1.68, 95% CI: 1.44 to 1.96, p-value: 0.000

First Serious Hospital Admission

Hypertensive treated: Hazard ratio: 1.61, 95% CI: 1.33 to 1.97, p-value: 0.000

Normotensive treated: Hazard ratio: 1.79, 95% CI: 1.42 to 2.25, p-value: 0.000

Death

Hypertensive treated: Hazard ratio: 1.45, 95% CI: 1.00 to 2.10, p-value: 0.048

Normotensive treated: Hazard ratio: 2.19, 95% CI: 1.47 to 3.27, p-value: 0.000

- **Total cholesterol: unexpectedly, those in the Moderately raised category are at less risk of experiencing a First Serious Hospital Admission or Death than those in the Desirable category[15]**

Reference category (Desirable) vs. Moderately raised

First Serious Hospital Admission[15]

Moderately raised: Hazard ratio: 0.78, 95% CI: 0.62 to 0.98, p-value: 0.033

Death[15]

Moderately raised: Hazard ratio: 0.56, 95% CI: 0.36 to 0.87, p-value: 0.010

- **HDL cholesterol: low HDL cholesterol associated with higher risk of hospital admission:**

Reference category (Desirable HDL) vs. Low HDL[16]

First Hospital Admission

Low HDL: Hazard ratio: 1.23, 95% CI: 1.11 to 1.37, p-value: 0.000

First Serious Hospital Admission

Low HDL: Hazard ratio: 1.20, 95% CI: 1.02 to 1.41, p-value: 0.024

- **Gamma – GT important when looking at a both sexes together and separately. Combined results shown below.**

Reference category (Normal) vs. High

First Hospital Admission

High: Hazard ratio: 1.18, 95% CI: 1.06 to 1.30, p-value: 0.001

First Serious Hospital Admission

High: Hazard ratio: 1.26, 95% CI: 1.09 to 1.47, p-value: 0.002

Death

High: Hazard ratio: 1.48, 95% CI: 1.13 to 1.95, p-value: 0.004

[15] Findings not significant in other versions of models. Significance probably a chance finding related to length of follow-up period and statistical power. These issues will be examined in subsequent analyses to be undertaken by the group in due course.

[16] Low levels of HDL cholesterol indicate a higher risk of getting heart disease

Fibrinogen & C-reactive protein: important predictors of hospital admission. Significant association also observed between C-reactive protein (top quintile) and death outcome.

Fibrinogen:

Reference category (Bottom quintile) vs. Top quintile

First Hospital Admission

Top quintile (5): Hazard ratio: 1.28, 95% CI: 1.09 to 1.49, p-value: 0.002

First Serious Hospital Admission

Top quintile (5): Hazard ratio: 1.96, 95% CI: 1.46 to 2.62, p-value: 0.000

C-reactive protein:

Reference category (Bottom quintile) vs. Top quintile

First Hospital Admission

Top quintile (5): Hazard ratio: 1.45, 95% CI: 1.26 to 1.67, p-value: 0.000

First Serious Hospital Admission

Top quintile (5): Hazard ratio: 2.18, 95% CI: 1.66 to 2.86, p-value: 0.000

Death

Top quintile (5): Hazard ratio: 3.15, 95% CI: 1.84 to 5.41, p-value: 0.000

- **Forced expiratory volume (FEV_1) a strong predictor of subsequent hospital admission and death. This is the case when looking at both sexes combined and split. Top category of variable show only below:**

Reference category (Equal or in excess of predicted values) vs. More than 1.64 sd below the predicted values

First Hospital Admission

>1.64 sd below: Hazard ratio: 1.56, 95% CI: 1.35 to 1.81, p-value: 0.000

First Serious Hospital Admission

>1.64 sd below: Hazard ratio: 2.21, 95% CI: 1.79 to 2.73, p-value: 0.000

Death

>1.64 sd below: Hazard ratio: 4.03, 95% CI: 2.80 to 5.79, p-value: 0.000

- Highest Hazard Ratios seen with FEV_1, C-reactive protein and Fibrinogen
- Many significant missing categories

8.3 Social

Appendix 4c

Due to the large number of differing social risk factors, these have been grouped into the following 6 headings for presentation purposes:

- Current Income Deprivation
- Employment Deprivation
- Education, Skills and Training Deprivation
- Geographic Deprivation
- Housing Deprivation
- Area Deprivation

Summary of results shown below:

- Results generally as expected
- Generally, hazard ratios increase as event seriousness increases

Current Income Deprivation

- **Those receiving *income related benefits* were at greater risk of experiencing a hospital admission or death than those not receiving them**

Reference category (Not receiving benefit) vs. Receiving benefit

First Hospital Admission

Receiving benefit: Hazard ratio: 1.42, 95% CI: 1.30 to 1.55, p-value: 0.000

First Serious Hospital Admission

Receiving benefit: Hazard ratio: 1.58, 95% CI: 1.39 to 1.81, p-value: 0.000

Death

Receiving benefit: Hazard ratio: 2.42, 95% CI: 1.93 to 3.02, p-value: 0.000

- **Those of lower *social class* were at greater risk of experiencing a hospital admission or death:**

Reference category (Professional & managerial technical) vs. Unskilled manual

First Hospital Admission

Unskilled manual: Hazard ratio: 1.42, 95% CI: 1.20 to 1.67, p-value: 0.000

First Serious Hospital Admission

Unskilled manual: Hazard ratio: 1.31, 95% CI: 1.05 to 1.65, p-value: 0.018

Death

Unskilled manual: Hazard ratio: 2.13, 95% CI: 1.39 to 3.26, p-value: 0.001

- **Greater *ownership of cars* associated with less risk of experiencing a hospital admission or death (especially death)**

Reference category (No Car) vs. One, Two & Three or more (death only)

First Hospital Admission

One: Hazard ratio: 0.81, 95% CI: 0.74 to 0.87, p-value: 0.000

Two: Hazard ratio: 0.67, 95% CI: 0.60 to 0.75, p-value: 0.000

First Serious Hospital Admission

One: Hazard ratio: 0.80, 95% CI: 0.70 to 0.92, p-value: 0.001

Two: Hazard ratio: 0.62, 95% CI: 0.50 to 0.76, p-value: 0.000

Death

One: Hazard ratio: 0.48, 95% CI: 0.38 to 0.60, p-value: 0.000

Two: Hazard ratio: 0.29, 95% CI: 0.18 to 0.45, p-value: 0.000

Three or more: Hazard ratio: 0.25, 95% CI: 0.07 to 0.96, p-value: 0.044

Employment Deprivation

- ***Unemployed* or *retired* were at greater risk of experiencing a hospital admission or death. In particular those unemployed 5 times more at risk of dying than those employed**

Reference category (Employed) vs. Unemployed

Death

Unemployed: Hazard ratio: 5.45, 95% CI: 2.83 to 10.52, p-value: 0.000

- ***Unemployment benefit* - No clear pattern in terms of influence on the risk of experiencing a hospital admission or death**

Education, Skills and Training

- **Those with lower *educational qualifications* associated with greater risk of experiencing a hospital admission or death**

Reference category (A-level(s) or a degree) vs. No formal qualifications

First Hospital Admission

No formal qualifications: Hazard ratio: 1.34, 95% CI: 1.21 to 1.47, p-value: 0.000

First Serious Hospital Admission

No formal qualifications: Hazard ratio: 1.45, 95% CI: 1.24 to 1.70, p-value: 0.000

Death

No formal qualifications: Hazard ratio: 1.77, 95% CI: 1.34 to 2.35, p-value: 0.000

Geographic Access

Rurality, drive time to GP, straight line distance to A&E and drive time to nearest hospital: No clear patterns in terms of influence on the risk of experiencing a hospital admission or death

Housing Deprivation

- ***Housing tenure* – People renting property were at more risk of experiencing a hospital admission or death than those owning a house outright or with mortgage**

Reference category (House owned or mortgage) vs. Rented accommodation

First Hospital Admission

Publicly rented: Hazard ratio: 1.43, 95% CI: 1.31 to 1.57, p-value: 0.000

First Serious Hospital Admission

Publicly rented: Hazard ratio: 1.63, 95% CI: 1.42 to 1.88, p-value: 0.000

Privately rented: Hazard ratio: 1.32, 95% CI: 1.05 to 1.66, p-value: 0.020

Death

Publicly rented: Hazard ratio: 2.59, 95% CI: 2.02 to 3.32, p-value: 0.000

Privately rented: Hazard ratio: 2.68, 95% CI: 1.89 to 3.80, p-value: 0.000

- ***Overcrowding* – no real significance**
- ***Central heating* – Those with central heating were less likely to experience a First Serious Hospital Admission compared to those without.**

Reference category (No central heating) vs. Yes central heating

First Serious Hospital Admission

Yes central heating: Hazard ratio: 0.78, 95% CI: 0.64 to 0.96, p-value: 0.016

Area Deprivation

- **The more deprived an area you live in, the greater the risk of experiencing a hospital admission or death – i.e. (results for top quintile shown only):**

Reference category (Bottom quintile (1)) vs. Top quintile (5)

First Hospital Admission

Top quintile (5): Hazard ratio: 1.39, 95% CI: 1.23 to 1.57, p-value: 0.000

First Serious Hospital Admission

Top quintile (5): Hazard ratio: 1.72, 95% CI: 1.39 to 2.12, p-value: 0.000

Death

Top quintile (5): Hazard ratio: 2.59, 95% CI: 1.78 to 3.76, p-value: 0.000

8.4 Health Status at Survey

Appendix 4d

- **General health, psychosocial health (GHQ 12 Score), longstanding illness, number of longstanding illnesses and incapacity benefits were all important and strong predictors of both hospital admission and death. (Selection of categories shown below – rest can be viewed in appendix 4d).**

General health – looking at Very bad

Reference category (Very good) vs. Very bad

First Hospital Admission

Very bad: Hazard ratio: 3.79, 95% CI: 2.74 to 5.25, p-value: 0.000

First Serious Hospital Admission

Very bad: Hazard ratio: 5.13, 95% CI: 3.47 to 7.61, p-value: 0.000

Death

Very bad: Hazard ratio: 10.24, 95% CI: 5.33 to 19.66, p-value: 0.000

Psychosocial health (GHQ 12 score) score of 4+

Reference category (zero score) vs. 4 plus score

First Hospital Admission

4 plus score: Hazard ratio: 1.79, 95% CI: 1.63 to 1.97, p-value: 0.000

First Serious Hospital Admission

4 plus score: Hazard ratio: 2.01, 95% CI: 1.73 to 2.34, p-value: 0.000

Death

4 plus score: Hazard ratio: 2.63, 95% CI: 2.01 to 3.42, p-value: 0.000

Longstanding illness

Reference category (No LI) vs. Limiting LI

First Hospital Admission

Limiting LI: Hazard ratio: 2.29, 95% CI: 2.10 to 2.50, p-value: 0.000

First Serious Hospital Admission

Limiting LI: Hazard ratio: 2.77, 95% CI: 2.39 to 3.20, p-value: 0.000

Death

Limiting LI: Hazard ratio: 2.75, 95% CI: 2.06 to 3.66, p-value: 0.000

Number of longstanding Illness

Reference category (None) vs. Three or more

First Hospital Admission

Three or more: Hazard ratio: 2.87, 95% CI: 2.45 to 3.36, p-value: 0.000

First Serious Hospital Admission

Three or more: Hazard ratio: 3.32, 95% CI: 2.67 to 4.12, p-value: 0.000

Death

Three or more: Hazard ratio: 3.49, 95% CI: 2.45 to 4.96, p-value: 0.000

Incapacity benefits

Reference category (Do not receive benefit) vs. Yes receive it

First Hospital Admission

Yes receive it: Hazard ratio: 1.97, 95% CI: 1.70 to 2.27, p-value: 0.000

First Serious Hospital Admission

Yes receive it: Hazard ratio: 2.41, 95% CI: 1.90 to 3.07, p-value: 0.000

Death

Yes receive it: Hazard ratio: 2.61, 95% CI: 1.76 to 3.88, p-value: 0.000

8.5 Prior Hospital Admissions

Appendix 4e

- **Number of previous hospital admissions 5 years prior to survey was examined. The top category of 4 or more prior admissions is shown here. Again, this proved to be another important and strong predictor of both hospital admission and death.**

Reference category (None) vs. Four or more

First Hospital Admission

Four or more: Hazard ratio: 4.40, 95% CI: 3.82 to 5.07, p-value: 0.000

First Serious Hospital Admission

Four or more: Hazard ratio: 4.08, 95% CI: 3.46 to 4.82, p-value: 0.000

Death

Four or more: Hazard ratio: 3.42, 95% CI: 2.55 to 4.59, p-value: 0.000

9 Multivariate Analysis – Hospital Admissions & Death

All of the lifestyle, biological and social risk factors, together with the, 'estimates of health at survey' and 'prior hospital admission' variables were entered into a Cox Proportional Hazard Regression Model, controlling for age and sex. Emigrants were again excluded from the analysis and the forward stepwise regression technique for choosing the variables to include in a multiple regression model was used. This was carried out for each of our outcomes of interest, namely, First Hospital Admission, First Serious Hospital Admission and Death. As previously explained in Chapter 8, specific risk factor missing categories were excluded from the single-predictor[17] modelling analysis, this was also applied to the multivariate modelling. Possible problems of collinearity amongst risk factor variables were automatically checked for by the STATA modelling algorithm, with any problematic variables being removed from the model.

9.1 First Hospital Admission

From our sample of 7,974 respondents, 41.4%[18] (3,566) had experienced at least one hospital admission. The modelling sought to identify which of the above risk factors influenced a subsequent hospital admission.

Of all the risk factor variables, only seven featured in the final Model 1, two from the General risk factor category, two from the Lifestyle risk factor category, two from the Estimates of Health Status risk factor category and the only risk factor from the Prior Admissions category, these are as follows:

General	**Lifestyle**	**Estimates of Health Status**	**Prior Admissions**
Age (5 year bands)	Smoking	General health	Number of admissions- 5 years prior to survey
Age * Sex	Physical activity	Longstanding illness	

(See Appendix 5a for details of the hazard ratios and significance.)

Of the lifestyle risk factors ex-smokers and smokers (light, moderate and heavy) were all at greater risk of experiencing a hospital admission than those who have never smoked before. A clear gradient can be seen in the Hazard Ratios i.e. increasing hazard ratios with increased smoking frequency. Heavy smokers were at the greatest risk –

Hazard ratio: 1.35, 95% CI: 1.20 to 1.53, p-value: 0.000.

[17] Age & Sex standardised association models

[18] Percentages weighted by survey weightings (weighta)

Those respondents participating in heavy physical activity have an increased risk of experiencing a hospital admission - Hazard ratio: 1.16, 95% CI: 1.05 to 1.28, p-value: 0.003. This result could be put down to sports related admissions. A clear gradient can also be seen in the number of admissions prior to the survey: as the number of admissions increases, so do the hazard ratios. Respondents having had 4 or more admissions were at 3 times more risk of experiencing an admission than a respondent having had no admissions prior to survey - Hazard ratio: 3.19, 95% CI: 2.76 to 3.69, p-value: 0.000.

Those respondents self-reporting good, fair, bad or very bad health were all at greater risk of a hospital admission than those reporting very good health. Both those reporting bad and very bad health were at equal risk of experiencing a hospital admission - Hazard ratio: 1.71, 95% CI: 1.40 to 2.08, p-value: 0.000 and Hazard ratio: 1.71, 95% CI: 1.20 to 2.43, p-value: 0.003, respectively. Lastly those respondents with a limiting or non-limiting longstanding illness were at greater risk of experiencing a hospital admission – Limiting longstanding illness - Hazard ratio: 1.45, 95% CI: 1.29 to 1.61, p-value: 0.000; Non-limiting longstanding illness - Hazard ratio: 1.25, 95% CI: 1.12 to 1.40, p-value: 0.000, respectively.

It was notable that no biological or social risk factors featured in the final model. The 'estimates of health status at survey', along with the 'prior hospital admissions' variable seem to be dominant in the model and, it was thought, may have been masking the effect of other risk factors. To test this assumption, it was decided to run a further model excluding both the 'estimates of health status' and 'prior hospital admissions' variables. The exclusion of these variables (Model 2) had the effect of introducing 4 extra risk factor variables into the model, featuring from the biological and social risk factor categories. These were:

Biological	**Social**
C-reactive protein	Economic activity
Forced expiratory volume (FEV_1)	
Blood pressure	

(See Appendix 5b for details of the hazard ratios and significance.)

Of those variables common to both models (smoking and physical activity), the hazard ratios for smoking were greater in Model 2 (exc Health Status) than in Model 1 (all Risk Factors). For example, for heavy smokers the hazard ratio in Model 1 was - as stated earlier - 1.35, compared to 1.55 in Model 2 - Hazard ratio: 1.55, 95% CI: 1.38 to 1.75, p-value: 0.000. When looking at physical activity however, a different result is seen. Model 1 shows that those respondents engaging in high physical activity were at greater risk of experiencing a hospital admission than those engaging in low physical activity - Hazard ratio: 1.16, 95% CI: 1.05 to 1.28, p-value: 0.000. Model 2 indicates that those respondents in the medium level of physical activity category were less at risk of experiencing a hospital admission - Hazard ratio: 0.86, 95% CI: 0.78 to 0.95, p-value: 0.002.

Looking at the three biological variables now introduced into the model it can be seen that only the top C-reactive protein quintile is significant - Hazard ratio: 1.20, 95% CI: 1.04 to 1.40, p-value: 0.013. Considering FEV_1, those respondents with their FEV_1 measurement '*1 to 1.64 standard deviations below the predicted values'* and '*More than 1.64 sd below the predicted values ('low')"* were more at risk of having a hospital admission than respondents with a measurement *'Equal to or in excess of predicted values'* i.e. Hazard ratio: 1.20, 95% CI: 1.03 to 1.40, p-value: 0.018 & Hazard ratio: 1.31, 95% CI: 1.14 to 1.51, p-value: 0.000 respectively. Lastly, blood pressure – respondents who are categorised as Hypertensive or Normotensive 'Treated' were at greater risk of a hospital admission than those who are Normotensive Untreated.

Hypertensive treated - Hazard ratio: 1.20, 95% CI: 1.03 to 1.40, p-value: 0.020
Normotensive treated - Hazard ratio: 1.52, 95% CI: 1.29 to 1.79, p-value: 0.000.

Social variables: those respondents who were retired were at greater risk of a hospital admission than those in employment - Hazard ratio: 1.42, 95% CI: 1.29 to 1.56, p-value: 0.000. It is clear, therefore, that the 'estimates of health status at survey' and 'prior hospital admissions' variables are important and reduce the significance of the biological and social risk factors. Both models can lend themselves to differing interpretations and are both of equal importance: thus, all further modelling was run both including and excluding the 'estimates of health status at survey' and 'prior admission' variables. All Hazard Ratios for both models can be viewed in **Appendix 5a & 5b**.

9.2 First Serious Hospital Admission

Looking at First Serious Hospital Admissions, the number of respondents from our sample (7,974) experiencing such an admission was 1,415 (15.0%)[19]. Below are those risk factors that were significant in the final models. The hazard ratios for both models can be viewed in **Appendix 5c & 5d.** As mentioned previously, some specific missing categories had to be excluded from the sample and this had the effect of reducing the survey sample from 7,974 to 7,948 (-0.3%).

Model 1

Including All Risk Factors

General

Age (5 year bands)

Age * Sex

Behavioural/Lifestyle

Smoking

Biological

Forced expiratory volume (FEV_1)

Fibrinogen

Social

Drive time to nearest hospital

Estimates of Health Status

General health

Longstanding illness

Prior Admissions

Number of prior admissions

Model 2

Excluding 'estimates of health status' and 'prior hospital admissions' variables [*]

General

Age (5 year bands)

Age * Sex

Behavioural/Lifestyle

Smoking

Biological

Forced expiratory volume (FEV_1)

C-reactive protein

Blood pressure

Social

Economic activity

[19] Percentages weighted by survey weightings (weighta)

[*] General health, GHQ score, limiting longstanding illness, number of longstanding illnesses, incapacity benefits and number of hospital admissions 5 years prior to survey

Two risk factors were significant in both models, i.e. smoking and FEV_1. With regard to smoking, and 'heavy smokers' in particular, we see that the hazard ratios are greater in model 2:

Model 1 - Hazard ratio: 1.50, 95% CI: 1.23 to 1.84, p-value: 0.000
Model 2 - Hazard ratio: 1.79, 95% CI: 1.47 to 2.19, p-value: 0.000.

It is worth noting that the hazard ratios were greater for smoking in the First Serious Hospital Admission model than in the First Hospital Admission Model.

Model 2 hazard ratios were also greater for FEV_1. Hazard ratios for respondents with low FEV_1 ('*more than 1.64 standard deviations below the predicted values' for both models are shown below:*

Model 1 - Hazard ratio: 1.34, 95% CI: 1.08 to 1.67, p-value: 0.009
Model 2 - Hazard ratio: 1.69, 95% CI: 1.37 to 2.09, p-value: 0.000.

'Drive time to nearest hospital' featured only in model 1. Respondents with a drive time to nearest hospital of 60 minutes or more were at greater risk of a serious admission compared to those with a drive time of 30 minutes or less, i.e.

Model 1 - Hazard ratio: 1.68, 95% CI: 1.15 to 2.46, p-value: 0.007

Again the 'estimates of health status' and 'prior hospital admissions' risk factors had an effect on the inclusion of variables in the model. However, they did not have the same impact in reducing the significance of the social and biological risk factors as was the case with the First Hospital Admission Model. The first effect of excluding these risk factors resulted in fibrinogen not being significant in Model 2 and a new biological risk factor taking its place, namely C-reactive protein. For both fibrinogen and C-reactive protein, the top quintile was significant. The Hazard Ratios for both these are as follows, with the reference category in both cases being the bottom quintile:

Fibrinogen: Hazard ratio: 1.45, 95% CI: 1.07 to 1.96, p-value: 0.015
C-reactive protein: Hazard ratio: 1.59, 95% CI: 1.21 to 2.10, p-value: 0.001.

The second effect is economic activity now being the significant social risk factor, whereas in Model 1 it was drive time to nearest hospital. Hazard Ratios for both are as follows:

Model 1 – drive time to nearest hospital: those respondents who lived more than 60 minutes away form nearest hospital were at greater risk than those 30 minutes or less away from nearest hospital:

Hazard ratio: 1.68, 95% CI: 1.15 to 2.46, p-value: 0.007

Model 2 - economic activity: those respondents who were retired were at greater risk of admission than those in employment:

Hazard ratio: 1.61, 95% CI: 1.36 to 1.91, p-value: 0.000.

The last effect was the inclusion of another biological risk factor, namely blood pressure. Respondents who are categorised as Hypertensive or Normotensive 'Treated' were at greater risk of a hospital admission than those who are Normotensive Untreated.

Hypertensive treated - Hazard ratio: 1.40, 95% CI: 1.14 to 1.71, p-value: 0.001
Normotensive treated - Hazard ratio: 1.55, 95% CI: 1.23 to 1.94, p-value: 0.000.

9.3 Death

417 of the 7,974 sample died during the follow-up period (4.0%)[20]. Due to the small number of deaths, specific age categories had to be excluded from the sample where no deaths occurred. In this case, both males and females aged 16-24 were excluded in addition to the specific missing categories mentioned earlier. This reduced the overall working sample size from 7,974 to 7,124 (-10.7%). Listed below are those risk factors that featured in the final models. The Hazard Ratios for both models can be viewed in **Appendix 5e & 5f**.

Model 1

Including All Risk Factors

General

Age (5 year bands)

Behavioural/Lifestyle

Smoking

Biological

Forced expiratory volume (FEV_1)

C-reactive protein

Body mass index (BMI)[21]

Social

Economic activity

Housing tenure

Estimates of Health Status

General health

Prior Admissions

Number of prior admissions

Model 2

Excluding 'estimates of health status' and 'prior hospital admissions' variables [*]

General

Age (5 year bands)

Behavioural/Lifestyle

Smoking

Physical activity

Biological

Forced expiratory volume (FEV_1)

C-reactive protein

Body mass index [21]

Total cholesterol [21]

Blood pressure

Social

Economic activity

Housing tenure

[20] Percentages weighted by survey weightings (weighta)

[*] General health, GHQ score, limiting longstanding illness, number of longstanding illnesses, incapacity benefits and number of hospital admissions 5 years prior to survey

[21] While those who were underweight were associated with an increased risk of death (an expected finding), surprisingly those who were obese were associated with a significantly reduced risk of death. However, the latter is probably a chance finding related to low number of deaths, length of follow-up period and statistical power. These issues will be examined in subsequent analyses to be undertaken by the group in due course.

Many variables were significant in both models i.e. smoking, FEV_1, C-reactive protein, body mass index, economic activity and housing tenure. As expected, - and as seen in earlier models - a clear gradient in the smoking hazard ratios emerged. The hazard ratios for smoking were greater in Model 2 than in Model 1.

Poorer levels of lung function (FEV_1) were associated with higher risk of death in both models, with Model 2 indicating the higher risk. Hazard ratios for low FEV_1 (‘*more than 1.64 sd below the predicted values’*) compared to reference category are shown below*:*

Model 1 - Hazard ratio: 1.89, 95% CI: 1.30 to 2.76, p-value: 0.001
Model 2 - Hazard ratio: 2.12, 95% CI: 1.48 to 3.05, p-value: 0.000.

With regard to C-reactive protein, in both models only the top quintile was significant and again Model 2 had the higher Hazard ratio:

Model 1 - Hazard ratio: 1.90, 95% CI: 1.08 to 3.33, p-value: 0.026
Model 2 - Hazard ratio: 2.18, 95% CI: 1.24 to 3.83, p-value: 0.007.

Having a body mass index classification of ‘underweight’ had an increased risk of death in both models:

Model 1 - Hazard ratio: 1.91, 95% CI: 1.17 to 3.10, p-value: 0.009
Model 2 - Hazard ratio: 1.80, 95% CI: 1.10 to 2.96, p-value: 0.020

In relation to the social risk factors significant in both models - housing tenure and economic activity - there was a higher risk of death associated with those in privately rented accommodation compared to those who owned their own homes:

Model 1 - Hazard ratio: 1.71, 95% CI: 1.11 to 2.51, p-value: 0.006
Model 2 - Hazard ratio: 1.77, 95% CI: 1.20 to 2.60, p-value: 0.004.

It can also be seen from both models that respondents who were unemployed were associated with a higher risk of death than respondents in employment, i.e.

Model 1 - Hazard ratio: 3.18, 95% CI: 1.57 to 6.44, p-value: 0.001
Model 2 - Hazard ratio: 3.23, 95% CI: 1.58 to 6.63, p-value: 0.001.

In terms of Model 2 – which excludes ‘estimates of health status’ and ‘prior hospital admissions’ as risk factors - the impact of these exclusions on variable selection is the inclusion of three further variables: physical activity, total cholesterol and blood pressure. In the case of physical activity, respondents participating in medium levels of activity were at less risk of death than those engaged in low activity i.e.

Medium: Hazard ratio: 0.65, 95% CI: 0.49 to 0.87, p-value: 0.003.

The result for total cholesterol was surprising in that it showed that those with 'moderately raised' cholesterol were at less risk of death than those with 'desirable' cholesterol:

Moderately Raised[22]: Hazard ratio: 0.62, 95% CI: 0.39 to 0.97, p-value: 0.038.

Finally, respondents categorised with normotensive treated blood pressure were at greater risk of death than those who were normotensive untreated i.e.

Normotensive treated - Hazard ratio: 1.97, 95% CI: 1.31 to 2.97, p-value: 0.001.

[22] Significance probably a chance finding related to low number of deaths, length of follow-up period and statistical power. These issues will be examined in subsequent analyses to be undertaken by the group in due course.

10 Summary of Main Findings

10.1 Single-Predictor[23] - First Hospital Admission, First Serious Hospital Admission and Death Models

- Generally, expected results were obtained in the age & sex standardised associations between risk factors and outcome of interest models
- Generally, hazard ratios increased as event seriousness (*First Hospital Admission, First Serious Admission & Death*) increased. In the case of smoking, for example, the hazard ratios for heavy smokers compared to those who had never smoked increased as follows:
  First Hospital Admission – HR: 1.73
  First Serious Hospital Admission – HR: 2.15
  Death – HR: 3.85

- **Behavioural**
  - The heavier the smoker, the increased risk of hospital admission and death.
  - Moderate drinkers were at less risk of hospital admission than light drinkers (protective factor), while ex-drinkers were associated with greater risk of any hospital admission, and male heavy drinkers were associated with greater risk of a serious admission
  - Increased physical activity was associated with decreased risk of hospital admission and death.
  - Not reaching the daily fruit & vegetable 5 a day target was associated with increased risk of hospital admission and death (particularly for females)
  - Smoking had highest hazard ratios of all behavioural/lifestyle risk factors.

- **Biological**
  - Obesity measures (body mass index & waist hip ratio) are important biological risk factors for disease. With regard to body mass index, expected results were obtained in relation to outcomes of hospitalisation, but not death:
    - Respondents who were underweight or obese were at greater risk of hospitalisation, in particular females.
    - A lower risk of mortality was observed for those who were obese compared to someone of a desirable weight[24]. This was the case for both sexes together, and for males separately.
  - Blood pressure: those classed as Hypertensive and Normotensive 'treated' were associated with higher risks of hospital admission and death

[23] Age & Sex standardised association models

- Total cholesterol: unexpectedly, those in the Moderately raised category were at less risk of experiencing a First Serious Admission or Death than those in the Desirable category[24].
- HDL cholesterol: low cholesterol was associated with higher risk of hospital admission.
- Gamma – GT was an important predictor variable when for sexes together and separately.
- Fibrinogen & C-reactive protein were important predictors of hospital admission. Significant associations were also observed between C-reactive protein (top quintile) and death outcome.
- Forced expiratory volume (FEV_1) was a strong predictor of subsequent hospital admission and death. This was the case when looking at both sexes combined and split.

- **Social**

- Those receiving *income related benefits* were at greater risk of experiencing a hospital admission or death than those not receiving them.
- Those of lower *social class* were at greater risk of experiencing a hospital admission or death.
- Higher levels of *car ownership* was associated with less risk of experiencing a hospital admission or death (especially death)
- *Unemployment benefit* - No clear pattern in terms of influence on the risk of experiencing a hospital admission or death
- Those who were *unemployed* or *retired* were at greater risk of experiencing a hospital admission or death. In particular, the risk of death within the follow-up period for those who were unemployed was 5 times that of those who were employed.
- Lower levels of *educational qualifications* were associated with a greater risk of experiencing a hospital admission or death.
- *Housing tenure* – respondents renting property were at more risk of experiencing a hospital admission or death than those owning a house outright or with a mortgage.
- *Overcrowding* – no real significance.
- *Central heating* – those with central heating were less likely to experience a First Serious Hospital Admission compared to those without.
- The more deprived the area of residence, the greater the risk of experiencing a hospital admission or death.

[24] Findings not significant in other versions of models. Significance probably a chance finding related to length of follow-up period and statistical power. These issues will be examined in subsequent analyses to be undertaken by the group in due course.

- *Rurality, drive time to a GP, straight line distance to A&E, and drive time to nearest hospital:* no clear pattern emerged from the analysis in terms of increased or reduced risk of experiencing a hospital admission or death.

Health Status at Survey

- General health, psychosocial health (GHQ 12 score), longstanding illness, number of longstanding illnesses, and incapacity benefits were all important and strong predictors of both hospital admission and death.

- **Prior Hospital Admission**
  - Number of previous hospital admissions 5 years prior to survey was another important and strong predictor of both hospital admission and death.

10.2 Multivariate - First Hospital Admission, First Serious Hospital Admission and Death Models

- 'Estimates of health status at survey' and 'Prior hospital admissions' risk factors are important and reduce the significance of certain other risk factors in the models i.e.
  - First Hospital Admission – reduced the significance of biological and social risk factors
  - First Serious Hospital Admission – reduced significance of social risk factors
  - Death – reduced significance of behavioural/lifestyle and biological risk factors
- Smoking was important in all of the multiple risk factor models
- Of the biological risk factors, only forced expiratory volume (FEV_1), C-reactive protein (CRP), fibrinogen and blood pressure were significant in the multivariate analyses.
- Smoking, forced expiratory volume (FEV_1), C-reactive protein, blood pressure and economic activity were all important predictors of outcomes in multivariate models (when excluding health status at survey and prior hospital admission risk factors)
- Individual/household social factors are more important than area deprivation

10.3 Conclusion

This work demonstrates that the linked Scottish Health Survey/SMR dataset is a valuable resource for examining the relationships between social, behavioural, biological and 'health status' factors and risk of hospitalisation or death.

The main strength of the dataset is clearly for follow-up analysis, and it provides impetus for future work. It is also worth noting that the utility of this resource will improve as further years of follow-up data accrue and with the addition of 2003 Scottish Health Survey data.

More detailed discussions of the implications of the modelling analysis will be available from a number of papers currently being drafted for submission to peer-reviewed journals. These will be available from the ScotPHO website at a future date. Further analysis of the linked dataset is underway (with full details available from the authors).

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Appendix 1 - Risk Factors Descriptions

Behavioural/Lifestyle

Smoking (*Tables 3, 3a & 3b*)

Respondent's daily smoking habit categorised as follows:.

- Never regularly smoked
- Ex-smoker
- Light smoker, (<10 a day) or cigar or pipe or high cotinine reading
- Moderate smoker, 10-20 per day
- Heavy smoker, 20+ a day

Drinking (*Tables 4, 4a & 4b*)

Respondent's weekly consumption of alcoholic units was categorised as follows (bearing in mind the government's weekly guidelines i.e. 21 units a week for males, and 14 units a week for females):

Males:	Females:
Never drank & Trivial	Never drank & Trivial
Ex-Drinker	Ex-Drinker
Light Drinker (Over 0-10 units)	Light Drinker (Over 0-7 units)
Moderate Drinker (Over 10-21 units)	Moderate Drinker (Over 7-14 units)
Heavy Drinker (Over 21-28 units)	Heavy Drinker (Over 14-21 units)
Excessive Drinker (Over 28 units)	Excessive Drinker (Over 21 units)

Physical Activity (*Tables 5, 5a & 5b*)

This variable was chosen due to potentially preventative effect on conditions such as cardiovascular disease and osteoporosis. Its importance was noted in the White Paper '*Towards a Healthier Scotland*' which proposed a National Physical Activity Strategy for Scotland to encourage people of all ages and walks of life to participate in physical activity. Respondents' number of days' participation in heavy housework, heavy gardening/DIY, walking, sports and exercise and activity at work in the four weeks prior to the survey were measured and grouped into the following 3 categories:

- Low activity (*zero to three occasions of 30mins of at least moderate activity in past four weeks – that is, less than once a week*)
- Medium activity (*four to 19 occasions – that is, at least one but fewer than five times per week*)
- High activity (*20 or more occasions – that is, five or more times per week*)

Diet (*Tables 6, 6a & 6b*)

Respondent's eating habits in relation to the government guidelines of consuming five portions of fruit and vegetables a day were examined. Fruit, Fruit Juice, Pulses, Cooked Green Vegetables, Cooked Root Vegetables, and Raw Vegetables or Salad were all combined to produce one binary variable:

- Reaches Daily Guideline – NO
- Reaches Daily Guideline – YES

Biological

Body Mass Index (BMI) (*Tables 7, 7a & 7b*)

Respondent's BMI measurement was calculated. BMI is one of the two widely used indicators to measure obesity and combines height and weight to give an overall measurement, which is categorised into one of the following categories:

BMI (kg/m^2)	Description
20 or less	Underweight
Over 20 to 25	Desirable
Over 25 to 30	Overweight
Over 30	Obese

Waist Hip Ratio (WHR) (*Tables 8, 8a & 8b*)

Respondent's WHR measurement was calculated. WHR is the other most widely used indicator to measure obesity. It combines waist and hip circumferences to give an overall measurement, which is categorised (on the basis of a 'raised WHR' being 0.95 or more in men, and 0.85 or more in women) separately for gender as follows:

Male	Female	Description
0.95 or less	0.85 or less	Normal
Over 0.95	Over 0.85	Raised

Blood Pressure (*Tables 9, 9a & 9b*)

Respondent's systolic (SBP) and diastolic (DBP) blood pressure measurements were taken. From this respondents were classified as either being **hypertensive** or **normotensive** using the known threshold values **140(SBP)/90(DBP) mmHg**.

Total Cholesterol (*Tables 10, 10a & 10b*)

This particular measurement was chosen due to its association with cardiovascular disease Respondent's level of cholesterol was measured and categorised into well-established categories:

Total Cholesterol level	**Description**
Less than 5.2 mmol/l	Desirable range
>=5.2 but <6.5 mmol/l	Mildly Raised
>=6.5 but <7.8 mmol/l	Moderately Raised
7.8 mmol/l or over	Severely Raised

HDL Cholesterol (*Tables 11, 11a & 11b*)

Respondent's level of HDL-Cholesterol was measured and categorised as below. Again this particular measurement was included due to its links with cardiovascular disease. Low levels of HDL Cholesterol indicate a higher risk of getting heart disease.

Male	Female	Description
Less than 1 mmol/l	Less than 1.3 mmol/l	Low
>=1 mmol/l	>=1.3 mmol/l	Desirable

Gamma-GT (*Tables 12, 12a & 12b*)

Clinical studies have shown levels of gamma-glutamyl transpeptidase (gamma-GT) in the blood to be associated with alcohol consumption, and consequent liver damage.[14] The normal range for gamma-GT is 7-42 iu/l for men and 6-22 iu/l for women. 3 respondents had levels below normal. These cases were added to the normal category. The categories were categorised into the following:

Male	Female	Description
0 – 42 iu/l	0 – 22 iu/l	Normal
>42 iu/l	>22 iu/l	High

Fibrinogen (*Tables 13, 13a & 13b*)

Fibrinogen can be used by a doctor to evaluate the body's ability to form and break down blood clots. At times it is also ordered alongside other cardiac risk factor such as C-Reactive Protein (CRP) to help determine a patient's overall risk of developing cardiovascular disease. There are as yet no direct treatments for elevated levels, thus the use of this risk factor has not gained widespread acceptance. A standard reference range is not available for this test, so it was decided to categorise the values into **quintiles**.

Fibrinogen quintiles (g/l)

	Men	**Women**
Bottom quintile	2.00	2.2
2nd quintile	2.1-2.3	2.3-2.5
3rd quintile	2.4-2.7	2.6-2.9
4th quintile	2.8-3.1	3.0-3.3
Top quintile	>3.2	>3.4

C-reactive protein (CRP) (*Tables 14, 14a & 14b*)

Like Fibrinogen, CRP is a cardiac risk factor to help determine a patient's overall risk of developing cardiovascular disease. Measurements are grouped in quintiles for males and females as shown below.

C-reactive protein quintiles (mg/l)

	Men	**Women**
Bottom quintile	0.4	0.5
2nd quintile	0.5-0.9	0.5-1.1
3rd quintile	1.0-1.7	1.2-2.2
4th quintile	1.8-3.5	2.3-4.5
Top quintile	>3.5	>4.5

Forced Expiratory Volume (FEV1) (*Tables 15, 15a & 15b*)

FEV1 is the most important lung function test. It measures how much air a person can exhale during a forced breath. The amount of air exhaled may be measured during the first (FEV_1), second (FEV_2), and/or third seconds (FEV_3) of the forced breath. It is used to:

- Diagnose chronic obstructive pulmonary disease (COPD). A person with COPD has a lower FEV_1 value than that of a healthy person.
- Gauge how well medications used to improve breathing are working.
- Determine if lung disease is getting worse i.e. a decrease in the FEV_1 value may indicate lung disease is getting worse

Predicted values of FEV were derived from a reference population by means of multiple regression equations and their residual standard deviation, with age and height being the key predictor variables. ECSC (European Community for Steel and Coal) reference values for persons of European descent were used as these were recommended by the European Respiratory Society in 1993. These values were then compared to the actual values and the results categorised into a four-level classification as follows:

- Equal to or in excess of predicted values
- Within 1 standard deviation below the predicted values
- 1 to 1.64 standard deviations below the predicted values
- More than 1.64 standard deviations below the predicted values ('low').

Social

Income Related Benefits (*Tables 16, 16a & 16b*)

Given the high levels of correlation between a number of income-related benefit variables included in the survey, one composite variable was created to represent the respondent being in receipt of any income related benefit. The income related benefits that make up this variable are: income support, family credit, unemployment benefit, housing benefit & council tax benefit. The new variable is binary:

- Receives Income Related Benefits – YES
- Receives Income Related Benefits – NO

Social Class (*Tables 17, 17a & 17b*)

Social class of head of household was chosen and is grouped in the following manner:

- I - Professional & II Managerial Technical (*Grouped together for sample size*)
- IIIN - Skilled Non-Manual
- IIIM – Skilled Manual
- IV – Semi-Skilled Manual
- Unskilled Manual
- Other

Car Ownership (*Tables 18, 18a & 18b*)

Whether or not a respondent had a car. The categories are as follows:

- None
- One
- Two
- Three or more

Highest Educational Qualification (*Tables 19, 19a & 19b*)

Respondent's level of highest educational qualification was looked at and categorised into the following groups:

- A-levels(s) or a degree
- GCSE at A-C or equivalent
- Other formal qualifications
- No formal qualifications

Economic Activity (*Tables 20, 20a & 20b*)

Respondent's economic status was considered. The categories are as follows:

- In Employment
- Unemployed
- Retired

Unemployment Benefit (*Tables 21, 21a & 21b*)

Whether a respondent received unemployment benefits or not. The categories are as follows:

- Yes
- No

Housing Tenure (*Tables 22, 22a & 22b*)

This was categorised into the following groups:

- House owned outright or with mortgage
- Publicly rented
- Privately rented

Overcrowding (*Tables 23, 23a & 23b*)

Overcrowding was defined as 'greater than 2 people per room'. Respondents were categorised as being either:

- Yes - overcrowded
- No – not overcrowded

Central Heating (*Tables 24, 24a & 24b*)

Whether or not a respondent's household had central heating or not.

- Yes
- No

Area deprivation (*Tables 25, 25a & 25b*)

2001 Carstairs deprivation scores were categorised into quintiles, with Bottom Quintile representing Most Affluent and Top Quintile representing Most Deprived.

Rurality (Tables 26, 26a & 26b)

This variable was mapped to the respondent's postcode and it allows us to see whether their place of residence is urban or rural. The categories are as follows:

- Primary cities with a population of 125,000 or more
- Urban settlements with a population of 10,000 or more
- Small accessible* towns with a population of 3,000 or more
- Small remote towns with a population of 3,000 or more
- Accessible* rural
- Remote rural

*Accessible is defined as those areas that are within a 30-minute drive time from the centre of town with a population of 10,000 or more

Access to the nearest GP practice (*Tables 27, 27a & 27b*)

This is based on drive times published on the Scottish Executive SIMD 2004 website. Average drive times in minutes are available for all datazones and have been mapped to the postcode for each respondent. This variable is categorised into the following groups:

- 5 minutes or less
- 5 minutes plus

Access to the nearest main hospital (*Tables 28 28a & 28b*)

This is measured by straight-line distances in kilometres using grid references. A main hospital is defined here as one of the 30 hospitals in Scotland (excluding children's hospitals) with an accident & emergency unit. This variable is categorised into the following groups:

- 5km or less
- Between 5km and 10km
- Between 10km and 20km
- Between 20km and 30km
- More than 30km

Drive time to nearest hospital (*Tables 29, 29a & 29b*)

Access to hospitals has already been measured by approximating the drive time from the respondent's household to the nearest hospital (Scottish Neighbourhood Statistics are not specific about the hospital type). The SNS data are aggregated to postcode sector level and include the number of households in each sector within:

- 30 minutes or less from nearest hospital
- 30 to 60 minutes from nearest hospital
- More than 60 minutes from nearest hospital

Summary of Estimates of Health Status at Survey

Self-Assessed General Health (*Tables 30, 30a & 30b*)

Respondents were asked to classify their health into one of the following categories:

- Very Good
- Good
- Fair
- Bad
- Very Bad

General Health Questionnaire (GHQ-12) (*Tables 31, 31a & 31b*)

GHQ-12 was used in order to assess the psychosocial health of respondents. It was designed to detect possible psychiatric morbidity in the general population and comprises of 12 questions regarding general levels of happiness, anxiety, depression, stress and sleep disturbance over 'the past few weeks' immediately prior to the interview. The score is categorised into the following groups:

- Zero score
- 1 to 3 score
- 4 plus score*

* A threshold score of four or more has been used to identify informants with a potential psychiatric disorder

Longstanding illness (*Tables 32, 32a & 32b*)

Longstanding illness is defined as an illness, disability or infirmity, which has affected or is likely to affect the informant over a period of time. Respondents were asked whether or not they had a longstanding illness and if so whether it limits their activity. Categories are as follows:

- Limiting Longstanding Illness
- Non Limiting Longstanding Illness
- No Limiting Longstanding Illness

Number of Longstanding Illnesses (*Tables 33 33a & 33b*)

Respondents were also asked how many longstanding illnesses they had and their answer was categorised into one of the following groups:

- No limiting longstanding illness
- One limiting longstanding illness
- Two limiting longstanding illness
- Three or more limiting longstanding illness

Incapacity benefits (*Tables 34, 34a & 34b*)

Incapacity Benefit is for people of working age that cannot work due to illness or disability and are not entitled to Statutory Sick Pay, or their Statutory Sick Pay has run out. Entitlement usually depends upon your National Insurance record (except some young adults), and may be subject to a medical assessment. Respondents are categorised into whether or not they receive this benefit:

- Yes
- No

Previous hospital admissions 5 years prior to survey

(*Tables 35, 35a & 35b*)

The number of previous admissions 5 years prior to survey was an additional non-survey risk factor, created as part of the linkage process. It was perceived that this variable would be an important risk factor relating to outcome measures of interest. The number of admissions are categorised into the following groups:

- None
- One
- Two
- Three
- Four or more

APPENDIX 2(a)- Behavioural/Lifestyle Risk Factor Fequencies

Table 3 - Smoking Status (Combined)

Smoking Status	N	%	Cum. %
never regularly smoked	3,497	42.1	42.1
ex smoker	1,543	18.6	60.7
light smoker, (<10) or cigar, pipe or high continine level	921	11.1	71.8
moderate smoker, 10-20 per day	1,181	14.2	86.0
heavy smoker, 20 plus per day	1,144	13.8	99.8
missing	19	0.2	100.0
Total	**8,305**	**100.0**	

Table 3a - Smoking Status (Males)

Smoking Status	N	%	Cum. %
never regularly smoked	1,374	37.5	37.5
ex smoker	745	20.3	57.8
light smoker, (<10) or cigar, pipe or high continine level	481	13.1	71.0
moderate smoker, 10-20 per day	497	13.6	84.5
heavy smoker, 20 plus per day	563	15.4	99.9
missing	4	0.1	100.0
Total	**3,664**	**100.0**	

Table 3b - Smoking Status (Females)

Smoking Status	N	%	Cum. %
never regularly smoked	2,123	46	45.74
ex smoker	798	17	62.94
light smoker, (<10) or cigar, pipe or high continine level	440	9.48	72.42
moderate smoker, 10-20 per day	684	15	87.16
heavy smoker, 20 plus per day	581	13	99.68
missing	15	0.32	100
Total	**4,641**	**100.0**	

Table 4 - Alcohol consumption rating (Combined)

alcohol consumption rating (units per week)	N	%	Cum. %
never drank & trivial	493	5.9	5.9
ex-drinker	399	4.8	10.7
light drinker	3,891	46.9	57.6
moderate drinker	1,675	20.2	77.8
heavy drinker	718	8.7	86.4
excessive drinker	1,056	12.7	99.1
missing	73	0.9	100.0
Total	**8,305**	**94.1**	

Table 4a - Alcohol consumption rating (Males)

alcohol consumption rating (units per week)	N	%	Cum. %
never drank & trivial	132	3.6	3.6
ex-drinker	161	4.4	8.0
light drinker (over 0-10 units per week)†	1,295	35.3	43.3
moderate drinker (over 10-21 units per week)	880	24.0	67.4
heavy drinker (over 21-28 units per week)	375	10.2	77.6
excessive drinker (over 28 units per week)	787	21.5	99.1
missing	34	0.9	100.0
Total	**3,664**	**96.4**	

Table 4b - Alcohol consumption rating (Females)

alcohol consumption rating (units per week)	N	%	Cum. %
never drank & trivial	361	7.8	7.8
ex-drinker	238	5.1	12.9
light drinker (over 0-7 units per week)†	2,596	55.9	68.8
moderate drinker (over 7-14 units per week)	795	17.1	86.0
heavy drinker (over 14-21 units per week)	343	7.4	93.4
excessive drinker (over 21-28 units per week)	269	5.8	99.2
missing	39	0.8	100.0
Total	**4,641**	**92.2**	

Table 5 - Physical Activity (Combined)

Physical Activity	N	%	Cum. %
low	3,156	38.0	38.0
medium	2,639	31.8	69.8
high	2,500	30.1	99.9
missing	10	0.1	100.0
Total	**8,305**	**100.0**	

Table 5a - Physical Activity (Males)

Physical Activity	N	%	Cum. %
low	1,362	37.2	37.2
medium	1,015	27.7	64.9
high	1,282	35.0	99.9
missing	5	0.1	100.0
Total	**3,664**	**100.0**	

Table 5b Physical Activity (Females)

Physical Activity	N	%	Cum. %
low	1,794	38.7	38.7
medium	1,624	35.0	73.7
high	1,218	26.2	99.9
missing	5	0.1	100.0
Total	**4,641**	**100.0**	

Table 6 Diet (Combined)

Daily Fruit & Vegetable Consumption	N	%	Cum. %
no	6,904	83.1	83.1
yes	1,401	16.9	100.0
Total	**8,305**	**100.0**	

Table 6a- Diet (Males)

Daily Fruit & Vegetable Consumption	N	%	Cum. %
no	3,221	87.9	87.9
yes	443	12.1	100.0
Total	**3,664**	**100.0**	

Table 6b- Diet (Females)

Daily Fruit & Vegetable Consumption	N	%	Cum. %
no	3,683	79.4	79.4
yes	958	20.6	100.0
Total	**4,641**	**100.0**	

APPENDIX 2(b)- Biological Risk Factor Fequencies

Table 7 - Body Mass Index (Combined)

Valid Body Mass Index (BMI) Measurements	N	%	Cum. %
underweight (under 20)	400	4.8	4.8
desirable (over 20-25)	2,662	32.1	36.9
overweight (over 25-30)	2,835	34.1	71.0
obese (over 30)	1,656	19.9	91.0
missing	752	9.1	100.0
Total	**8,305**	**100.0**	

Table 7a Body Mass Index (Males)

Valid Body Mass Index (BMI) Measurements	N	%	Cum. %
underweight (under 20)	143	3.9	3.9
desirable (over 20-25)	1,070	29.2	33.1
overweight (over 25-30)	1,471	40.2	73.3
obese (over 30)	687	18.8	92.0
missing	293	8.0	100.0
Total	**3,664**	**100.0**	

Table 7b- Body Mass Index (Females)

Valid Body Mass Index (BMI) Measurements	N	%	Cum. %
underweight (under 20)	257	5.5	5.5
desirable (over 20-25)	1,592	34.3	39.8
overweight (over 25-30)	1,364	29.4	69.2
obese (over 30)	969	20.9	90.1
missing	459	9.9	100.0
Total	**4,641**	**100.0**	

Table 8 - Waist Hip Ratio (Combined)

Valid Waist Hip Ratio Measurements	N	%	Cum. %
normal	5,142	61.9	61.9
raised	1,737	20.9	82.8
missing	1,426	17.2	100.0
Total	**8,305**	**100.0**	

Table 8a- Waist Hip Ratio (Males)

Valid Waist Hip Ratio Measurements	N	%	Cum. %
normal	2,228	60.8	
raised	867	23.7	
missing	569	15.5	
Total	**3,664**	**100.0**	

Table 8b - Waist Hip Ratio (Females)

Valid Waist Hip Ratio Measurements	N	%	Cum. %
normal	2,914	62.8	62.8
raised	870	18.8	81.5
missing	857	18.5	100.0
Total	**4,641**	**100.0**	

Table 9 - Blood Pressure (Combined)

Blood Pressure	N	%	Cum. %
hypertensive	1,970	23.7	23.7
normotensive	4,957	59.7	83.4
missing	1,378	16.6	100.0
Total	**8,305**	**100.0**	

Table 9a - Blood Pressure (Males)

Blood Pressure	N	%	Cum. %
hypertensive	982	26.8	26.8
normotensive	2,133	58.2	85
missing	549	15.0	100
Total	**3,664**	**100.0**	

Table 9b - Blood Pressure (Females)

Blood Pressure	N	%	Cum. %
hypertensive	988	21.3	21.29
normotensive	2,824	60.9	82.14
missing	829	17.9	100
Total	**4,641**	**100.0**	

Table 10 - Total Cholesterol (Combined)

Total Cholesterol	N	%	Cum. %
desirable range	2,275	27.4	27.4
mildly raised	2,233	26.9	54.3
moderately raised	904	10.9	65.2
severly raised	195	2.4	67.5
missing	2,698	32.5	100.0
Total	**8,305**	**100.0**	

Table 10a - Total Cholesterol (Males)

Total Cholesterol	N	%	Cum. %
desirable range	1,036	28.3	28.3
mildly raised	1,055	28.8	57.1
moderately raised	402	11.0	68.0
severly raised	68	1.9	69.9
missing	1,103	30.1	100.0
Total	**3,664**	**100.0**	

Table 10b - Total Cholesterol (Females)

Total Cholesterol	N	%	Cum. %
desirable range	1,239	26.7	26.7
mildly raised	1,178	25.4	52.1
moderately raised	502	10.8	62.9
severly raised	127	2.7	65.6
missing	1,595	34.4	100.0
Total	**4,641**	**100.0**	

Table 11 - HDL - Cholesterol (Combined)

HDl - Cholesterol	N	%	Cum. %
low	1,172	14.1	14.1
desirable	4,405	53.0	67.2
missing	2,728	32.9	100.0
Total	**8,305**	**100.0**	

Table 11a - HDL - Cholesterol (Males)

HDl - Cholesterol	N	%	Cum. %
low	419	11.4	11.4
desirable	2,125	58.0	69.4
missing	1,120	30.6	100.0
Total	**3,664**	**100.0**	

Table 11b - HDL - Cholesterol (Females)

HDl - Cholesterol	N	%	Cum. %
low	753	16.2	16.2
desirable	2,280	49.1	65.4
missing	1,608	34.7	100.0
Total	**4,641**	**100.0**	

Table 12 - Gamma-GT (Combined)

Gamma-GT Ranges	N	%	Cum. %
normal	4,162	50.1	50.1
high	1,572	18.9	69.0
missing	2,571	31.0	100.0
Total	**8,305**	**100.0**	

Table 12a - Gamma-GT (Males)

Gamma-GT Ranges	N	%	Cum. %
normal	2,022	55.2	55.2
high	606	16.5	71.7
missing	1,036	28.3	100.0
Total	**3,664**	**100.0**	

Table 12b - Gamma-GT (Females)

Gamma-GT Ranges	N	%	Cum. %
normal	2,140	46.1	46.1
high	966	20.8	66.9
missing	1,535	33.1	100.0
Total	**4,641**	**100.0**	

Table 13 - Fibrinogen (Combined)

Fibrinogen Quintiles	N	%	Cum. %
bottom	1,004	12.1	12.1
second	933	11.2	23.3
third	1,225	14.8	38.1
forth	911	11.0	49.0
top	1,098	13.2	62.3
missing	3,134	37.7	100.0
Total	**8,305**	**87.9**	

Table 13a - Fibrinogen (Males)

Fibrinogen Quintiles	N	%	Cum. %
bottom	440	12.0	12.0
second	435	11.9	23.9
third	581	15.9	39.7
forth	409	11.2	50.9
top	497	13.6	64.5
missing	1,302	35.5	100.0
Total	**3,664**	**88.0**	

Table 13b - Fibrinogen (Females)

Fibrinogen Quintiles	N	%	Cum. %
bottom	564	12.2	12.2
second	498	10.7	22.9
third	644	13.9	36.8
forth	502	10.8	47.6
top	601	13.0	60.5
missing	1,832	39.5	100.0
Total	**4,641**	**87.9**	

Table 14-Reactive Protein (Combined)

CRP Quintiles	N	%	Cum. %
bottom	1,142	13.8	13.8
second	1,109	13.4	27.1
third	1,044	12.6	39.7
forth	1,150	13.9	53.5
top	1,215	14.6	68.2
missing	2,645	31.9	100.0
Total	**8,305**	**86.3**	

Table 14a- C-Reactive Protein (Males)

CRP Quintiles	N	%	Cum. %
bottom	473	12.9	12.9
second	540	14.7	27.7
third	485	13.2	40.9
forth	536	14.6	55.5
top	554	15.1	70.6
missing	1,076	29.4	100.0
Total	**3,664**	**87.1**	

Table 14b - C-Reactive Protein (Females)

CRP Quintiles	N	%	Cum. %
bottom	669	14.4	14.4
second	569	12.3	26.7
third	559	12.0	38.7
forth	614	13.2	52.0
top	661	14.2	66.2
missing	1,569	33.8	100.0
Total	**4,641**	**85.6**	

Table 15 - Forced Expiratory Volume (FEV) (Combined)

Forced Expiratory Volume (FEV)	N	%	Cum. %
equal to or in excess of predicted values	3,366	40.5	40.5
within 1 standard deviation below the predicted values	1,756	21.1	61.7
1 to 1.64 standard deviations below the predicted values	621	7.5	69.2
more than 1.64 standard deviations below the predicted values ('low')	573	6.9	76.1
missing	1,989	24.0	100.0
Total	**8,305**	**100.0**	

Table 15a - Forced Expiratory Volume (FEV) (Males)

Forced Expiratory Volume (FEV)	N	%	Cum. %
equal to or in excess of predicted values	1,468	40.1	40.1
within 1 standard deviation below the predicted values	789	21.5	61.6
1 to 1.64 standard deviations below the predicted values	287	7.8	69.4
more than 1.64 standard deviations below the predicted values ('low')	291	7.9	77.4
missing	829	22.6	100.0
Total	**3,664**	**100.0**	

Table 15b - Forced Expiratory Volume (FEV) (Females)

Forced Expiratory Volume (FEV)	N	%	Cum. %
equal to or in excess of predicted values	1,898	40.9	40.9
within 1 standard deviation below the predicted values	967	20.8	61.7
1 to 1.64 standard deviations below the predicted values	334	7.2	68.9
more than 1.64 standard deviations below the predicted values ('low')	282	6.1	75.0
missing	1,160	25.0	100.0
Total	**4,641**	**100.0**	

APPENDIX 2(c)- Social Risk Factor Fequencies

Table 16 - Income Related Benefits (Combined)

Income Related Benefits	N	%	Cum. %
yes	2,389	28.8	28.8
no	5,916	71.2	100.0
Total	**8,305**	**100.0**	

Table 16a - Income Related Benefits (Males)

Income Related Benefits	N	%	Cum. %
yes	906	24.73	24.73
no	2,758	75.27	100
Total	**3,664**	**100.0**	

Table 16b - Income Related Benefits (Females)

Income Related Benefits	N	%	Cum. %
yes	1,483	32.0	32.0
no	3,158	68.1	100.0
Total	**4,641**	**100.0**	

Table 17 - Social Class (Combined)

Social Class	N	%	Cum. %
I - Professional & II Managerial Technical	2,656	32.0	32.0
IIIN - Skilled Non-Manual	1,324	15.9	47.9
IIIM – Skilled Manual	2,213	26.7	74.6
IV – Semi-Skilled Manual	1,300	15.7	90.2
Unskilled Manual	512	6.2	96.4
Other	29	0.4	96.7
Missing	271	3.3	100.0
Total	**8,305**	**100.0**	

Table 17a Social Class (Males)

Social Class	N	%	Cum. %
I - Professional & II Managerial Technical	1,210	33.0	33.0
IIIN - Skilled Non-Manual	387	10.6	43.6
IIIM – Skilled Manual	1,202	32.8	76.4
IV – Semi-Skilled Manual	562	15.3	91.7
Unskilled Manual	177	4.8	96.6
Other	15	0.4	97.0
Missing	111	3.0	100.0
Total	**3,664**	**100.0**	

Table 17b - Social Class (Females)

Social Class	N	%	Cum. %
I - Professional & II Managerial Technical	1,446	31.2	31.2
IIIN - Skilled Non-Manual	937	20.2	51.4
IIIM – Skilled Manual	1,011	21.8	73.1
IV – Semi-Skilled Manual	738	15.9	89.0
Unskilled Manual	335	7.2	96.3
Other	14	0.3	96.6
Missing	160	3.5	100.0
Total	**4,641**	**100.0**	

Table 18 - Car Ownership (Combined)

Car Ownership	N	%	Cum. %
none	2,484	29.9	29.9
one	3,948	47.5	77.5
two	1,595	19.2	96.7
three or more	278	3.4	100.0
Total	**8,305**	**100.0**	

Table 18a - Car Ownership (Males)

Car Ownership	N	%	Cum. %
none	886	24.2	24.2
one	1,835	50.1	74.3
two	792	21.6	95.9
three or more	151	4.1	100.0
Total	**3,664**	**100.0**	

Table 18b - Car Ownership (Females)

Car Ownership	N	%	Cum. %
none	1,598	34.4	34.4
one	2,113	45.5	80.0
two	803	17.3	97.3
three or more	127	2.7	100.0
Total	**4,641**	**100.0**	

Table 19 - Highest Educatonal Qualification (Combined)

Highest Qualification	N	%	Cum. %
a-level(s) or a degree	4,060	48.9	48.9
gcse at a-c or equivalent	1,195	14.4	63.3
other formal qualifications	619	7.5	70.7
no formal qualifications	2,416	29.1	99.8
missing	15	0.2	100.0
Total	**8,305**	**100.0**	

Table 19a - Highest Educational Qualification (Males)

Highest Qualification	N	%	Cum. %
a-level(s) or a degree	1,913	52.2	52.2
gcse at a-c or equivalent	519	14.2	66.4
other formal qualifications	347	9.5	75.9
no formal qualifications	878	24.0	99.8
missing	7	0.2	100.0
Total	**3,664**	**100.0**	

Table 19b - Highest Educational Qualification (Females)

Highest Qualification	N	%	Cum. %
a-level(s) or a degree	2,147	46.3	46.3
gcse at a-c or equivalent	676	14.6	60.8
other formal qualifications	272	5.9	66.7
no formal qualifications	1,538	33.1	99.8
missing	8	0.2	100.0
Total	**4,641**	**100.0**	

Table 20 - Economic Activity (Combined)

Economic Activity	N	%	Cum. %
employment	4,559	54.9	54.9
unemployed	326	3.9	58.8
retired	3,400	40.9	99.8
missing	20	0.2	100.0
Total	**8,305**	**100.0**	

Table 20a - Economic Activity (Males)

Economic Activity	N	%	Cum. %
employment	2,257	61.6	61.6
unemployed	225	6.1	67.7
retired	1,176	32.1	99.8
missing	6	0.2	100.0
Total	**3,664**	**100.0**	

Table 20b - Economic Activity (Females)

Economic Activity	N	%	Cum. %
employment	2,302	49.6	49.6
unemployed	101	2.2	51.8
retired	2,224	47.9	99.7
missing	14	0.3	100.0
Total	**4,641**	**100.0**	

Table 21 - Unemployment Benefit (Combined)

Unemployment Benefit	N	%	Cum. %
yes	172	2.1	2.1
no	8,133	97.9	100.0
Total	**8,305**	**100.0**	

Table 21a - Unemployment Benefit (Males)

Unemployment Benefit	N	%	Cum. %
yes	121	3.3	3.3
no	3,543	96.7	100.0
Total	**3,664**	**100.0**	

Table 21b - Unemployment Benefit (Females)

Unemployment Benefit	N	%	Cum. %
yes	51	1.1	1.1
no	4,590	98.9	100.0
Total	**4,641**	**100.0**	

Table 22 - Housing Tenure (Combined)

Housing Tenure	N	%	Cum. %
House owned outright or with mortgage	5,209	62.7	62.7
publicly rented	2,174	26.2	88.9
privately rented	917	11.0	99.9
missing	5	0.1	100.0
Total	**8,305**	**100.0**	

Table 22a - Housing Tenure (Males)

Housing Tenure	N	%	Cum. %
House owned outright or with mortgage	2,408	65.7	65.7
publicly rented	852	23.3	89.0
privately rented	400	10.9	99.9
missing	4	0.1	100.0
Total	**3,664**	**100.0**	

Table 22b - Housing Tenure (Females)

Housing Tenure	N	%	Cum. %
House owned outright or with mortgage	2,801	60.4	60.4
publicly rented	1,322	28.5	88.8
privately rented	517	11.1	100.0
missing	1	0.0	100.0
Total	**4,641**	**100.0**	

Table 23 - Overcrowding (>2 ppr) (Combined)

Overcrowding	N	%	Cum. %
yes - overcrowded	78	0.9	0.9
no - not overcrowded	8,227	99.1	100.0
Total	**8,305**	**100.0**	

Table 23a - Overcrowding (>2 ppr) (Males)

Overcrowding	N	%	Cum. %
yes - overcrowded	37	1.0	1.0
no - not overcrowded	3,627	99.0	100.0
Total	**3,664**	**100.0**	

Table 23b - Overcrowding (>2 ppr) (Females)

Overcrowding	N	%	Cum. %
yes - overcrowded	41	0.9	0.9
no - not overcrowded	4,600	99.1	100.0
Total	**4,641**	**100.0**	

Table 24 - Central Heating (Combined)

Central Heating	N	%	Cum. %
yes	7,615	91.7	91.7
no	690	8.3	100.0
Total	**8,305**	**100.0**	

Table 24a - Central Heating (Males)

Central Heating	N	%	Cum. %
yes	3,350	91.4	91.4
no	314	8.6	100.0
Total	**3,664**	**100.0**	

Table 24b - Central Heating (Females)

Central Heating	N	%	Cum. %
yes	4,265	91.9	91.9
no	376	8.1	100.0
Total	**4,641**	**100.0**	

Table 25 - Carstairs Area Deprivation (Combined)

Carstairs Quintiles	N	%	Cum. %
bottom	1,468	17.7	17.7
second	1,675	20.2	37.8
third	1,992	24.0	61.8
forth	1,536	18.5	80.3
top	1,625	19.6	99.9
missing	9	0.1	100.0
Total	**8,305**	**100.0**	

Table 25a - Carstairs Area Deprivation (Males)

Carstairs Quintiles	N	%	Cum. %
bottom	660	18.0	18.0
second	764	20.9	38.9
third	859	23.4	62.3
forth	654	17.9	80.2
top	722	19.7	99.9
missing	5	0.1	100.0
Total	**3,664**	**100.0**	

Table 25b - Carstairs Area Deprivation (Females)

Carstairs Quintiles	N	%	Cum. %
bottom	808	17.4	17.4
second	911	19.6	37.0
third	1,133	24.4	61.5
forth	882	19.0	80.5
top	903	19.5	99.9
missing	4	0.1	100.0
Total	**4,641**	**100.0**	

Table 26 - Urban Rural Classification (Combined)

Urban Rural Classification	N	%	Cum. %
Primary cities with a population of 125,000 or more	2,802	33.7	33.7
Urban settlements with a population of 10,000 or more	2,480	29.9	63.6
Small accessible* towns with a population of 3,000 or more	1,001	12.1	75.7
Small remote towns with a population of 3,000 or more	467	5.6	81.3
accessible* rural	925	11.1	92.4
remote rural	622	7.5	99.9
missing	8	0.1	100.0
Total	**8,305**	**100**	

*Accessible is defined as those areas that are within a 30-minute drive time from the centre of town with a population of 10,000 or more

Table 26a - Urban Rural Classification (Males)

Urban Rural Classification	N	%	Cum. %
Primary cities with a population of 125,000 or more	1,203	32.8	32.8
Urban settlements with a population of 10,000 or more	1,085	29.6	62.5
Small accessible* towns with a population of 3,000 or more	449	12.3	74.7
Small remote towns with a population of 3,000 or more	192	5.2	79.9
accessible* rural	432	11.8	91.7
remote rural	299	8.2	99.9
missing	4	0.1	100.0
Total	**3,664**	**100**	

*Accessible is defined as those areas that are within a 30-minute drive time from the centre of town with a population of 10,000 or more

Table 26b - Urban Rural Classification (Females)

Urban Rural Classification	N	%	Cum. %
Primary cities with a population of 125,000 or more	1,599	34.5	34.5
Urban settlements with a population of 10,000 or more	1,395	30.1	64.5
Small accessible* towns with a population of 3,000 or more	552	11.9	76.4
Small remote towns with a population of 3,000 or more	275	5.9	82.3
accessible* rural	493	10.6	93.0
remote rural	323	7.0	99.9
missing	4	0.1	100.0
Total	**4,641**	**100**	

*Accessible is defined as those areas that are within a 30-minute drive time from the centre of town with a population of 10,000 or more

Table 27 - Access to the nearest GP practice (Combined)

GP Drive Time	N	%	Cum. %
5 minutes or less	6,816	82.1	82.1
5 minutes plus	1,481	17.8	99.9
missing	8	0.1	100.0
Total	**8,305**	**100**	

Table 27a - Access to the nearest GP practice (Males)

GP Drive Time	N	%	Cum. %
5 minutes or less	2,992	81.7	81.7
5 minutes plus	668	18.2	99.9
missing	4	0.1	100.0
Total	**3,664**	**100**	

Table 27b- Access to the nearest GP practice (Females)

GP Drive Time	N	%	Cum. %
5 minutes or less	3,824	82.4	82.4
5 minutes plus	813	17.5	99.9
missing	4	0.1	100.0
Total	**4,641**	**100**	

Table 28 - Access to the nearest main hospital (Combined)

Straight Line Distance to Hospital	N	%	Cum. %
5km or less	3,248	39.1	39.1
between 5km and 10km	1,935	23.3	62.4
between 10km and 20km	1,456	17.5	79.9
between 20km and 30km	789	9.5	89.4
more than 30km	869	10.5	99.9
missing	8	0.1	100.0
Total	**8,305**	**100**	

Table 28a - Access to the nearest main hospital (Males)

Straight Line Distance to Hospital	N	%	Cum. %
5km or less	1,362	37.2	37.2
between 5km and 10km	893	24.4	61.5
between 10km and 20km	664	18.1	79.7
between 20km and 30km	365	10.0	89.6
more than 30km	376	10.3	99.9
missing	4	0.1	100.0
Total	**3,664**	**100**	

Table 28b - Access to the nearest main hospital (Females)

Straight Line Distance to Hospital	N	%	Cum. %
5km or less	1,886	40.6	40.6
between 5km and 10km	1,042	22.5	63.1
between 10km and 20km	792	17.1	80.2
between 20km and 30km	424	9.1	89.3
more than 30km	493	10.6	99.9
missing	4	0.1	100.0
Total	**4,641**	**100**	

Table 29 - Drive time to nearest hospital (Combined)

Hospital Time	N	%	Cum. %
30 minutes or less	7,824	94.2	94.2
30 to 60 minutes	123	1.5	95.7
more than 60 minutes	80	1.0	96.7
Missing	278	3.4	100.0
Total	**8,305**	**100**	

Table 29a - Drive time to nearest hospital (Males)

Hospital Time	N	%	Cum. %
30 minutes or less	3,440	93.9	93.9
30 to 60 minutes	64	1.8	95.6
more than 60 minutes	42	1.2	96.8
Missing	118	3.2	100.0
Total	**3,664**	**100**	

Table 29b - Drive time to nearest hospital (Females)

Hospital Time	N	%	Cum. %
30 minutes or less	4,384	94.5	94.5
30 to 60 minutes	59	1.3	95.7
more than 60 minutes	38	0.8	96.6
Missing	160	3.5	100.0
Total	**4,641**	**100**	

APPENDIX 2(d)- Health Status at Survey Risk Factor Fequencies

Table 30 - Self-Assessed General Health (Combined)

General Health	N	%	Cum. %
very good	2,917	35.1	35.1
good	3,280	39.5	74.6
fair	1,568	18.9	93.5
bad	450	5.4	98.9
very bad	90	1.1	100.0
Total	**8,305**	**100.0**	

Table 30a Self-Assessed General Health (Males)

General Health	N	%	Cum. %
very good	1,233	33.7	33.7
good	1,477	40.3	74.0
fair	708	19.3	93.3
bad	197	5.4	98.7
very bad	49	1.3	100.0
Total	**3,664**	**100.0**	

Table 30b - Self-Assessed General Health (Females)

General Health	N	%	Cum. %
very good	1,684	36.3	36.3
good	1,803	38.9	75.1
fair	860	18.5	93.7
bad	253	5.5	99.1
very bad	41	0.9	100.0
Total	**4,641**	**100.0**	

Table 31 General Health Questionnaire (Combined)

GHQ-12	N	%	Cum. %
zero score	4,720	56.8	56.8
1 to 3 score	2,139	25.8	82.6
4 plus score	1,383	16.7	99.2
missing	63	0.8	100.0
Total	**8,305**	**100.0**	

Table 31a - General Health Questionnaire (Males)

GHQ-12 Score	N	%	Cum. %
zero score	2,208	60.3	60.3
1 to 3 score	921	25.1	85.4
4 plus score	500	13.7	99.0
missing	35	1.0	100.0
Total	**3,664**	**100.0**	

Table 31b - General Health Questionnaire (Females)

GHQ-12	N	%	Cum. %
zero score	2,512	54.1	54.1
1 to 3 score	1,218	26.2	80.4
4 plus score	883	19.0	99.4
missing	28	0.6	100.0
Total	**4,641**	**100.0**	

Table 32 Limiting Long Standing Illness (Combined)

LSI	N	%	Cum. %
Limiting Longstanding Illness	2,203	26.5	26.5
Non Limiting Longstanding Illness	1,394	16.8	43.3
No Limiting Longstanding Illness	4,708	56.7	100.0
Total	**8,305**	**100.0**	

Table 32a - Limiting Long Standing Illness (Males)

LSI	N	%	Cum. %
Limiting Longstanding Illness	940	25.7	25.7
Non Limiting Longstanding Illness	636	17.4	43.0
No Limiting Longstanding Illness	2,088	57.0	100.0
Total	**3,664**	**100.0**	

Table 32b - Limiting Long Standing Illness (Females)

LSI	N	%	Cum. %
Limiting Longstanding Illness	1,263	27.2	27.2
Non Limiting Longstanding Illness	758	16.3	43.6
No Limiting Longstanding Illness	2,620	56.5	100.0
Total	**4,641**	**100.0**	

Table 33 - No. of Longtanding Illnesses (Combined)

No. LSI	N	%	Cum. %
No longtanding Illness	4,720	56.8	56.8
One longtanding Illness	2,345	28.2	85.1
Two Longtanding Illnesses	894	10.8	95.8
Three or more Longtanding Illnesses	346	4.2	100.0
Total	**8,305**	**100.0**	

Table 33a - No. of Longtanding Illnesses (Males)

No. LSI	N	%	Cum. %
No longtanding Illness	2,090	57.0	57.0
One longtanding Illness	1,061	29.0	86.0
Two Longtanding Illnesses	383	10.5	96.5
Three or more Longtanding Illnesses	130	3.6	100.0
Total	**3,664**	**100.0**	

Table 33b - No. of Longtanding Illnesses (Females)

No. LSI	N	%	Cum. %
No longtanding Illness	2,630	56.7	56.7
One longtanding Illness	1,284	27.7	84.3
Two Longtanding Illnesses	511	11.0	95.4
Three or more Longtanding Illnesses	216	4.7	100.0
Total	**4,641**	**100.0**	

Table 34 - Incapacity Benefits (Combined)

Incapacity Benefits	N	%	Cum. %
yes	564	6.8	6.8
no	7,741	93.2	100.0
Total	**8,305**	**100.0**	

Table 34a- Incapacity Benefits (Males)

Incapacity Benefits	N	%	Cum. %
yes	309	8.4	8.4
no	3,355	91.6	100.0
Total	**3,664**	**100.0**	

Table 34b - Incapacity Benefits (Females)

Incapacity Benefits	N	%	Cum. %
yes	255	5.5	5.5
no	4,386	94.5	100.0
Total	**4,641**	**100.0**	

APPENDIX 2(e)- Number of prior admissions, Risk Factor Fequency

Table 35 - Number of Prior Admissions (Combined)

Prior Admissions	N	%	Cum. %
none	5,078	61.1	61.1
one	1,641	19.8	80.9
two	675	8.1	89.0
three	354	4.3	93.3
four or more	557	6.7	100.0
Total	**8,305**	**100.0**	

Table 35a Number of Prior Admissions (Males)

Prior Admissions	N	%	Cum. %
none	2,291	62.5	62.5
one	688	18.8	81.3
two	269	7.3	88.7
three	154	4.2	92.9
four or more	262	7.2	100.0
Total	**3,664**	**100.0**	

Table 35b - Number of Prior Admissions (Females)

Prior Admissions	N	%	Cum. %
none	2,787	60.1	60.1
one	953	20.5	80.6
two	406	8.8	89.3
three	200	4.3	93.6
four or more	295	6.4	100.0
Total	**4,641**	**100.0**	

APPENDIX 3 Key Migration Statistics

The following key points and statistics regarding migration/emigration are from the GRO Scotland 2003 Annual Review and data from the 2001 Census.

- Although historically, Scotland has been a nation of net out-migration rather than net in-migration, ***in 6 out of the last 14 years***, Scotland experienced net migration ***gain*** rather than loss.
- Over the last 10 years there has typically been approximately ***70,000*** migrants annually ***both in and out*** of Scotland.
- ***47,766*** people moved ***from*** Scotland to elsewhere in the UK within the year prior to the 2001 census in comparison to ***47,823*** people moving ***into*** Scotland from elsewhere in the UK.
- ***28,868*** moved ***from outwith the UK*** to Scotland in the year prior to the census but no equivalent information is available for Scottish residents having moved overseas.
- The largest net-migration rates between Scotland and the rest of the UK was for the ***16-24*** age group (2.52% leaving Scotland versus 2.26% in-migration, a ***net loss of –0.26%)*** and in the ***25-34*** age group (***net loss –0.17%***). All other age groups showed small net gains in migration.
- Only about **25%** of Scots-domiciled students who study elsewhere in the UK find employment in Scotland within 6 months of graduation.
- There was ***no*** appreciable difference between males and females in net migration with the rest of the UK.
- Net migration losses to the rest of the UK were observed in people ***without*** long-term limiting illnesses and those in ***"good"*** health.

Appendix 4a - 'Age & Sex Standardised Association' between Behavioural Risk Factors and Hospital Admission & Death

Behavioural Risk Factors	N	N(%)[1]	1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
			Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]
SMOKING (Combined)											
Never regularly smoked†	3,351	44.1	1.00			1.00			1.00		
Ex smoker	1,496	17.6	1.20	(1.08 to 1.33)	**	1.30	(1.10 to 1.53)	**	1.60	(1.17 to 2.20)	**
Light smoker, (<10) or cigar, pipe or high continine	863	11.3	1.19	(1.04 to 1.36)	**	1.36	(1.10 to 1.69)	**	2.14	(1.44 to 3.18)	***
Moderate smoker, 10-20 per day	1,141	13.7	1.52	(1.36 to 1.70)	***	1.65	(1.37 to 1.98)	***	3.20	(2.26 to 4.54)	***
Heavy smoker, 20 plus per day	1,109	13.0	1.73	(1.54 to 1.94)	***	2.15	(1.78 to 2.60)	***	3.85	(2.76 to 5.36)	***
Missing	14	0.3	1.19	(0.44 to 3.21)	n/s	n/a	n/a	n/a	15.79	(3.46 to 71.99)	***
SMOKING (Male)											
Never regularly smoked†	1,310	39.7	1.00			1.00			1.00		
Ex smoker	724	18.7	1.21	(1.03 to 1.42)	*	1.43	(1.11 to 1.85)	**	1.45	(0.94 to 2.25)	n/s
Light smoker, (<10) or cigar, pipe or high continine	449	13.3	1.16	(0.95 to 1.42)	n/s	1.38	(1.00 to 1.91)	*	1.93	(1.19 to 3.12)	**
Moderate smoker, 10-20 per day	481	13.8	1.48	(1.25 to 1.76)	***	1.93	(1.47 to 2.55)	***	2.78	(1.64 to 4.73)	***
Heavy smoker, 20 plus per day	539	14.4	1.70	(1.43 to 2.02)	***	2.33	(1.74 to 3.11)	***	3.28	(2.04 to 5.27)	***
Missing	4	0.2	0.88	(0.17 to 4.62)	n/s	n/a	n/a	n/a	42.11	(24.37 to 72.76)	***
SMOKING (Female)											
Never regularly smoked†	2,041	48.5	1.00			1.00			1.00		
Ex smoker	772	16.5	1.18	(1.02 to 1.37)	*	1.20	(0.97 to 1.49)	n/s	1.78	(1.10 to 2.87)	*
Light smoker, (<10) or cigar, pipe or high continine	414	9.4	1.23	(1.04 to 1.47)	*	1.41	(1.06 to 1.88)	*	2.39	(1.32 to 4.32)	**
Moderate smoker, 10-20 per day	660	13.7	1.55	(1.34 to 1.79)	***	1.45	(1.13 to 1.86)	**	3.66	(2.28 to 5.88)	***
Heavy smoker, 20 plus per day	570	11.7	1.75	(1.50 to 2.04)	***	2.03	(1.59 to 2.60)	***	4.64	(2.86 to 7.54)	***
Missing	10	0.4	1.34	(0.38 to 4.71)	n/s	n/a	n/a	n/a	n/a	n/a	n/a
DRINKING (Combined)											
Never drank & Trivial	483	5.5	1.00	(0.85 to 1.17)	n/s	1.00	(0.80 to 1.25)	n/s	0.94	(0.63 to 1.39)	n/s
Ex-drinker	384	4.1	1.29	(1.08 to 1.53)	**	1.38	(1.10 to 1.72)	**	1.48	(1.00 to 2.20)	n/s
Light Drinker†	3,762	45.7	1.00			1.00			1.00		
Moderate Drinker	1,599	20.9	0.88	(0.79 to 0.98)	*	0.86	(0.73 to 1.00)	n/s	1.00	(0.75 to 1.34)	n/s
Heavy Drinker	684	9.1	0.91	(0.79 to 1.04)	n/s	1.13	(0.91 to 1.42)	n/s	0.83	(0.50 to 1.39)	n/s
Excessive Drinker	996	13.7	0.98	(0.87 to 1.10)	n/s	0.95	(0.77 to 1.17)	n/s	1.36	(0.95 to 1.94)	n/s
Missing	66	1.0	1.57	(1.01 to 2.42)	*	2.41	(1.07 to 5.41)	*	3.52	(1.03 to 12.06)	*
DRINKING (Male)											
Never drank & Trivial	129	3.4	1.20	(0.86 to 1.67)	n/s	1.24	(0.78 to 1.98)	n/s	1.52	(0.84 to 2.73)	n/s
Ex-drinker	154	3.6	1.41	(1.09 to 1.82)	**	1.59	(1.12 to 2.24)	*	1.58	(0.92 to 2.73)	n/s
Light Drinker (Over 0-10 units per week) †	1,248	35.3	1.00			1.00			1.00		
Moderate Drinker (Over 10-21 units per week)	843	24.5	0.92	(0.78 to 1.08)	n/s	0.93	(0.73 to 1.19)	n/s	1.07	(0.71 to 1.61)	n/s
Heavy Drinker (Over 21-28 units per week)	357	10.6	0.92	(0.74 to 1.13)	n/s	1.46	(1.06 to 2.02)	*	1.07	(0.58 to 1.97)	n/s
Excessive Drinker (Over 28 units per week)	744	21.5	1.00	(0.86 to 1.17)	n/s	1.03	(0.80 to 1.31)	n/s	1.43	(0.94 to 2.19)	n/s
Missing	32	1.1	1.55	(0.82 to 2.92)	n/s	2.47	(0.66 to 9.18)	n/s	n/a	n/a	n/a

Notes:

1. Weighted category proportions using survey weighting variable -*weighta*

2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant; n/a = not applicable (category cases excluded from model, due to zero admissions/deaths)

† - reference category of variable

Behavioural Risk Factors	N	N(%)[1]	1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
			Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]
DRINKING (Female)											
Never drank & Trivial	354	7.5	0.91	(0.75 to 1.10)	n/s	0.90	(0.69 to 1.16)	n/s	0.65	(0.38 to 1.11)	n/s
Ex-drinker	230	4.6	1.21	(0.97 to 1.50)	n/s	1.25	(0.93 to 1.68)	n/s	1.40	(0.79 to 2.48)	n/s
Light Drinker (Over 0-7 units per week) †	2,514	55.9	1.00			1.00			1.00		
Moderate Drinker (Over 7-14 units per week)	756	17.5	0.85	(0.74 to 0.98)	*	0.81	(0.66 to 1.00)	*	0.95	(0.56 to 1.64)	n/s
Heavy Drinker (Over 14-21 units per week)	327	7.7	0.91	(0.74 to 1.12)	n/s	0.80	(0.56 to 1.13)	n/s	0.42	(0.17 to 1.07)	n/s
Excessive Drinker (Over 21-28 units per week)	252	6.0	0.98	(0.78 to 1.22)	n/s	0.92	(0.62 to 1.37)	n/s	1.55	(0.72 to 3.30)	n/s
Missing	34	0.9	1.60	(0.93 to 2.75)	n/s	2.40	(0.89 to 6.48)	n/s	5.59	(1.79 to 17.76)	**
PHYSICAL ACTIVITY (Combined)											
Low Activity†	3,076	35.8	1.00			1.00			1.00		
Medium Activity	2,531	32.3	0.78	(0.70 to 0.86)	***	0.70	(0.60 to 0.82)	***	0.46	(0.34 to 0.61)	***
High Activity	2,357	31.8	0.89	(0.81 to 0.98)	*	0.66	(0.56 to 0.79)	***	0.43	(0.29 to 0.63)	***
Missing	10	0.1	0.66	(0.27 to 1.62)	n/s	1.14	(0.34 to 3.84)	n/s	1.75	(0.38 to 8.16)	n/s
PHYSICAL ACTIVITY (Male)											
Low Activity†	1,329	33.7	1.00			1.00			1.00		
Medium Activity	971	28.8	0.76	(0.66 to 0.89)	**	0.70	(0.56 to 0.88)	**	0.44	(0.30 to 0.64)	***
High Activity	1,202	37.4	0.96	(0.83 to 1.10)	n/s	0.61	(0.48 to 0.78)	***	0.47	(0.30 to 0.74)	**
Missing	5	0.2	0.38	(0.07 to 2.11)	n/s	1.12	(0.21 to 6.04)	n/s	n/a	n/a	n/a
PHYSICAL ACTIVITY (Female)											
Low Activity†	1,747	37.8	1.00			1.00			1.00		
Medium Activity	1,560	35.8	0.78	(0.709 to 0.88)	***	0.71	(0.57 to 0.87)	**	0.48	(0.30 to 0.78)	**
High Activity	1,155	26.3	0.82	(0.72 to 0.95)	**	0.73	(0.57 to 0.93)	*	0.35	(0.17 to 0.69)	**
Missing	5	0.1	1.29	(0.45 to 3.64)	n/s	1.17	(0.23 to 5.79)	n/s	4.79	(1.00 to 22.91)	n/s
DIET (Combined)											
Reaches Daily Guide Line - NO	6,623	83.6	1.04	(0.94 to 1.15)	n/s	1.24	(1.06 to 1.45)	**	1.85	(1.25 to 2.72)	**
Reaches Daily Guide Line - YES†	1,351	16.5	1.00			1.00			1.00		
DIET - Male											
Reaches Daily Guide Line - NO	3,074	87.7	1.01	(0.85 to 1.18)	n/s	1.18	(0.90 to 1.55)	n/s	1.29	(0.76 to 2.18)	n/s
Reaches Daily Guide Line - YES†	433	12.4	1.00			1.00			1.00		
DIET - Female											
Reaches Daily Guide Line - NO	3,549	79.5	1.06	(0.94 to 1.20)	n/s	1.27	(1.04 to 1.56)	*	2.78	(1.72 to 4.47)	***
Reaches Daily Guide Line - YES†	918	20.5	1.00			1.00			1.00		

Notes:

1. Weighted category proportions using survey weighting variable - *weighta*

2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant;

† - reference category of variable

Appendix 4b - 'Age & Sex Standardised Association' between Biological Risk Factors and Hospital Admission & Death

Biological Risk Factors	N	N(%)[1]	1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
			Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]
BMIGROUP - (Combined)											
Underweight (Under 20)	383	4.9	1.15	(0.94 to 1.41)	n/s	1.64	(1.20 to 2.23)	**	2.55	(1.65 to 3.95)	***
Desirable (20-25)†	2,528	32.5	1.00			1.00			1.00		
Overweight (25-30)	2,730	34.2	1.10	(0.99 to 1.21)	n/s	1.12	(0.95 to 1.32)	n/s	0.76	(0.56 to 1.02)	n/s
Obese (Over 30)[3]	1,615	19.5	1.18	(1.06 to 1.31)	**	1.27	(1.05 to 1.52)	*	0.66	(0.47 to 0.93)	*
Missing	718	8.8	1.21	(1.04 to 1.39)	*	1.56	(1.24 to 1.97)	***	1.68	(1.19 to 2.37)	**
BMIGROUP - (Male)											
Underweight (Under 20)	137	4.1	1.18	(0.87 to 1.61)	n/s	1.40	(0.84 to 2.33)	n/s	2.00	(1.06 to 3.81)	*
Desirable (20-25)†	1,019	30.7	1.00			1.00			1.00		
Overweight (25-30)[3]	1,404	39.2	1.01	(0.88 to 1.17)	n/s	1.00	(0.79 to 1.28)	n/s	0.65	(0.45 to 0.95)	*
Obese (Over 30)[3]	670	18.6	1.02	(0.85 to 1.21)	n/s	1.16	(0.86 to 1.56)	n/s	0.58	(0.36 to 0.93)	*
Missing	277	7.4	1.28	(1.01 to 1.63)	*	1.82	(1.29 to 2.56)	**	1.73	(1.08 to 2.75)	*
BMIGROUP - (Female)											
Underweight (Under 20)	246	5.7	1.15	(0.88 to 1.50)	n/s	1.82	(1.21 to 2.74)	**	3.30	(1.62 to 6.70)	**
Desirable (20-25)†	1,509	34.4	1.00			1.00			1.00		
Overweight (25-30)	1,326	29.4	1.17	(1.03 to 1.34)	*	1.25	(1.01 to 1.55)	*	0.96	(0.60 to 1.53)	n/s
Obese (Over 30)	945	20.4	1.32	(1.16 to 1.51)	***	1.37	(1.08 to 1.73)	*	0.79	(0.47 to 1.33)	n/s
Missing	441	10.3	1.16	(0.96 to 1.39)	n/s	1.36	(0.99 to 1.85)	n/s	1.63	(0.96 to 2.79)	n/s
WAIST HIP RATIO (Combined)											
Normal†	4,925	63.8	1.00			1.00			1.00		
Raised	1,703	19.0	1.22	(1.12 to 1.33)	***	1.35	(1.18 to 1.54)	***	1.31	(1.03 to 1.67)	*
Missing	1,346	17.3	1.08	(0.97 to 1.21)	n/s	1.39	(1.16 to 1.66)	***	1.80	(1.34 to 2.44)	***
WAIST HIP RATIO (Male)											
Normal†	2,124	63.1	1.00			1.00			1.00		
Raised	850	21.1	1.19	(1.04 to 1.35)	**	1.26	(1.03 to 1.54)	*	1.14	(0.83 to 1.57)	n/s
Missing	533	15.8	1.05	(0.87 to 1.26)	n/s	1.53	(1.16 to 2.02)	**	1.88	(1.23 to 2.86)	**
WAIST HIP RATIO (Female)											
Normal†	2,801	64.4	1.00			1.00			1.00		
Raised	853	16.8	1.25	(1.10 to 1.42)	**	1.45	(1.21 to 1.73)	***	1.62	(1.13 to 2.33)	**
Missing	813	18.8	1.11	(0.96 to 1.27)	n/s	1.29	(1.03 to 1.62)	*	1.77	(1.12 to 2.79)	*

Notes:

1. Weighted category proportions using survey weighting variable - *weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant;
3. Combined Obese Hazard Ratio (HR) and Male Overweight & Obese HR for 'Death' - Significance probably a chance finding related to low number of deaths, length of follow-up period and statistical power. These issues will be examined in subsequent analyses to be undertaken by the group in due course

† - reference category of variable

Biological Risk Factors	N	N(%)[1]	1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
			Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]
BLOOD PRESSURE - (Combined)											
Hypertensive Untreated	1,380	15.6	1.01	(0.90 to 1.13)	n/s	1.09	(0.93 to 1.28)	n/s	1.18	(0.87 to 1.60)	n/s
Hypertensive Treated	554	5.5	1.31	(1.13 to 1.53)	**	1.61	(1.33 to 1.97)	***	1.45	(1.00 to 2.110)	*
Normotensive Treated	429	4.6	1.68	(1.44 to 1.96)	***	1.79	(1.42 to 2.25)	***	2.19	(1.47 to 3.27)	***
Normotensive Untreated†	4,311	57.7	1.00			1.00			1.00		
Missing	1,300	16.6	1.04	(0.92 to 1.17)	n/s	1.31	(1.08 to 1.58)	**	1.71	(1.20 to 2.44)	**
BLOOD PRESSURE - Male											
Hypertensive Untreated	719	18.2	0.97	(0.83 to 1.14)	n/s	1.17	(0.93 to 1.48)	n/s	1.28	(0.81 to 2.01)	n/s
Hypertensive Treated	241	5.2	1.26	(1.00 to 1.58)	n/s	1.66	(1.23 to 2.23)	**	1.62	(0.98 to 2.69)	n/s
Normotensive Treated	185	4.4	1.86	(1.456 to 2.38)	***	2.37	(1.70 to 3.30)	***	2.71	(1.57 to 4.68)	***
Normotensive Untreated†	1,848	57.0	1.00			1.00			1.00		
Missing	514	15.2	0.97	(0.80 to 1.18)	n/s	1.46	(1.09 to 1.97)	*	1.99	(1.17 to 3.39)	*
BLOOD PRESSURE - (Female)											
Hypertensive Untreated	661	13.0	1.05	(0.90 to 1.24)	n/s	1.01	(0.80 to 1.28)	n/s	1.05	(0.64 to 1.72)	n/s
Hypertensive Treated	313	5.7	1.37	(1.12 to 1.69)	**	1.58	(1.20 to 2.07)	**	1.25	(0.71 to 2.20)	n/s
Normotensive Treated	244	4.8	1.54	(1.27 to 1.87)	***	1.35	(1.02 to 1.80)	*	1.60	(0.85 to 3.02)	n/s
Normotensive Untreated†	2,463	58.4	1.00			1.00			1.00		
Missing	786	18.0	1.09	(0.94 to 1.26)	n/s	1.19	(0.94 to 1.51)	n/s	1.41	(0.84 to 2.36)	n/s
TOTAL CHOLESTEROL - (Combined)											
Desirable Range†	2,173	29.6	1.00			1.00			1.00		
Mildly Raised	2,168	26.4	1.05	(0.94 to 1.18)	n/s	1.08	(0.91 to 1.28)	n/s	1.12	(0.83 to 1.52)	n/s
Moderately Raised[4]	879	10.0	0.90	(0.78 to 1.05)	n/s	0.78	(0.62 to 0.98)	*	0.56	(0.36 to 0.87)	*
Severly Raised	190	1.9	0.98	(0.76 to 1.27)	n/s	0.92	(0.64 to 1.31)	n/s	0.87	(0.42 to 1.79)	n/s
Missing	2,564	32.1	1.12	(1.01 to 1.25)	*	1.21	(1.02 to 1.45)	*	1.39	(0.99 to 1.95)	n/s
TOTAL CHOLESTEROL - (Male)											
Desirable Range†	990	30.6	1.00			1.00			1.00		
Mildly Raised	1,023	27.6	1.11	(0.93 to 1.31)	n/s	1.06	(0.82 to 1.35)	n/s	1.05	(0.74 to 1.50)	n/s
Moderately Raised	386	10.2	0.97	(0.78 to 1.21)	n/s	0.85	(0.60 to 1.20)	n/s	0.54	(0.28 to 1.03)	n/s
Severly Raised	65	1.7	0.94	(0.56 to 1.59)	n/s	0.47	(0.19 to 1.14)	n/s	0.36	(0.09 to 1.44)	n/s
Missing	1,043	29.9	1.20	(1.02 to 1.42)	*	1.30	(1.00 to 1.69)	n/s	1.52	(0.99 to 2.33)	n/s

Notes:

1. Weighted category proportions using survey weighting variable -*weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant;
4. Combined Moderately Raised Hazard Ratio (HR) for 'Serious Admission' and 'Death' and Female Moderately Raised HR for 'Serious Admission'- Significance probably a chance finding related to length of follow-up period and statistical power.

† - reference category of variable

Biological Risk Factors	N	N(%)[1]	1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
			Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]
TOTAL CHOLESTEROL - (Female)											
Desirable Range†	1,183	28.7	1.00			1.00			1.00		
Mildly Raised	1,145	25.2	1.00	(0.86 to 1.17)	n/s	1.10	(0.86 to 1.41)	n/s	1.22	(0.69 to 2.16)	n/s
Moderately Raised[4]	493	9.7	0.84	(0.69 to 1.03)	n/s	0.72	(0.52 to 1.00)	n/s	0.57	(0.28 to 1.15)	n/s
Severly Raised	125	2.2	0.98	(0.75 to 1.29)	n/s	1.09	(0.72 to 1.66)	n/s	1.04	(0.43 to 2.52)	n/s
Missing	1,521	34.2	1.05	(0.91 to 1.21)	n/s	1.14	(0.90 to 1.44)	n/s	1.24	(0.72 to 2.14)	n/s
HDL - CHOLESTEROL - (Combined)											
Low	1,136	13.5	1.23	(1.11 to 1.37)	***	1.20	(1.02 to 1.41)	*	1.33	(0.97 to 1.81)	n/s
Desirable†	4,245	54.1	1.00			1.00			1.00		
Missing	2,593	32.5	1.18	(1.08 to 1.28)	***	1.30	(1.12 to 1.49)	***	1.59	(1.24 to 2.04)	***
HDL - CHOLESTEROL - (Male)											
Low	407	11.4	1.27	(1.08 to 1.49)	**	1.29	(0.99 to 1.68)	n/s	1.06	(0.68 to 1.65)	n/s
Desirable†	2,041	58.2	1.00			1.00			1.00		
Missing	1,059	30.4	1.23	(1.08 to 1.40)	**	1.40	(1.14 to 1.72)	**	1.63	(1.15 to 2.31)	**
HDL - CHOLESTEROL - (Female)											
Low	729	15.5	1.20	(1.03 to 1.40)	*	1.12	(0.92 to 1.37)	n/s	1.66	(1.10 to 2.52)	*
Desirable†	2,204	50.0	1.00			1.00			1.00		
Missing	1,534	34.5	1.13	(1.01 to 1.27)	*	1.20	(1.00 to 1.44)	*	1.55	(1.08 to 2.24)	*
GAMMA-GT (Combined)											
Normal†	4,003	51.6	1.00			1.00			1.00		
High	1,535	17.6	1.18	(1.06 to 1.30)	**	1.26	(1.09 to 1.47)	**	1.48	(1.13 to 1.95)	**
Missing	2,436	30.8	1.13	(1.03 to 1.24)	*	1.31	(1.13 to 1.52)	***	1.88	(1.45 to 2.44)	***
GAMMA-GT (Male)											
Normal†	1,945	56.2	1.00			1.00			1.00		
High	587	15.5	1.10	(0.94 to 1.28)	n/s	1.17	(0.92 to 1.49)	n/s	1.37	(0.93 to 2.02)	n/s
Missing	975	28.4	1.13	(0.98 to 1.30)	n/s	1.32	(1.06 to 1.64)	*	1.95	(1.37 to 2.77)	***
GAMMA-GT (Female)											
Normal†	2,059	47.1	1.00			1.00			1.00		
High	948	19.8	1.24	(1.09 to 1.43)	**	1.34	(1.11 to 1.62)	**	1.59	(1.08 to 2.36)	*
Missing	1,461	33.1	1.13	(1.01 to 1.27)	*	1.30	(1.07 to 1.58)	**	1.79	(1.22 to 2.63)	**

Notes:

1. Weighted category proportions using survey weighting variable - *weighta*

2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant;

† - reference category of variable

Biological Risk Factors	N	N(%)[1]	1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
			Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]
FIBRINOGEN (Combined)											
Quintile1†	942	13.3	1.00			1.00			1.00		
Quintile2	882	12.0	0.93	(0.79 to 1.11)	n/s	0.96	(0.69 to 1.33)	n/s	0.55	(0.27 to 1.13)	n/s
Quintile3	1,189	15.4	0.94	(0.80 to 1.10)	n/s	1.16	(0.86 to 1.58)	n/s	0.91	(0.46 to 1.79)	n/s
Quintile4	892	10.4	0.96	(0.81 to 1.13)	n/s	1.32	(0.97 to 1.80)	n/s	0.95	(0.50 to 1.81)	n/s
Quintile5	1,075	12.1	1.28	(1.09 to 1.49)	**	1.96	(1.46 to 2.62)	***	1.73	(0.94 to 3.19)	n/s
Missing	2,994	36.9	1.16	(1.01 to 1.32)	*	1.68	(1.28 to 2.9)	***	1.57	(0.87 to 2.84)	n/s
FIBRINOGEN (Male)											
Quintile1†	409	13.5	1.00			1.00			1.00		
Quintile2	409	12.9	0.85	(0.65 to 1.11)	n/s	0.99	(0.58 to 1.68)	n/s	0.33	(0.10 to 1.10)	n/s
Quintile3	563	16.2	0.78	(0.62 to 0.98)	*	1.09	(0.69 to 1.73)	n/s	1.24	(0.49 to 3.15)	n/s
Quintile4	399	10.3	0.85	(0.66 to 1.09)	n/s	1.20	(0.74 to 1.94)	n/s	0.86	(0.35 to 2.15)	n/s
Quintile5	489	12.3	1.34	(1.06 to 1.68)	*	2.20	(1.40 to 3.47)	**	1.78	(0.74 to 4.26)	n/s
Missing	1,238	34.8	1.09	(0.89 to 1.34)	n/s	1.79	(1.19 to 2.69)	**	1.74	(0.73 to 4.18)	n/s
FIBRINOGEN (Female)											
Quintile1†	533	13.0	1.00			1.00			1.00		
Quintile2	473	11.1	1.03	(0.82 to 1.29)	n/s	0.94	(0.62 to 1.41)	n/s	0.82	(0.31 to 2.14)	n/s
Quintile3	626	14.5	1.12	(0.90 to 1.39)	n/s	1.23	(0.84 to 1.82)	n/s	0.51	(0.18 to 1.42)	n/s
Quintile4	493	10.6	1.07	(0.85 to 1.34)	n/s	1.45	(0.98 to 2.13)	n/s	1.12	(0.41 to 3.05)	n/s
Quintile5	586	11.9	1.21	(0.99 to 1.48)	n/s	1.73	(1.22 to 2.46)	**	1.69	(0.70 to 4.08)	n/s
Missing	1,756	38.9	1.22	(1.02 to 1.47)	*	1.58	(1.12 to 2.23)	**	1.39	(0.62 to 3.13)	n/s
C-REACTIVE PROTEIN (Combined)											
Quintile1†	1,081	14.7	1.00			1.00			1.00		
Quintile2	1,056	13.8	0.91	(0.77 to 1.08)	n/s	1.10	(0.80 to 1.51)	n/s	1.10	(0.56 to 2.20)	n/s
Quintile3	1,016	12.5	1.18	(1.00 to 1.39)	n/s	1.49	(1.12 to 1.98)	**	1.27	(0.68 to 2.40)	n/s
Quintile4	1,121	13.6	1.10	(0.94 to 1.28)	n/s	1.45	(1.09 to 1.93)	*	1.37	(0.78 to 2.42)	n/s
Quintile5	1,194	13.7	1.45	(1.26 to 1.67)	***	2.18	(1.66 to 2.86)	***	3.15	(1.84 to 5.41)	***
Missing	2,506	31.6	1.22	(1.07 to 1.40)	**	1.82	(1.40 to 2.36)	***	3.05	(1.77 to 5.27)	***
C-REACTIVE PROTEIN (Male)											
Quintile1†	443	14.0	1.00			1.00			1.00		
Quintile2	511	15.5	1.07	(0.83 to 1.40)	n/s	1.33	(0.81 to 2.19)	n/s	1.17	(0.44 to 3.11)	n/s
Quintile3	473	13.2	1.26	(0.97 to 1.63)	n/s	1.72	(1.07 to 2.76)	*	1.08	(0.41 to 2.84)	n/s
Quintile4	523	13.8	1.13	(0.89 to 1.43)	n/s	1.63	(1.01 to 2.62)	*	1.38	(0.60 to 3.80)	n/s
Quintile5	545	14.0	1.59	(1.27 to 1.99)	***	2.46	(1.56 to 3.87)	***	3.39	(1.58 to 7.62)	**
Missing	1,012	29.4	1.36	(1.10 to 1.69)	**	2.21	(1.43 to 3.42)	***	3.58	(1.59 to 8.08)	**

Notes:

1. Weighted category proportions using survey weighting variable - *weighta*

2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant;

† - reference category of variable

Biological Risk Factors	N	N(%)[1]	1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
			Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]
C-REACTIVE PROTEIN (Female)											
Quintile1†	638	15.5	1.00	checked		1.00	checked		1.00	checked	
Quintile2	545	12.1	0.78	(0.62 to 0.97)	*	0.93	(0.62 to 1.40)	n/s	1.04	(0.39 to 2.78)	n/s
Quintile3	543	11.8	1.12	(0.90 to 1.40)	n/s	1.35	(0.94 to 1.94)	n/s	1.53	(0.65 to 3.61)	n/s
Quintile4	598	13.4	1.09	(0.88 to 1.34)	n/s	1.35	(0.96 to 1.89)	n/s	1.37	(0.60 to 3.16)	n/s
Quintile5	649	13.4	1.35	(1.12 to 1.62)	**	2.02	(1.47 to 2.77)	***	2.89	(1.33 to 6.29)	**
Missing	1,494	33.8	1.12	(0.95 to 1.33)	n/s	1.57	(1.15 to 2.15)	**	2.50	(1.17 to 5.34)	*
FEV (Combined)											
Equal to or in excess of predicted values †	3,230	41.1	1.00			1.00			1.00		
Within 1 standard deviation below the predicted values	1,699	21.1	1.15	(1.03 to 1.28)	*	1.35	(1.13 to 1.62)	**	1.46	(1.00 to 2.11)	*
1 to 1.64 standard deviations below the predicted values	601	7.5	1.38	(1.18 to 1.60)	***	1.76	(1.42 to 2.18)	***	2.68	(1.79 to 4.03)	***
More than 1.64 sd below the pred values ('low')"	554	6.6	1.56	(1.35 to 1.81)	***	2.21	(1.79 to 2.73)	***	4.03	(2.80 to 5.79)	***
Missing	1,890	23.6	1.28	(1.15 to 1.43)	***	1.82	(1.55 to 2.13)	***	3.49	(2.58 to 4.74)	***
FEV (Male)											
Equal to or in excess of predicted values †	1,401	41.1	1.00			1.00			1.00		
Within 1 standard deviation below the predicted values	766	21.6	1.15	(0.98 to 1.35)	n/s	1.40	(1.06 to 1.84)	*	1.09	(0.68 to 1.75)	n/s
1 to 1.64 standard deviations below the predicted values	277	7.9	1.49	(1.20 to 1.85)	***	2.30	(1.69 to 3.13)	***	2.44	(1.45 to 4.12)	**
More than 1.64 sd below the pred values ('low')"	280	7.0	1.54	(1.26 to 1.89)	***	2.33	(1.73 to 3.14)	***	3.68	(2.31 to 5.85)	***
Missing	783	22.3	1.34	(1.14 to 1.57)	***	2.22	(1.70 to 2.90)	***	3.10	(2.07 to 4.64)	***
FEV (Female)											
Equal to or in excess of predicted values †	1,829	41.1	1.00			1.00			1.00		
Within 1 standard deviation below the predicted values	933	20.7	1.14	(0.99 to 1.32)	n/s	1.32	(1.04 to 1.66)	*	2.15	(1.21 to 3.83)	**
1 to 1.64 standard deviations below the predicted values	324	7.2	1.27	(1.05 to 1.53)	*	1.33	(0.97 to 1.82)	n/s	3.16	(1.64 to 6.12)	**
More than 1.64 sd below the pred values ('low')"	274	6.2	1.60	(1.30 to 1.96)	***	2.15	(1.64 to 2.82)	***	4.65	(2.50 to 8.64)	***
Missing	1,107	24.8	1.24	(1.08 to 1.42)	**	1.53	(1.25 to 1.87)	***	4.25	(2.59 to 6.96)	***

Notes:

1. Weighted category proportions using survey weighting variable - *weighta*

2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant;

† - reference category of variable

Appendix 4c - 'Age & Sex Standardised Association' between Social Risk Factors and Hospital Admission & Death

Social Risk Factors	N	N(%)[1]	1. First Hospital Admission: Hazard Ratio	95% (CI)	Significance[2]	2. First Serious Hospital Admission: Hazard Ratio	95% (CI)	Significance[2]	3. Death: Hazard Ratio	95% (CI)	Significance[2]
Current Income Deprivation											
INCOME RELATED BENEFITS											
Yes	2,300	24.1	1.42	(1.31 to 1.55)	***	1.58	(1.39 to 1.81)	***	2.42	(1.93 to 3.02)	***
No†	5,674	75.9	1.00			1.00			1.00		
SOCIAL CLASS											
I - Professional & II - Managerial Technical†	2,527	33.3	1.00			1.00			1.00		
IIIN - Skilled Non-Manual	1,272	14.4	1.12	(0.99 to 1.27)	n/s	1.08	(0.88 to 1.32)	n/s	1.40	(0.97 to 2.03)	n/s
IIIM - Skilled Manual	2,156	28.4	1.28	(1.15 to 1.42)	***	1.28	(1.10 to 1.48)	**	1.44	(1.07 to 1.94)	*
IV - Semi-Skilled Manual	1,257	15.0	1.35	(1.20 to 1.52)	***	1.37	(1.13 to 1.65)	**	1.88	(1.29 to 2.74)	**
V - Unskilled Manual	503	5.4	1.42	(1.20 to 1.67)	***	1.31	(1.05 to 1.65)	*	2.13	(1.389 to 3.26)	**
Other	16	0.2	2.06	(1.09 to 3.89)	*	3.37	(0.93 to 12.8)	n/s	2.74	(0.31 to 24.08)	n/s
Missing	243	3.3	1.25	(0.97 to 1.61)	n/s	1.19	(0.83 to 1.73)	n/s	1.26	(0.63 to 2.53)	n/s
CAR OWNERSHIP											
None†	2,378	23.6	1.00			1.00			1.00		
One	3,796	46.7	0.81	(0.74 to 0.87)	***	0.80	(0.70 to 0.92)	**	0.48	(0.38 to 0.60)	***
Two	1,533	24.2	0.67	(0.60 to 0.75)	***	0.62	(0.50 to 0.76)	***	0.29	(0.18 to 0.45)	***
Three or more	267	5.6	0.84	(0.67 to 1.06)	n/s	0.82	(0.53 to 1.27)	n/s	0.25	(0.07 to 0.96)	*
Employment Deprivation											
ECONOMIC ACTIVITY											
In Employment†	4,383	60.1	1.00			1.00			1.00		
Unemployment	309	3.9	1.32	(1.06 to 1.64)	*	1.23	(0.79 to 1.91)	n/s	5.45	(2.83 to 10.52)	***
Retired	3,263	35.8	1.57	(1.43 to 1.73)	***	1.94	(1.64 to 2.31)	***	3.03	(2.03 to 4.56)	***
Missing	19	0.2	1.21	(0.59 to 2.48)	n/s	3.47	(1.45 to 8.31)	**	10.55	(3.26 to 34.12)	***
UNEMPLOYMENT BENEFIT											
Yes	162	2.0	1.10	(0.83 to 1.46)	n/s	1.44	(0.85 to 2.41)	n/s	2.17	(0.97 to 4.87)	n/s
No†	7,812	98.0	1.00			1.00			1.00		
Education, Skills and Training											
HIGHEST EDUCATIONAL QUALIFICATION											
A-level(s) or a degree†	3,830	52.4	1.00			1.00			1.00		
GCSE at A-C or equivalent	1,157	14.7	1.30	(1.15 to 1.46)	***	1.38	(1.12 to 1.71)	**	1.36	(0.89 to 2.07)	n/s
Other formal qualifications	607	6.8	1.27	(1.10 to 1.46)	**	1.39	(1.12 to 1.72)	**	1.46	(0.99 to 2.15)	n/s
No formal qualifications	2,367	26.0	1.34	(1.21 to 1.47)	***	1.45	(1.24 to 1.70)	***	1.77	(1.34 to 2.35)	***
Missing	13	0.2	0.86	(0.34 to 2.14)	n/s	1.60	(0.31 to 8.19)	n/s	n/a	n/a	n/a

Notes:
1. Weighted category proportions using survey weighting variable - *weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant;
† - reference category of variable

Geographic Access and Telecommunications Deprivation	N	N(%)[1]	1. First Hospital Admission Hazard Ratio	95% (CI)	Significance[2]	2. First Serious Hospital Admission Hazard Ratio	95% (CI)	Significance[2]	3. Death Hazard Ratio	95% (CI)	Significance[2]
RURALITY * Accessible is defined as those areas that are within a 30 minute drive time from the centre of a town with a population of 10,000 or more											
Primary cities with a population of 125,000 or more †	2,656	37.6	1.00			1.00			1.00		
Urban setlements with a population of 10,000 or more	2,412	29.7	1.06	(0.96 to 1.18)	n/s	1.02	(0.87 to 1.20)	n/s	0.87	(0.66 to 1.15)	n/s
Small accessible* towns with a population of 3,000 or more	974	11.8	1.01	(0.88 to 1.16)	n/s	0.92	(0.73 to 1.16)	n/s	0.77	(0.51 to 1.15)	n/s
Small remote towns with a populationof 3,000 or more	457	4.2	0.92	(0.78 to 1.08)	n/s	0.96	(0.75 to 1.22)	n/s	0.72	(0.48 to 1.10)	n/s
Accessible* rural	876	11.6	0.95	(0.83 to 1.08)	n/s	0.95	(0.72 to 1.24)	n/s	0.98	(0.68 to 1.41)	n/s
Remote rural	591	5.1	0.88	(0.76 to 1.01)	n/s	0.91	(0.70 to 1.18)	n/s	0.63	(0.42 to 0.95)	*
Missing	8	0.1	0.69	(0.180 to 2.62)	n/s	n/a	n/a	n/a	n/a	n/a	n/a
ACCESS TO NEAREST GP PRACTICE											
5 minutes or less †	6,559	83.7	1.00			1.00			1.00		
5 minutes plus	1,407	16.2	0.99	(0.89 to 1.09)	n/s	0.96	(0.83 to 1.12)	n/s	0.80	(0.59 to 1.09)	n/s
Missing	8	0.1	0.69	(0.18 to 2.60)	n/s	n/a	n/a	n/a	n/a	n/a	n/a
ACCESS TO NEAREST MAIN HOSPITAL											
5km or less †	3,099	41.1	1.00			1.00			1.00		
Between 5km and 10km	1,858	24.4	0.96	(0.87 to 1.07)	n/s	1.01	(0.86 to 1.18)	n/s	0.91	(0.70 to 1.20)	n/s
Between 10km and 20km	1,411	17.1	0.91	(0.81 to 1.03)	n/s	0.80	(0.64 to 0.98)	*	0.71	(0.50 to 1.01)	n/s
Between 20km and 30km	759	9.4	0.91	(0.79 to 1.05)	n/s	0.91	(0.72 to 1.14)	n/s	0.76	(0.50 to 1.15)	n/s
More than 30km	839	7.9	0.84	(0.74 to 0.96)	**	0.89	(0.71 to 1.10)	n/s	0.59	(0.42 to 0.83)	**
Missing	8	0.1	0.66	(0.7 to 2.48)	n/s	n/a	n/a	n/a	n/a	n/a	n/a
DRIVE TIME TO NEAREST HOSPITAL											
30 minutes or less †	7,529	95.4	1.00			1.00			1.00		
30 to 60 minutes	115	0.9	0.73	(0.47 to 1.14)	n/s	0.90	(0.47 to 1.75)	n/s	0.86	(0.38 to 1.96)	n/s
More than 60 minutes	78	0.7	0.99	(0.67 to 1.48)	n/s	1.46	(0.92 to 2.31)	n/s	1.07	(0.41 to 2.80)	n/s
Missing	252	2.9	1.12	(0.88 to 1.42)	n/s	1.43	(0.98 to 2.09)	*	1.48	(0.85 to 2.58)	n/s
Housing Deprivation											
HOUSING TENURE											
House owned outright or with mortgage †	5,044	67.3	1.00			1.00			1.00		
Publicly rented	2,112	23.0	1.43	(1.31 to 1.57)	***	1.63	(1.42 to 1.88)	***	2.59	(2.02 to 3.32)	***
Privately rented	814	9.7	1.15	(0.97 to 1.36)	n/s	1.32	(1.05 to 1.66)	*	2.68	(1.89 to 3.80)	***
Missing	4	0.1	1.52	(0.22 to 10.26)	n/s	n/a	n/a	n/a	n/a	n/a	n/a

Notes:

1. Weighted category proportions using survey weighting variable -*weighta*

2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant; n/a = not applicable (category cases excluded from model, due to zero admissions/deaths)

† - reference category of variable

			1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
Housing Deprivation - continued	**N**	**N(%)[1]**	**Hazard Ratio**	**95% (CI)**	**Significance[2]**	**Hazard Ratio**	**95% (CI)**	**Significance[2]**	**Hazard Ratio**	**95% (CI)**	**Significance[2]**
OVERCROWDING											
Yes	75	1.4	0.94	(0.61 to 1.45)	n/s	1.07	(0.48 to 2.42)	n/s	n/a	n/a	n/a
No†	7,899	98.6	1.00			1.00			1.00		
CENTRAL HEATING											
Yes		92.6	0.89	(0.78 to 1.02)	n/s	0.78	(0.64 to 0.96)	*	0.72	(0.49 to 1.05)	n/s
No†		7.4	1.00			1.00					
Area Deprivation											
CARSTAIRS QUINTILES											
Bottom†	1,393	20.0	1.00			1.00			1.00		
Second	1,609	18.6	1.06	(0.94 to 1.21)	n/s	1.32	(1.06 to 1.65)	*	1.62	(1.08 to 2.44)	*
Third	1,933	22.3	1.14	(1.01 to 1.29)	*	1.46	(1.19 to 1.79)	***	1.85	(1.30 to 2.65)	**
Forth	1,467	19.1	1.14	(1.00 to 1.31)	n/s	1.59	(1.27 to 2.00)	***	2.06	(1.41 to 2.99)	***
Top	1,564	20.0	1.39	(1.23 to 1.57)	***	1.72	(1.39 to 2.12)	***	2.59	(1.78 to 3.76)	***
Missing	8	0.1	0.79	(0.21 to 2.97)	n/s	n/a	n/a	n/a	n/a	n/a	n/a

Notes:

1. Weighted category proportions using survey weighting variable - *weighta*

2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant; n/a = not applicable (category cases excluded from model, due to zero admissions/deaths)

† - reference category of variable

Appendix 4d - 'Age & Sex Standardised Association' between Estimates of Health Risk Factors and Hospital Admission & Death

Estimates of Health at Survey	N	N(%)[1]	1. First Hospital Admission: Hazard Ratio	95% (CI)	Significance[2]	2. First Serious Hospital Admission: Hazard Ratio	95% (CI)	Significance[2]	3. Death: Hazard Ratio	95% (CI)	Significance[2]
GENERAL HEALTH											
Very good†	2,783	36.5	1.00			1.00			1.00		
Good	3,128	40.2	1.40	(1.28 to 1.53)	***	1.34	(1.14 to 1.57)	***	1.20	(0.85 to 1.70)	n/s
Fair	1,533	17.6	2.13	(1.90 to 2.38)	***	2.38	(2.01 to 2.81)	***	3.08	(2.22 to 4.27)	***
Bad	442	4.8	3.48	(2.97 to 4.07)	***	4.62	(3.79 to 5.62)	***	5.49	(3.77 to 8.00)	***
Very bad	88	0.9	3.79	(2.74 to 5.25)	***	5.13	(3.47 to 7.61)	***	10.24	(5.33 to 19.66)	***
GHQ 12 SCORE											
zero score†	4,545	58.3	1.00			1.00			1.00		
1 to 3 score	2,043	25.6	1.30	(1.19 to 1.42)	***	1.40	(1.22 to 1.61)	***	1.52	(1.16 to 2.00)	**
4 plus score	1,324	15.4	1.79	(1.63 to 1.97)	***	2.01	(1.73 to 2.34)	***	2.63	(2.01 to 3.42)	***
Missing	62	0.7	1.56	(1.06 to 2.29)	*	1.35	(0.81 to 2.25)	n/s	2.32	(0.95 to 5.61)	n/s
LONGSTANDING ILLNESS											
Limiting LI	2,141	23.7	2.29	(2.10 to 2.50)	***	2.77	(2.39 to 3.20)	***	2.75	(2.06 to 3.66)	***
Non limiting LI	1,348	17.0	1.44	(1.30 to 1.61)	***	1.36	(1.15 to 1.61)	***	1.42	(0.99 to 2.03)	n/s
No LI†	4,485	59.4	1.00			1.00			1.00		
NUMBER OF LONGSTANDING ILLNESSES											
No LSI†	4,497	59.5	1.00			1.00			1.00		
One LSI	2,271	27.7	1.70	(1.56 to 1.85)	***	1.82	(1.57 to 2.10)	***	1.82	(1.33 to 2.48)	***
Two LSI	868	9.4	2.22	(1.97 to 2.49)	***	2.71	(2.26 to 3.26)	***	2.41	(1.72 to 3.36)	***
Three or more LSI	338	3.4	2.87	(2.45 to 3.36)	***	3.32	(2.67 to 4.12)	***	3.49	(2.45 to 4.96)	***
INCAPACITY BENEFIT											
Yes	550	6.5	1.97	(1.70 to 2.27)	***	2.41	(1.90 to 3.07)	***	2.61	(1.76 to 3.88)	***
No†	7,424	93.5	1.00			1.00					

Notes:
1. Weighted category proportions using survey weighting variable - *weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant;
† - reference category of variable

Appendix 4e - 'Age & Sex Standardised Association' between Prior Hospital Admission Risk Factor and Hospital Admission & Death

			1. First Hospital Admission			2. First Serious Hospital Admission			3. Death		
Prior Hospital Admissions	N	N(%)[1]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]	Hazard Ratio	95% (CI)	Significance[2]
None†	4,826	63.1	1.00			1.00			1.00		
One	1,601	19.6	1.74	(1.57 to 1.93)	***	1.61	(1.37 to 1.89)	***	1.38	(1.02 to 1.87)	*
Two	658	7.8	2.14	(1.89 to 2.43)	***	1.83	(1.48 to 2.25)	***	1.54	(1.07 to 2.22)	*
Three	343	3.8	2.69	(2.29 to 3.17)	***	2.42	(1.87 to 3.13)	***	1.53	(0.87 to 2.69)	n/s
Four or more	546	5.9	4.40	(3.82 to 5.07)	***	4.08	(3.46 to 4.82)	***	3.42	(2.55 to 4.59)	***

Notes:

1. Weighted category proportions using survey weighting variable - *weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant

† - reference category of variable

APPENDIX 5(a) - 'First Hospital Admission' Cox Proportional Hazard Model
All Risk Factors Included

1. First Hospital Admission

Behavioural Risk Factors	N	N(%)[1]	Hazard Ratio	95% (CI)	Significance[2]
GENDER					
Female†	4,467	50.3	1.00		
Male	3,507	49.7	0.85	(0.65 to 1.10)	n/s
AGE					
Age Group (16-19)	323	6.5	1.12	(0.77 to 1.63)	n/s
Age Group (20-24)	452	8.1	0.98	(0.76 to 1.26)	n/s
Age Group (25-29)	663	9.8	0.95	(0.73 to 1.25)	n/s
Age Group (30-34)	850	10.9	0.92	(0.73 to 1.15)	n/s
Age Group (35-39)†	872	10.8	1.00		
Age Group (40-44)	772	9.8	1.01	(0.82 to 1.26)	n/s
Age Group (45-49)	687	9.2	1.05	(0.82 to 1.34)	n/s
Age Group (50-54)	750	8.9	1.11	(0.89 to 1.39)	n/s
Age Group (55-59)	673	7.5	1.23	(0.96 to 1.57)	n/s
Age Group (60-64)	657	6.9	1.31	(1.04 to 1.64)	*
Age Group (65-69)	680	6.5	1.64	(1.31 to 2.05)	***
Age Group (70-74)	595	5.3	1.80	(1.44 to 2.24)	***
AGE * SEX					
Male*(16-19)	158	6.9	0.78	(0.46 to 1.31)	n/s
Male*(20-24)	181	8.6	0.85	(0.55 to 1.33)	n/s
Male*(25-29)	298	10.1	0.88	(0.57 to 1.36)	n/s
Male*(30-34)	366	11.0	1.08	(0.74 to 1.57)	n/s
Male*(35-39)†	388	10.8	1.00		
Male*(40-44)	358	10.0	0.95	(0.65 to 1.37)	n/s
Male*(45-49)	317	9.2	0.91	(0.63 to 1.31)	n/s
Male*(50-54)	312	8.8	1.08	(0.74 to 1.59)	n/s
Male*(55-59)	323	7.4	1.22	(0.83 to 1.79)	n/s
Male*(60-64)	289	6.5	1.14	(0.79 to 1.64)	n/s
Male*(65-69)	279	6.1	1.16	(0.82 to 1.64)	n/s
Male*(70-74)	238	4.7	1.47	(1.04 to 2.09)	*
SMOKING					
Never regularly smoked†	3,351	44.1	1.00		
Ex smoker	1,496	17.6	1.06	(0.95 to 1.18)	n/s
Light smoker, (<10) or cigar, pipe or high continine	863	11.3	1.10	(0.95 to 1.26)	n/s
Moderate smoker, 10-20 per day	1,141	13.7	1.29	(1.15 to 1.45)	***
Heavy smoker, 20 plus per day	1,109	13.0	1.35	(1.20 to 1.53)	***
Missing	14	0.3	1.18	(0.44 to 3.19)	n/s
PHYSICAL ACTIVITY					
Low Activity†	3,076	35.8	1.00		
Medium Activity	2,531	32.3	0.98	(0.89 to 1.09)	n/s
High Activity	2,357	31.8	1.16	(1.05 to 1.28)	**
Missing	10	0.1	0.86	(0.33 to 2.25)	n/s
GENERAL HEALTH					
Very good†	2,783	36.5	1.00		
Good	3,128	40.2	1.19	(1.09 to 1.31)	***
Fair	1,533	17.6	1.42	(1.24 to 1.62)	***
Bad	442	4.8	1.71	(1.40 to 2.08)	***
Very bad	88	0.9	1.71	(1.20 to 2.43)	**
PRIOR HOSPITAL ADMISSIONS					
None†	4,826	63.1	1.00		
One	1,601	19.6	1.59	(1.44 to 1.77)	***
Two	658	7.8	1.78	(1.56 to 2.03)	***
Three	343	3.8	2.16	(1.82 to 2.55)	***
Four or more	546	5.9	3.19	(2.76 to 3.69)	***
LIMITING LONGSTANDING ILLNESS (LSI)					
Limiting LI	2,141	23.7	1.45	(1.29 to 1.61)	***
Non limiting LI	1,348	17.0	1.25	(1.12 to 1.40)	***
No LI†	4,485	59.4	1.00		

1. Weighted category proportions using survey weighting variable - *weigh*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant
† - reference category of variable

APPENDIX 5(b) - 'First Hospital Admission' Cox Proportional Hazard Model

('Estimates of Health at Survey' & 'Number of Admissions 5 years prior to survey', excluded from model)

1. First Hospital Admission

Behavioural Risk Factors	N	N(%)[1]	Hazard Ratio	95% (CI)	Significance[2]
GENDER					
Female†	4,467	50.3	1.00		
Male	3,507	49.7	0.79	(0.60 to 1.02)	n/s
AGE					
Age Group (16-19)	323	6.5	0.76	(0.53 to 1.11)	n/s
Age Group (20-24)	452	8.1	0.76	(0.59 to 0.98)	n/s
Age Group (25-29)	663	9.8	0.81	(0.62 to 1.05)	n/s
Age Group (30-34)	850	10.9	0.85	(0.67 to 1.06)	n/s
Age Group (35-39)†	872	10.8	1.00		
Age Group (40-44)	772	9.8	0.91	(0.72 to 1.15)	n/s
Age Group (45-49)	687	9.2	1.03	(0.80to 1.32)	n/s
Age Group (50-54)	750	8.9	0.97	(0.79 to 1.20)	n/s
Age Group (55-59)	673	7.5	1.10	(0.86 to 1.42)	n/s
Age Group (60-64)	657	6.9	0.98	(0.77 to 1.24)	n/s
Age Group (65-69)	680	6.5	1.21	(0.95 to 1.53)	n/s
Age Group (70-74)	595	5.3	1.45	(1.15 to 1.82)	**
AGE * SEX					
Male*(16-19)	158	6.9	0.94	(0.57 to 1.56)	n/s
Male*(20-24)	181	8.6	0.97	(0.63 to 1.49)	n/s
Male*(25-29)	298	10.1	1.06	(0.69 to 1.62)	n/s
Male*(30-34)	366	11.0	1.21	(0.83 to 1.77)	n/s
Male*(35-39)†	388	10.8	1.00		
Male*(40-44)	358	10.0	1.07	(0.73 to 1.56)	n/s
Male*(45-49)	317	9.2	0.95	(0.65 to 1.37)	n/s
Male*(50-54)	312	8.8	1.27	(0.88 to 1.82)	n/s
Male*(55-59)	323	7.4	1.33	(0.91 to 1.93)	n/s
Male*(60-64)	289	6.5	1.53	(1.06 to 2.20)	*
Male*(65-69)	279	6.1	1.35	(0.95 to 1.91)	n/s
Male*(70-74)	238	4.7	1.57	(1.01 to 2.24)	*
SMOKING					
Never regularly smoked†	3,351	44.1	1.00		
Ex smoker	1,496	17.6	1.16	(1.04 to 1.30)	**
Light smoker, (<10) or cigar, pipe or high continine	863	11.3	1.19	(1.04 to 1.35)	*
Moderate smoker, 10-20 per day	1,141	13.7	1.42	(1.27 to 1.60)	***
Heavy smoker, 20 plus per day	1,109	13.0	1.55	(1.38 to 1.75)	***
Missing	14	0.3	1.15	(0.42 to 3.14)	n/s
PHYSICAL ACTIVITY					
Low Activity†	3,076	35.8	1.00		
Medium Activity	2,531	32.3	0.86	(0.78 to 0.95)	**
High Activity	2,357	31.8	1.02	(0.94 to 1.12)	n/s
Missing	10	0.1	0.79	(0.37 to 1.69)	n/s
FORCED EXPIRATORY VOLUME (FEV1)					
Equal to or in excess of predicted values†	3,230	41.1	1.00		
Within 1 standard deviation below the predicted values	1,699	21.1	1.08	(0.96 to 1.20)	n/s
1 to 1.64 standard deviations below the predicted values	601	7.5	1.20	(1.03 to 1.40)	*
More than 1.64 sd below the pred values ('low')"	554	6.6	1.31	(1.14 to 1.51)	***
Missing	1,890	23.6	1.42	(1.22 to 1.64)	***
C-REACTIVE PROTEIN					
Quintile1†	1,081	14.7	1.00		
Quintile2	1,056	13.8	0.91	(0.76 to 1.07)	n/s
Quintile3	1,016	12.5	1.11	(0.94 to 1.32)	n/s
Quintile4	1,121	13.6	0.97	(0.82 to 1.14)	n/s
Quintile5	1,194	13.7	1.20	(1.04 to 1.40)	**
Missing	2,506	31.6	1.11	(0.95 to 1.28)	n/s
EMPLOYMENT STATUS					
In Employment†	4,383	60.1	1.00		
Unemployment	309	3.9	1.18	(0.95 to 1.47)	n/s
Retired	3,263	35.8	1.42	(1.29 to 1.56)	***
Missing	19	0.2	1.10	(0.55 to 2.21)	n/s
BLOOD PRESSURE					
Hypertensive Untreated	1,380	15.6	0.99	(0.88 to 1.11)	n/s
Hypertensive Treated	554	5.5	1.20	(1.03 to 1.40)	*
Normotensive Treated	429	4.6	1.52	(1.29 to 1.79)	***
Normotensive Untreated†	4,311	57.7	1.00		
Missing	1,300	16.6	0.74	(0.62 to 0.88)	**

Notes:

1. Weighted category proportions using survey weighting variable - *weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant

† - reference category of variable

APPENDIX 5(c) - 'First Serious Hospital Admission' Cox Proportional Hazard Model
All Risk Factors Included

Behavioural Risk Factors	1. First Serious Hospital Admission				
	N	N(%)[1]	Hazard Ratio	95% (CI)	Significance[2]
GENDER					
Female†	4,453	50.3	1.00		
Male	3,495	49.7	0.68	(0.40 to 1.18)	n/s
AGE					
Age Group (16-19)	311	6.3	0.33	(0.13 to 0.83)	*
Age Group (20-24)	451	8.1	0.55	(0.31 to 1.00)	n/s
Age Group (25-29)	662	9.8	0.53	(0.31 to 0.90)	*
Age Group (30-34)	847	10.9	0.38	(0.22 to 0.66)	**
Age Group (35-39)†	871	10.8	1.00		
Age Group (40-44)	772	9.8	1.00	(0.63 to 1.57)	n/s
Age Group (45-49)	685	9.2	1.09	(0.70 to 1.71)	n/s
Age Group (50-54)	748	9.0	1.64	(1.10 to 2.44	*
Age Group (55-59)	672	7.5	1.65	(1.10 to 2.50)	*
Age Group (60-64)	656	6.9	2.11	(1.43 to 3.11)	***
Age Group (65-69)	678	6.5	2.67	(1.83to 3.88)	***
Age Group (70-74)	595	5.3	3.24	(2.18 to 4.81)	***
AGE * SEX					
Male*(16-19)	153	6.7	1.39	(0.36 to 5.39)	n/s
Male*(20-24)	180	8.6	1.92	(0.75 to 4.91)	n/s
Male*(25-29)	298	10.1	1.47	(0.60 to 3.55)	n/s
Male*(30-34)	363	11.0	3.18	(1.42 to 7.10)	**
Male*(35-39)†	388	10.9	1.00		
Male*(40-44)	358	10.0	0.95	(0.45 to 1.98)	n/s
Male*(45-49)	316	9.2	1.38	(0.66 to 2.90)	n/s
Male*(50-54)	311	8.9	1.06	(0.55 to 2.04)	n/s
Male*(55-59)	323	7.5	1.23	(0.64 to 2.37)	n/s
Male*(60-64)	289	6.5	1.26	(0.67 to 2.37)	n/s
Male*(65-69)	278	6.1	1.60	(0.86 to 2.94)	n/s
Male*(70-74)	238	4.7	1.95	(1.05 to 3.60)	*
SMOKING					
Never regularly smoked†	3,346	44.3	1.00		
Ex smoker	1,495	17.6	1.13	(0.94 to 1.33)	n/s
Light smoker, (<10) or cigar, pipe or high continine	861	11.3	1.20	(0.96 to 1.49)	n/s
Moderate smoker, 10-20 per day	1,139	13.7	1.30	(1.07 to 1.58)	**
Heavy smoker, 20 plus per day	1,107	13.1	1.50	(1.23 to 1.84)	***
FORCED EXPIRATORY VOLUME (FEV1)					
Equal to or in excess of predicted values†	3,219	41.1	1.00		
Within 1 standard deviation below the predicted values	1,696	21.2	1.20	(1.00 to 1.43)	n/s
1 to 1.64 standard deviations below the predicted values	598	7.5	1.28	(1.02 to 1.59)	*
More than 1.64 sd below the pred values ('low')"	553	6.6	1.34	(1.08 to 1.67)	**
Missing	1,882	23.6	1.47	(1.24 to 1.75)	***
FIBRINOGEN					
Quintile1†	940	13.3	1.00		
Quintile2	876	11.9	0.97	(0.69 to 1.36)	n/s
Quintile3	1,185	15.3	1.10	(0.80 to 1.49)	n/s
Quintile4	889	10.4	1.17	(0.85 to 1.62)	n/s
Quintile5	1,074	12.1	1.45	(1.07 to 1.98)	*
Missing	2,984	36.9	1.15	(0.86 to 1.53)	n/s
DRIVE TIME TO NEAREST HOSPITAL					
30 minutes or less†	7,510	95.5	1.00		
30 to 60 minutes	115	0.9	0.99	(0.55 to 1.78)	n/s
More than 60 minutes	78	0.7	1.68	(1.15 to 2.46)	**
Missing	245	2.9	1.24	(0.93 to 1.71)	n/s
GENERAL HEALTH					
Very good†	2,775	36.6	1.00		
Good	3,115	40.1	1.07	(0.91 to 1.26)	n/s
Fair	1,529	17.6	1.32	(1.08 to 1.63)	**
Bad	441	4.8	1.82	(1.42 to 2.34)	***
Very bad	88	0.9	1.83	(1.20 to 2.77)	**
PRIOR HOSPITAL ADMISSIONS					
None†	4,804	63.0	1.00		
One	1,598	19.6	1.40	(1.19 to 1.64)	***
Two	657	7.8	1.44	(1.16 to 1.78)	**
Three	343	3.8	1.80	(1.38 to 2.35)	***
Four or more	546	5.9	2.61	(2.18 to 3.14)	***
LIMITING LONGSTANDING ILLNESS (LSI)					
Limiting LI	2,137	23.7	1.61	(1.32 to 1.97)	***
Non limiting LI	1,345	17.0	1.18	(0.99 to 1.41)	n/s
No LI†	4,466	59.3	1.00		

Notes:
1. Weighted category proportions using survey weighting variable *weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant
† - reference category of variable

APPENDIX 5(d) - 'First Serious Hospital Admission' Cox Proportional Hazard Model

('Estimates of Health at Survey' & 'Number of Admissions 5 years prior to survey', excluded from model)

1. First Serious Hospital Admission

Behavioural Risk Factors	N	N(%)[1]	Hazard Ratio	95% (CI)	Significance[2]
GENDER					
Female†	4,453	50.3	1.00		
Male	3,495	49.7	0.66	(0.38 to 1.14)	n/s
AGE					
Age Group (16-19)	311	6.3	0.24	(0.10 to 0.59)	**
Age Group (20-24)	451	8.1	0.43	(0.24 to 0.78)	**
Age Group (25-29)	662	9.8	0.46	(0.27 to 0.78)	**
Age Group (30-34)	847	10.9	0.35	(0.20 to 0.61)	***
Age Group (35-39)†	871	10.8	1.00		
Age Group (40-44)	772	9.8	0.92	(0.59 to 1.45)	n/s
Age Group (45-49)	685	9.2	1.19	(0.77 to 1.86)	n/s
Age Group (50-54)	748	9.0	1.47	(0.98 to 2.20)	n/s
Age Group (55-59)	672	7.5	1.54	(1.01 to 2.34)	*
Age Group (60-64)	656	6.9	1.60	(1.05 to 2.45)	**
Age Group (65-69)	678	6.5	2.01	(1.34 to 3.01)	**
Age Group (70-74)	595	5.3	2.68	(1.78 to 4.05)	***
AGE * SEX					
Male*(16-19)	153	6.7	1.43	(0.37 to 5.47)	n/s
Male*(20-24)	180	8.6	1.94	(0.76 to 4.98)	n/s
Male*(25-29)	298	10.1	1.69	(0.70 to 4.08)	n/s
Male*(30-34)	363	11.0	3.57	(1.56 to 8.18)	**
Male*(35-39)†	388	10.9	1.00		
Male*(40-44)	358	10.0	1.02	(0.49 to 2.11)	n/s
Male*(45-49)	316	9.2	1.35	(0.65 to 2.81)	n/s
Male*(50-54)	311	8.9	1.26	(0.66 to 2.40)	n/s
Male*(55-59)	323	7.5	1.36	(0.71 to 2.63)	n/s
Male*(60-64)	289	6.5	1.69	(0.90 to 3.20)	n/s
Male*(65-69)	278	6.1	1.72	(0.92 to 3.21)	n/s
Male*(70-74)	238	4.7	1.90	(1.04 to 3.47)	*
SMOKING					
Never regularly smoked†	3,346	44.3	1.00		
Ex smoker	1,495	17.6	1.22	(1.03 to 1.44)	*
Light smoker, (<10) or cigar, pipe or high continine	861	11.3	1.31	(1.06 to 1.63)	*
Moderate smoker, 10-20 per day	1,139	13.7	1.46	(1.21 to 1.77)	***
Heavy smoker, 20 plus per day	1,107	13.1	1.79	(1.47o 2.19)	***
FORCED EXPIRATORY VOLUME (FEV1)					
Equal to or in excess of predicted values†	3,219	41.1	1.00		
Within 1 standard deviation below the predicted values	1,696	21.2	1.22	(1.01 to 1.46)	*
1 to 1.64 standard deviations below the predicted values	598	7.5	1.43	(1.14 to 1.79)	**
More than 1.64 sd below the pred values ('low')"	553	6.6	1.69	(1.37 to 2.09)	***
Missing	1,882	23.6	1.83	(1.48 to 2.26)	***
C-REACTIVE PROTEIN					
Quintile1†	1,076	14.7	1.00		
Quintile2	1,053	13.8	1.04	(0.76 to 1.44)	n/s
Quintile3	1,011	12.5	1.32	(0.99 to 1.77)	n/s
Quintile4	1,120	13.6	1.17	(0.88 to 1.57)	n/s
Quintile5	1,191	13.7	1.59	(1.21 to 2.10)	**
Missing	2,497	31.6	1.35	(1.02 to 1.79)	*
ECONOMIC ACTIVITY					
In Employment†	4,372	60.1	1.00		
Unemployment	308	3.9	1.03	(0.66 to 1.63)	n/s
Retired	3,250	35.8	1.61	(1.36 to 1.91)	***
Missing	18	0.2	2.87	(1.16 to 7.09)	*
BLOOD PRESSURE					
Hypertensive Untreated	1,380	15.6	1.02	(0.87 to 1.20)	n/s
Hypertensive Treated	554	5.5	1.40	(1.14 to 1.71)	**
Normotensive Treated	429	4.6	1.55	(1.23 to 1.94)	***
Normotensive Untreated†	4,311	57.7	1.00		
Missing	1,300	16.6	0.80	(0.61 to 1.04)	n/s

Notes:
1. Weighted category proportions using survey weighting variable - *weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant
† - reference category of variable

APPENDIX 5(e) - 'Death' Cox Proportional Hazard Model
All Risk Factors Included

1. Death

Behavioural Risk Factors	N	N(%)[1]	Hazard Ratio	95% (CI)	Significance[2]
GENDER					
Female†	3,992	50.8	1.00		
Male	3,132	49.2	3.38	(0.44 to 26.10)	n/s
AGE					
Age Group (25-29)	648	11.3	1.43	(0.13 to 16.24)	n/s
Age Group (30-34)	825	12.6	1.23	(0.14 to 11.00)	n/s
Age Group (35-39)†	857	12.5	1.00		
Age Group (40-44)	765	11.5	2.36	(0.36 to 15.34)	n/s
Age Group (45-49)	683	10.9	4.22	(0.57 to 31.12)	n/s
Age Group (50-54)	745	10.5	14.46	(2.99 to 69.96)	**
Age Group (55-59)	672	8.9	25.83	(5.57 to 119.85)	***
Age Group (60-64)	656	8.1	37.25	(7.96 to 174.23)	***
Age Group (65-69)	680	7.7	40.95	(9.01 to 186.19)	***
Age Group (70-74)	593	6.2	59.04	(12.94 to 269.36)	***
AGE * SEX					
Male*(25-29)	293	11.8	0.76	(0.03 to 18.81)	n/s
Male*(30-34)	351	12.6	0.45	(0.02 to 9.20)	n/s
Male*(35-39)†	380	12.7	1.00		
Male*(40-44)	356	11.9	1.32	(0.12 to 14.98)	n/s
Male*(45-49)	315	11.0	0.76	(0.06 to10.08)	n/s
Male*(50-54)	309	10.5	0.37	(0.04 to 3.36)	n/s
Male*(55-59)	323	8.9	0.23	(0.03 to 1.83)	n/s
Male*(60-64)	289	7.8	0.28	(0.03 to 2.38)	n/s
Male*(65-69)	279	7.3	0.51	(0.06 to 4.23)	n/s
Male*(70-74)	237	5.6	0.59	(0.07 to 4.62)	n/s
SMOKING					
Never regularly smoked†	2,964	43.1	1.00		
Ex smoker	1,457	20.0	1.37	(0.98 to 1.90)	n/s
Light smoker, (<10) or cigar, pipe or high continine	695	9.7	1.44	(0.96 to 2.16)	n/s
Moderate smoker, 10-20 per day	970	13.0	1.80	(1.23 to 2.63)	**
Heavy smoker, 20 plus per day	1,034	14.1	1.91	(1.33 to 2.74)	**
FORCED EXPIRATORY VOLUME (FEV1)					
Equal to or in excess of predicted values†	2,881	40.8	1.00		
Within 1 standard deviation below the predicted values	1,534	21.5	1.18	(0.80 to 1.72)	n/s
1 to 1.64 standard deviations below the predicted values	539	7.7	1.69	(1.12 to 2.55)	*
More than 1.64 sd below the pred values ('low')"	526	7.1	1.89	(1.30 to 2.76)	**
Missing	1,644	22.8	1.76	(1.21 to 2.54)	**
C-REACTIVE PROTEIN					
Quintile1†	906	13.2	1.00		
Quintile2	950	13.9	1.19	(0.59 to 2.40)	n/s
Quintile3	937	13.1	1.19	(0.63 to 2.22)	n/s
Quintile4	1,062	14.9	1.07	(0.60 to 1.92)	n/s
Quintile5	1,127	14.9	1.90	(1.08 to 3.33)	*
Missing	2,142	30.0	1.79	(1.01 to 3.19)	*
BMIGROUP					
Underweight (Under 20)	263	3.4	1.91	(1.17 to 3.10)	**
Desirable (20-25)†	2,128	29.4	1.00		
Overweight (25-30)	2,554	36.7	0.83	(0.61 to 1.13)	n/s
Obese (Over 30)[3]	1,534	21.6	0.63	(0.44 to 0.92)	*
Missing	645	9.0	1.14	(0.77 to 1.68)	n/s
ECONOMIC ACTIVITY					
In Employment†	3,951	61.7	1.00		
Unemployment	232	3.0	3.18	(1.57 to 6.44)	**
Retired	2,932	35.2	1.35	(0.93 to 1.98)	n/s
Missing	9	0.1	7.02	(3.08 to 15.97)	***
HOUSING TENURE					
House owned outright or with mortgage †	4,609	68.8			
Publicly rented	1,854	23.0	1.55	(1.18 to 2.05)	**
Privately rented	661	8.3	1.71	(1.11 to 2.51)	**
GENERAL HEALTH					
Very good†	2,478	36.3	1.00		
Good	2714	38.6	0.93	(0.66 to 1.31)	n/s
Fair	1416	18.6	1.66	(1.15 to 2.38)	**
Bad	431	5.6	1.98	(1.28 to 3.07)	**
Very bad	85	1.0	3.00	(1.54 to 5.86)	**
PRIOR HOSPITAL ADMISSIONS					
None†	4,228	61.1	1.00		
One	1,444	20.0	1.22	(0.89 to 1.67)	n/s
Two	598	8.1	1.17	(0.80 to 1.72)	n/s
Three	328	4.2	1.12	(0.64 to 1.97)	n/s
Four or more	526	6.7	1.98	(1.44 to 2.72)	***

Notes:
1. Weighted category proportions using survey weighting variable -*weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant
3. Significance probably a chance finding related to low number of deaths, length of follow-up period and statistical power. These issues will be examined in subsequent analyses to be undertaken by the group in due course

† - reference category of variable

APPENDIX 5(f) - 'Death' Cox Proportional Hazard Model
('Estimates of Health at Survey' & 'Number of Admissions 5 years prior to survey', excluded from model)

1. Death

Behavioural Risk Factors	N	N(%)[1]	Hazard Ratio	95% (CI)	Significance[2]
GENDER					
Female†	3,992	50.8	1.0		
Male	3,132	49.2	3.24	(0.42 to 25.25)	n/s
AGE					
Age Group (25-29)	648	11.3	1.37	(0.12 to 15.86)	n/s
Age Group (30-34)	825	12.6	1.23	(0.14 to 10.97)	n/s
Age Group (35-39)†	857	12.5	1.00		
Age Group (40-44)	765	11.5	2.27	(0.36 to 14.74)	n/s
Age Group (45-49)	683	10.9	4.28	(0.58 to 31.33)	n/s
Age Group (50-54)	745	10.5	13.50	(2.75 to 66.19)	**
Age Group (55-59)	672	8.9	24.71	(5.29 to 115.37)	***
Age Group (60-64)	656	8.1	29.37	(6.14 to 140.39)	***
Age Group (65-69)	680	7.7	32.32	(6.87 to 152.19)	***
Age Group (70-74)	593	6.2	45.00	(9.48 to 213.51)	***
AGE * SEX					
Male*(25-29)	293	11.8	0.85	(0.03 to 20.98)	n/s
Male*(30-34)	351	12.6	0.50	(0.02 to 10.11)	n/s
Male*(35-39)†	380	12.7	1.00		
Male*(40-44)	356	11.9	1.42	(0.13 to 15.74)	n/s
Male*(45-49)	315	11.0	0.71	(0.05 to 9.32)	n/s
Male*(50-54)	309	10.5	0.42	(0.05 to 3.87)	n/s
Male*(55-59)	323	8.9	0.23	(0.03 to 1.86)	n/s
Male*(60-64)	289	7.8	0.33	(0.04 to 2.73)	n/s
Male*(65-69)	279	7.3	0.55	(0.07 to 4.54)	n/s
Male*(70-74)	237	5.6	0.62	(0.08 to 4.96)	n/s
SMOKING					
Never regularly smoked†	2,964	43.1	1.00		
Ex smoker	1,457	20.0	1.49	(1.07 to 2.08)	*
Light smoker, (<10) or cigar, pipe or high continine	695	9.7	1.58	(1.07 to 2.34)	*
Moderate smoker, 10-20 per day	970	13.0	1.94	(1.34 to 2.82)	***
Heavy smoker, 20 plus per day	1,034	14.1	2.21	(1.55 to 3.16)	***
PHYSICAL ACTIVITY					
Low Activity†	2,874	38.0	1.00		
Medium Activity	2,238	31.8	0.65	(0.49 to 0.87)	**
High Activity	2,002	30.0	0.71	(0.48 to 1.06)	n/s
Missing	10	0.1	2.93	(0.99 to 8.66)	n/s
FORCED EXPIRATORY VOLUME (FEV1)					
Equal to or in excess of predicted values†	2,881	40.8	1.00		
Within 1 standard deviation below the predicted values	1,534	21.5	1.20	(0.81 to 1.78)	n/s
1 to 1.64 standard deviations below the predicted values	539	7.7	1.82	(1.19 to 2.78)	**
More than 1.64 sd below the pred values ('low")"	526	7.1	2.12	(1.48 to 3.05)	***
Missing	1,644	22.8	2.37	(1.59 to 3.55)	**
C-REACTIVE PROTEIN					
Quintile1†	906	13.2	1.00		
Quintile2	950	13.9	1.22	(0.61 to 2.47)	n/s
Quintile3	937	13.1	1.22	(0.66 to 2.26)	n/s
Quintile4	1,062	14.9	1.10	(0.61 to 1.98)	n/s
Quintile5	1,127	14.9	2.18	(1.24 to 3.83)	**
Missing	2,142	30.0	3.17	(1.50 to 6.71)	**
BLOOD PRESSURE					
Hypertensive Untreated	1,347	17.4	1.08	(0.78 to 1.49)	n/s
Hypertensive Treated	554	6.4	1.17	(0.81to 1.69)	n/s
Normotensive Treated	428	5.4	1.97	(1.31 to 2.97)	**
Normotensive Untreated†	3,751	55.0	1.00		
Missing	1,119	15.8	0.74	(0.46 to 1.19)	n/s
BMIGROUP					
Underweight (Under 20)	263	3.4	1.80	(1.10 to 2.96)	*
Desirable (20-25)†	2,128	29.4	1.00		
Overweight (25-30)	2,554	36.7	0.78	(0.57 to 1.07)	n/s
Obese (Over 30)[3]	1,534	21.6	0.60	(0.42 to 0.86)	**
Missing	645	9.0	1.05	(0.71 to 1.57)	n/s
TOTAL CHOLESTEROL					
Desirable Range†	1,786	26.2	1.00		
Mildly Raised	2,081	29.3	1.28	(0.94 to 1.73)	n/s
Moderately Raised[4]	861	11.5	0.62	(0.39 to 0.97)	*
Severly Raised	189	2.3	1.10	(0.52 to 2.32)	n/s
Missing	2,207	30.7	0.64	(0.36 to 1.14)	n/s
ECONOMIC ACTIVITY					
In Employment†	3,951	61.7	1.00		
Unemployment	232	3.0	3.23	(1.58 to 6.63)	**
Retired	2,932	35.2	1.66	(1.13to 2.43)	**
Missing	9	0.1	13.94	(5.18 to 37.48)	***
HOUSING TENURE					
House owned outright or with mortgage†	4,609	68.8	1.00		
Publicly rented	1,854	23.0	1.65	(1.26 to 2.16)	***
Privately rented	661	8.3	1.77	(1.20 to 2.60)	**

Notes:
1. Weighted category proportions using survey weighting variable *weighta*
2. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; n/s = not significant; n/a = not applicable (category cases excluded from model, due to zero deaths)
3 & 4. Significance probably a chance finding related to low number of deaths, length of follow-up period and statistical power. These issues will be examined in subsequent analyses to be undertaken by the group in due course
† - reference category of variable