

# Chapter 8:

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## Population and Human Health

State of the Environment Report

## EAST AYRSHIRE COUNCIL STATE OF THE ENVIRONMENT REPORT CHAPTER 8 – POPULATION AND HUMAN HEALTH

### SUMMARY

#### **Key Messages**

#### **Population**

- The total population of East Ayrshire according to the 2011 Census was 122,767.
- The general trend has been a growth in population of East Ayrshire - a growth of 2 % from the last census in 2003
- By 2037 the population of East Ayrshire is projected to be 121,928 which is a decrease of 0.7% compared to the 2011 population
- Generally the age structure of the East Ayrshire population is similar to that of Scotland as a whole although East Ayrshire has a lower proportion of young people and higher proportion of older people compared to the rest of Scotland.

#### **Age of Population**

The age structure of the East Ayrshire population is typical of Scotland but levels of deprivation are higher than the Scottish average. There are marked socio-economic and environmental inequalities within East Ayrshire.

#### **Life Expectancy**

Life expectancy in East Ayrshire is marginally lower than the national average and reflects the socio-economic and environmental inequalities within East Ayrshire.

#### **Health**

- Death from cancers are slightly higher in East Ayrshire with cardiovascular and cerebrovascular death rates, slightly lower.
- The rate of cancer registrations is similar to that elsewhere in Scotland but rates of hospital admission for chronic obstructive pulmonary disease (COPD) and coronary heart disease are much higher than elsewhere in Scotland.
- There are proportionately more emergency hospital admissions than elsewhere in Scotland.
- The health of older people in East Ayrshire (65+years) is markedly poorer than the national average in relation to serious respiratory and cardiovascular disease
- East Ayrshire generally scores below the Scottish average on health behaviours as reflected in alcohol-related deaths, smoking prevalence, participation in exercise and obesity.
- Health in East Ayrshire is currently improving with an ongoing growth in life expectancy and reduction in cardiovascular and respiratory death rates.
- Levels of obesity in East Ayrshire are similar to levels across the rest of Scotland

#### **Employment and Employment Sectors**

Job growth in East Ayrshire was below the national average for the period between 1998 and 2008, increasing by 5% as compared to a national increase of 12%. The East Ayrshire economic growth (Gross Value Added) rate was around 0.1% between 1997 and 2007, below the national average rate of 2.3%.

#### **Socio-Economic Impacts**

There is some evidence to link health issues (cancer, heart disease and, obesity) and socio-economic inequalities within East Ayrshire. There is little evidence to link health with environmental inequalities and the evidence base is limited.

### Overall Trends in Population and Health

Health in East Ayrshire is currently improving with an ongoing growth in life expectancy and reduction in cardiovascular and respiratory death rates. Health is likely to continue to improve as a result of reduced environmental emissions and workplace exposures to dust and other hazardous substances. There is also, however, some evidence of an upward trend in adverse health behaviours that might ultimately offset the increase in life expectancy such as smoking, alcohol consumption and obesity.

### State and Trend



## OVERVIEW

### 1.1 Population

The total population of East Ayrshire according to the 2011 Census was 122,767. This represents a growth of 2 % from the last census in 2003 (120,235).

**Table 1 – Summary Population Facts (Scottish Census, 2011)**

Population Fact	East Ayrshire	Scotland
All people (Population)	122,767	5,295,403
Median age – Females	43	42
Median age – Males	41	40
Number of males per female - under 25	1.04	1.03
Number of males per female - 25 to 64	0.94	0.96
Number of males per female - 65 and over	0.78	0.76

The average age for women in East Ayrshire is 43 and for men is 41. There are more women than men in East Ayrshire, a trend reflected across most of Scotland.

## 1.2 Population Growth Projections

The National Records for Scotland provided population growth projections for Scotland as a whole as well as for each local authority<sup>1</sup>. This is based on a series of assumptions for future fertility, mortality and migration.

The population of Scotland as a whole is projected to rise from 5.31 million in 2012 to 5.52 million in 2022 and will continue to rise to 5.78 million in 2037 – an increase of 9% over the 25 year period.

By 2037 the population of East Ayrshire is projected to be 121,928 which is a decrease of 0.6% compared to the 2012 population. Over this 25 year period the age group projected to increase the most in size is the 75+ year age group – indicating an ageing population. The numbers of young people is expected to decline during the same period by 7.1%.

**Table 2 – Population Projections (National Records for Scotland, 2014)**

Area	2012	2022	2037	% Change between 2012 and 2037
SCOTLAND	5,313,600	5,519,588	5,780,371	+ 9%
East Ayrshire	122,720	123,578	121,928	- 0.6%

## 1.3 Age of Population

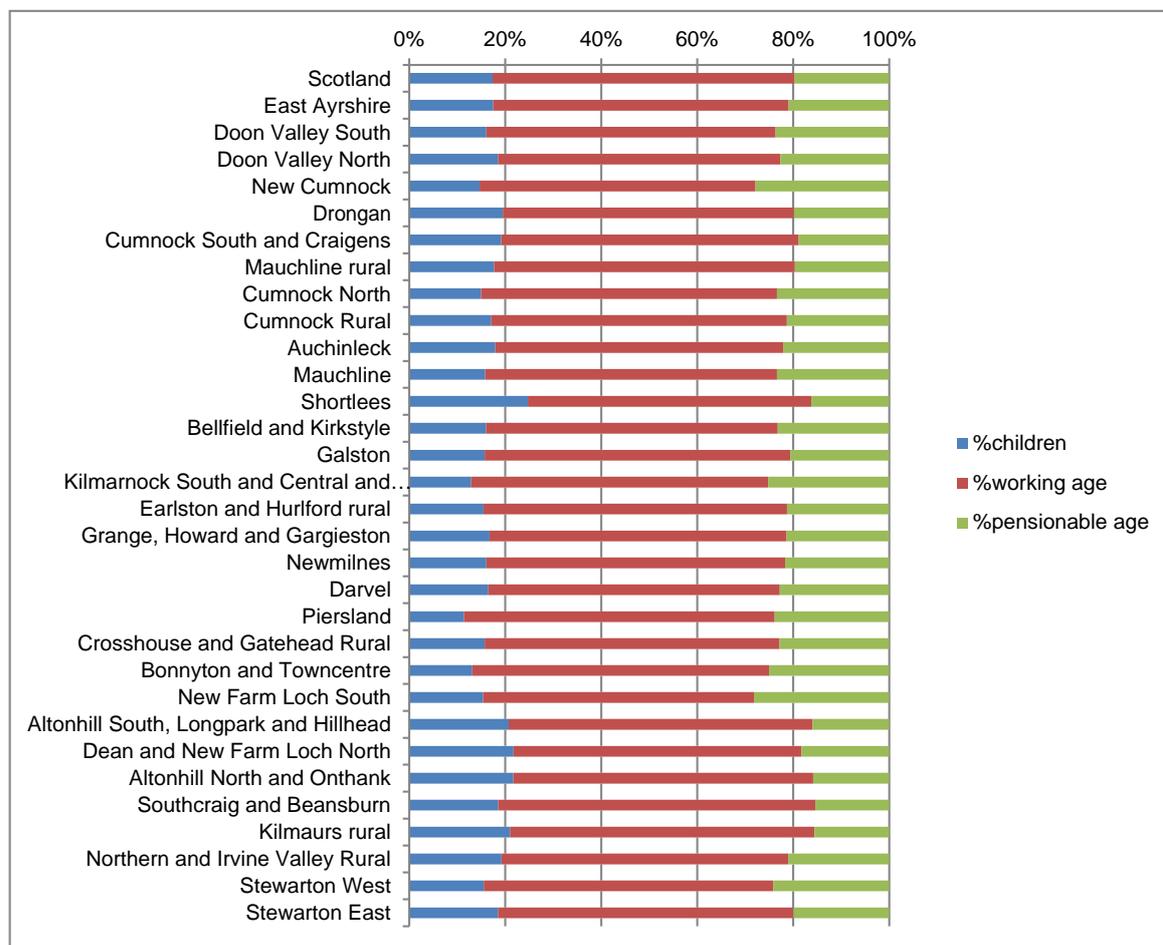
The population of East Ayrshire has a similar age structure to Scotland as a whole, although there is local variation in the proportions of children and older people (Table 3 and Fig. 1). East Ayrshire has a lower proportion of young people and higher proportion of older people compared to the rest of Scotland.

**Table 3 – East Ayrshire Age Structure (Scottish Census, 2011)**

Age Profile	East Ayrshire	Scotland
All people (Population)	122,767	5,295,403
% 0 to 4 years old	5.5	5.5
% 5 to 15 years old	12.1	11.8
% 16 to 29 years old	16.9	18.5
% 30 to 44 years old	19.7	20
% 45 to 59 years old	21.7	21.1
% 60 to 74 years old	16.5	15.5
% 75 years old and over	7.7	7.7

<sup>1</sup> National Records for Scotland 'Population Projections for Scottish Areas, 2014'

**Figure 1:** Age structure of East Ayrshire population and of “intermediate geographies” from the Scottish Neighbourhood Statistics website<sup>2</sup>.



#### 1.4 Life Expectancy in East Ayrshire

Life expectancy is slightly shorter than for Scotland as a whole but is improving in line with elsewhere in Scotland. The figure for life expectancy is based on deaths and population data over a three-year period.

**Table 4 – Life Expectancy at Birth (National Records for Scotland, 2014) for 2011 - 2013**

Gender	Life Expectancy at Birth	
	East Ayrshire	Scotland
Male	75.8	76.9
Female	79.7	81.0

#### 1.5 Socio-Economic Influences on Health

In general life expectancy and health are improving across the UK and life expectancy in the Ayrshire and Arran Health Board Area has increased in line with the Scottish national average. There are a range of factors which affect health and life expectancy.

- East Ayrshire has an increased prevalence of smoking

<sup>2</sup><https://www.scotlandscensus.gov.uk/ods-web/area.html>

- East Ayrshire has a lower level of participation in sport
- Increasing incidences of obesity and alcohol-related deaths also suggest a relatively high prevalence of lifestyle factors that may contribute to future ill health

Socio - economic circumstances are important determinants of health with male life expectancy in the most affluent areas of Scottish cities being more than 10 years greater than that in the least affluent areas. Overall, there are marked reductions in how healthy people are if they are from more deprived backgrounds.

Averaged measures of socio-economic status suggest levels of deprivation within East Ayrshire are higher than the national average. Information from the Scottish Neighbourhood Statistics website:

- In 2010, 16.7% of the population was deprived compared with a national average of 13.4% and 15% of the working age population was deprived compared with a national average of 12.3%; and
- In 2012, 6.1% of the working age population claimed jobseeker’s allowance versus the national average of 4.3% and in 2011 53.1% of the population were dependent on benefits versus a national average of 47.3%.

#### 1.4 Environment/ Neighbourhood Quality

The health and wellbeing of a population is in part dependent on the quality of the local environment and places in which people live.

Environmental inequalities do exist in East Ayrshire including regional variation in exposure to air pollution e.g. proximity to major road infrastructure / town centres and other elements including proximity to derelict land. There are additional factors which affect how people perceive their health such as individual perception of neighbourhood quality e.g. graffiti, quality of housing, employment opportunities etc. Place quality and a sense of community are also important factors.

The Scottish Household Survey collects data from a sample of households across Local Authority regions with questions being asked of 190 households in East Ayrshire across a range of topic areas including neighbourhood and environmental quality.

As shown in Table 5, in general the trend is an upward one with 95% of respondents to the survey in 2013 stating their neighbourhood in East Ayrshire was very or fairly good.

**Table 5 – Rating of Neighbourhood as a place to live by year (SHS, 2017)**

Rating	2007-2008	2009-2010	2011	2012	2013	2014	2015	2016	2017
<b>East Ayrshire</b>									
Very/fairly good	92	94	-	90	95	91	94	92.3	95
Very good	46	42	-	45	47	52	43	51.0	44
Fairly good	45	52	-	45	48	39	51	41.4	51
Fairly poor	6	4	-	7	3	7	3	5	3
Very poor	2	2	-	3	1	2	3	2	1
No opinion	0	-	-	-	-	-	-	-	-
Total	100	100	-	100	100	100	100	100	100
Base	450	530	-	220	190	230	220	210	250
<b>Scotland</b>									
Very/fairly good	92	94	94	94	94	94	95	95.0	95

Rating	2007-2008	2009-2010	2011	2012	2013	2014	2015	2016	2017
Very good	52	55	56	55	55	56	56	56.7	57
Fairly good	40	38	38	38	39	39	38	38.3	38
Fairly poor	5	4	4	4	4	4	4	4	3
Very poor	2	2	2	2	2	2	1	1	1
No opinion	0	0	0	0	0	0	0	0	0
Total	100	100	100	100	100	100	100	100	100
Base	19,700	24,980	12,890	9,890	9,920	9,800	9,410	9,640	9,810

### 1.5 Employment and Key Sectors

There has been steady economic growth at national and global levels for the greater part of the last decade. However, the economic crisis that began in late 2007 has had a far reaching impact on all aspects of the economy, dropping the UK into recession. Job growth in East Ayrshire was below the national average for the period between 1998 and 2008, increasing by 5% as compared to a national increase of 12%. The East Ayrshire economic growth (Gross Value Added) rate was around 0.1% between 1997 and 2007, below the national average rate of 2.3%.

East Ayrshire Council is part of the Ayrshire Economic Partnership (AEP). This includes representatives from the three Ayrshire local authorities, Scottish Enterprise, Ayrshire Chamber of Commerce and Industry and individual business leaders, all working together to provide a strategic direction to the economic performance of Ayrshire and Arran. East Ayrshire tourism experienced a 5% growth between 2006 and 2010 with increased visitor numbers and spend despite a downturn in other parts of Ayrshire.

The Health Service is the single largest employer in the area and the Council itself employs some 6,000 people. There are 4,500 social care jobs in East Ayrshire<sup>3</sup>.

Scottish Enterprise (SE) provides support to approximately 60 of East Ayrshire's larger companies each year; particularly where there is significant growth potential and access is provided to Scottish Enterprise's business support grants and loans. There are 36 'Account Managed' companies who are supported with growth plans.

Scottish Enterprise work with East Ayrshire Council and other partners through the National Scottish Coal Taskforce and Local Response Team seeking to promote *East Ayrshire as a place in which to live, invest and visit and to inspire confidence and pride amongst residents.*

**Table 6** – Extract from Scottish Enterprise 'East Ayrshire 2013 – 2014 Activity Report'<sup>4</sup>

Activity	Scotland	East Ayrshire
Total No. of Account Managed Companies	2205	36
- of which are deemed of particular importance to the economy	373	4
- of which are early stage growth companies	110	1
No. of companies entering the Business Gateway Pipeline	472	6
No. of Growth Prospect companies	157	1

<sup>3</sup> <https://www.east-ayrshire.gov.uk/Resources/PDF/E/EconomicDevelopmentStrategy2014-2025.pdf>

<sup>4</sup> <http://www.scottish-enterprise.com>

The M77 extension has created an important new employment corridor with excellent M8 and M74 links. This is anticipated to stimulate further interest in development and investment during economic recovery. EU funding has been secured to undertake speculative build of industrial property to further enhance the competitiveness of the area post-recession.

Economic growth increases revenues available to local authorities and enables expenditure on new housing including affordable housing. The road and rail network place East Ayrshire at the heart of Scotland's sustainable economic growth policy with physical infrastructure and employment sites that provide quality investment opportunities.

## STATE AND TREND - DETAILED ANALYSIS

### 2.1 Population

#### State

The current population of East Ayrshire has been steady over recent years with minor fluctuations over the period 2004 – 2014 and a fairly steady population over the last 5 years.

**Table 7 – Population Change between 2010 and 2014 (SHS, 2014)**

Area	2010	2011	2012	2013	2014
Scotland					
(Population)	5,262,200	5,299,900	5,313,600	5,327,700	5,347,500
East Ayrshire					
(Population)	122,410	122,690	122,720	122,440	122,150

#### Trend

Whilst the population projections suggest a small decline in population to 2037, this can be attributed to minor / natural fluctuations in numbers of births, deaths and migration. East Ayrshire's birth rate has been consistently higher than the Scottish average since 2003.

**Table 8 – Births between 2009 and 2013 (SHS, 2014)**

Registration Year	Scotland	East Ayrshire
2009	59,046	1,362
2010	58,791	1,334
2011	58,590	1,362
2012	58,027	1,358
2013	56,014	1,342

### 2.2 Age structure

#### State

In general the age structure of the population is changing across Scotland as the birth rate has fallen and the 'baby boomer' generation move towards retirement age.

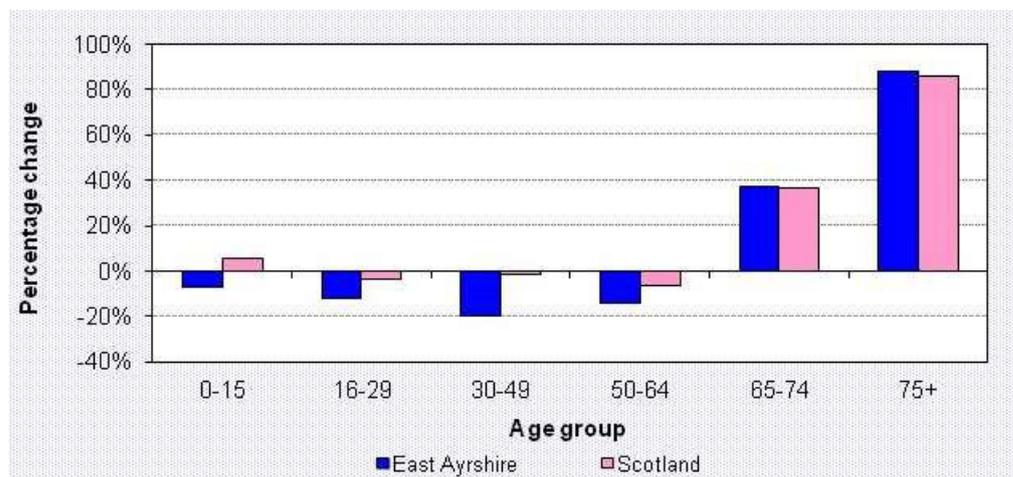
- Between mid-2004 and mid-2014 there was a decrease of 3% in the number of children under 16 and an increase of 17% in the number of people aged 75 and over.
- The ageing of the population is also evident in the rise of 13% in the 45-59 age group, and of 17% in the 60-74 age group.

This pattern is also evident within the data for East Ayrshire.

**Trend**

The projections suggest that the population will continue to age in East Ayrshire, with greatest percentage increases for the 65+ and 75+ age ranges as shown in Figure 2.

**Figure 2 – Percentage Change in Population Age Structure between 2012 and 2037 (National Records for Scotland)**

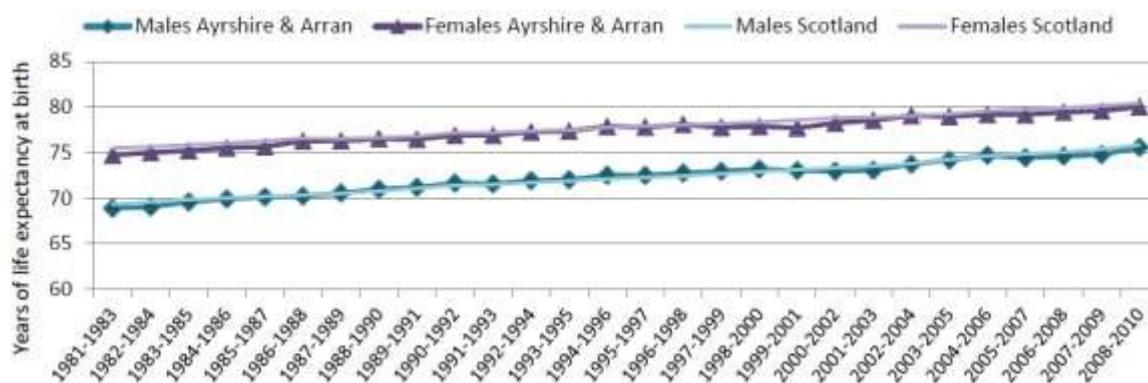


**2.3 Life expectancy**

**State**

In general life expectancy and health are improving across the UK and life expectancy in the Ayrshire and Arran Health Board Area has grown in line with the Scottish national average (Fig.3).

**Figure 3: Growth in life expectancy at birth in Ayrshire and Arran (Director of Public Health’s 2013/14 report)**



The 2014 Health Profile for East Ayrshire<sup>5</sup> indicates that life expectancy is marginally lower than the national average, cancer death rates slightly higher and cardiovascular and cerebrovascular death rates, slightly lower (Table 9). Overall mortality rates are not significantly different from national averages.

<sup>5</sup> <https://scotpho.nhsnss.scot.nhs.uk/scotpho/profileSelectAction.do>

**Table 9:** Summary of Life Expectancy Data for East Ayrshire

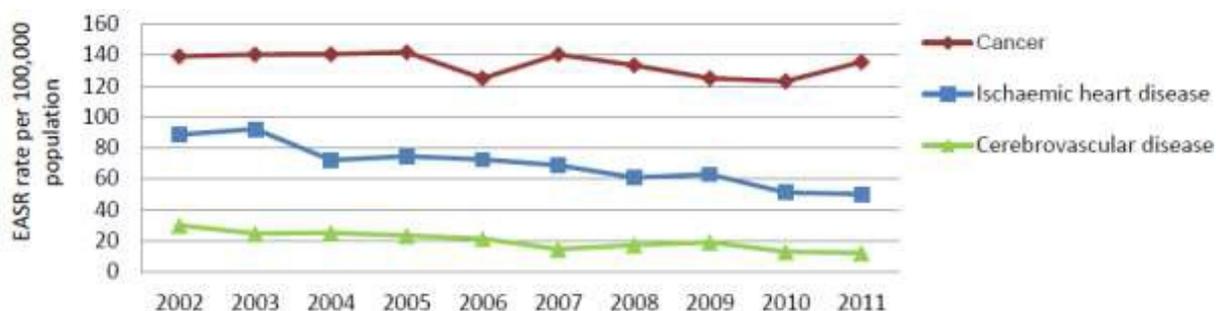
Health endpoint	year	Metric	East Ayrshire	Scotland
Male life expectancy	2012	Years	76.1	76.6
Female life expectancy	2012	Years	80.2	80.8
Deaths all ages	2011	Per 100,000 population	1,234	1,198.7
Deaths from Coronary Heart Disease <75s	2011	Per 100,000 population	62.4	63.1
Deaths from Cancer <75s	2011	Per 100,000 population	178.6	174.3
Deaths from cerebrovascular disease <75s	2011	Per 100,000 population	18.1	20.8

**Trend**

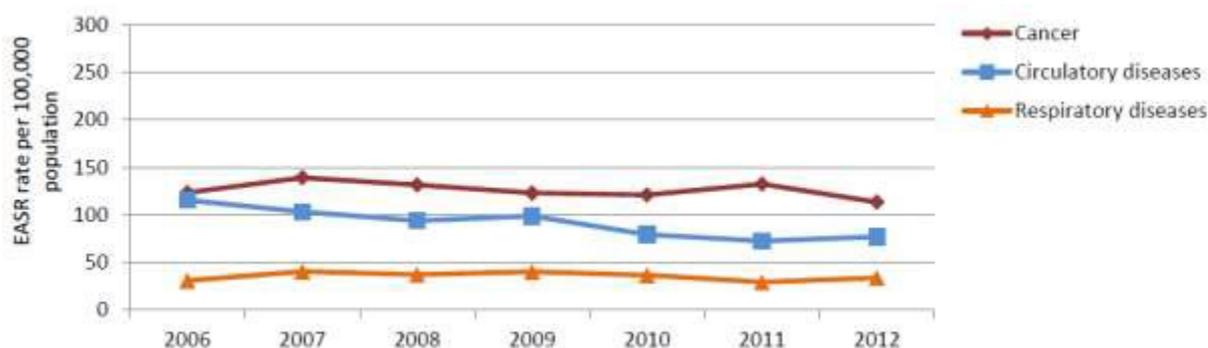
Death rates for the following diseases have fallen slightly over the last decade and there is a stronger downwards trend for deaths for all types of cardiovascular disease, which is in line with the trend for Scotland as a whole (Figs. 4, 5 and 6). In contrast, there has been little change in cancer death rates (Figs. 4 and 5):

- ischemic (problems with blood vessels);
- circulatory; and
- cerebrovascular (problems with blood supply to the brain)

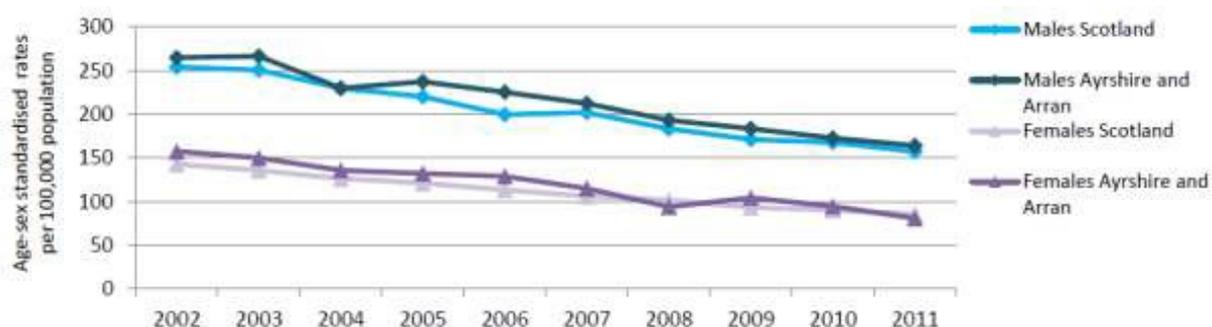
**Figure 4:** Time trends in premature deaths (age <75 years) by cause in Ayrshire and Arran (Director of Public Health’s 2013/14 report). This chart illustrates a gradual downward trend for both ischaemic heart disease and cerebrovascular disease, while cancer death rates have seen little change. The single largest cause of premature mortality in Ayrshire and Arran is cancer.



**Figure 5:** Time trends in deaths by cause (all age) in Ayrshire and Arran (Director of Public Health’s 2013/14 report). This chart illustrates a gradual downward trend for circulatory diseases, while respiratory disease and cancer death rates have seen little change.



**Figure 6:** Reducing mortality from cardiovascular causes in Ayrshire and Arran (Director of Public Health’s 2013/14 report). This chart shows an overall decline in deaths caused by cardiovascular disease between 2002 and 2011 for both men and women.



## 2.4 Health

### 2.4.1 Chronic Disease and Hospitalisation

#### State

The rate of cancer registrations in East Ayrshire is similar to that elsewhere in Scotland. Rates of hospital admission for COPD and coronary heart disease are much higher in East Ayrshire than elsewhere in Scotland (Table 10).

**Table 10:** Chronic disease and hospitalisation in East Ayrshire (from 2018 Health Profile)

Health endpoint	Year	Metric	East Ayrshire	Scotland
Cancer registrations	2018	Per population 100,000	737	613.9
Patients hospitalised with COPD	2018	Per population 100,000	444	362
Patients hospitalised with coronary heart disease	2018	Per population 100,000	566	468
Patients hospitalised with cerebrovascular disease	2011	Per population 100,000	259.8	280.0
Patients hospitalised with asthma	2018	Per population 100,000	159	127.6
Emergency medical admissions	2017	Per population 100,000	11749	9685.3
Road traffic accident casualties	2017	Per population 100,000	80	66.9

There are proportionately more emergency hospital admissions in East Ayrshire than elsewhere in Scotland. This is consistent with the higher admission rates for coronary and respiratory disease, but might also reflect differences in health care practice. The road casualty rate is higher in East Ayrshire than the Scottish average which probably reflects differences in the nature of the road network.

The health of older people in East Ayrshire (65+years) is poorer than the national average in relation to serious respiratory and cardiovascular disease with higher rates of hospitalisation for COPD and coronary heart disease (Table 3). There is also a greater rate of multiple hospitalisations for individuals in this age group than the national average. This may reflect a higher prevalence of serious respiratory and cardiovascular illnesses although differences in medical practice could also have a role. The relatively poor respiratory and cardiovascular health of older people may be partly a function of smoking prevalence and other lifestyle factors

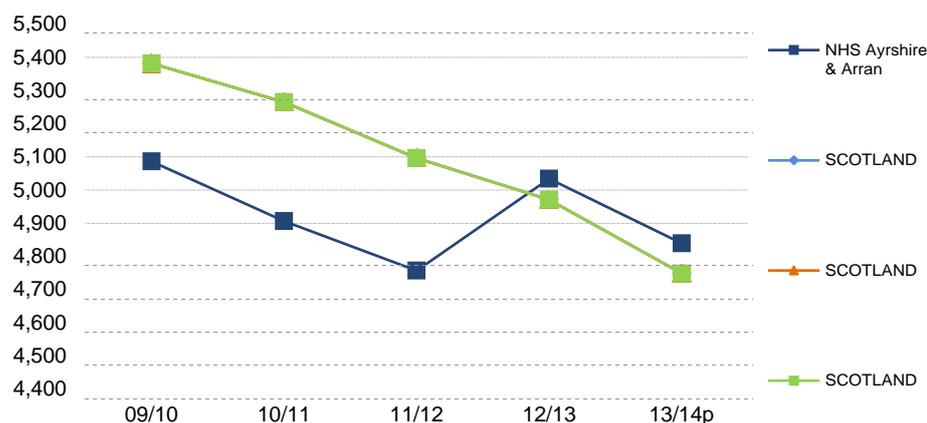
(see below), widespread former employment in dusty trades such as coal mining and poverty. The proportion of older adults receiving social care in East Ayrshire is slightly greater than the national average although there are inconsistencies between different measures of social support (Table 4). The higher levels of social care relative to the national average may reflect the relatively high prevalence of respiratory and cardiovascular ill health.

**Trend**

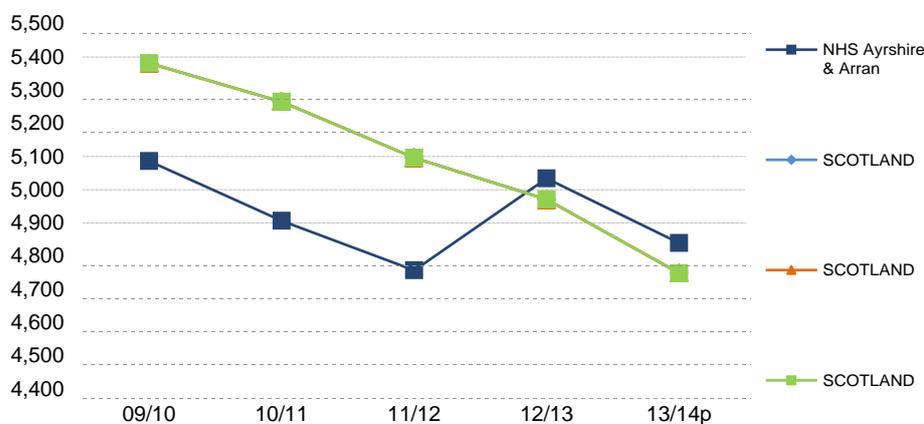
In general terms population health is improving across Scotland as reflected by the growth in life expectancy.

The increase in the proportion of older people in the population has been coupled with increases in the prevalence of conditions typical of old age such as chronic respiratory and cardiac illness. Improved treatments mean that many individuals survive for much longer with serious chronic illness than in the past. Rates of emergency hospital admission and emergency hospital stays in NHS Ayrshire and Arran have slightly reduced in recent years but the rate of reduction has been less than for Scotland as a whole (Figs. 8 and 9).

**Figure 8:** Rates of emergency hospital admissions per 100,000 population (all ages). This chart illustrates that the rates of emergency hospital admissions in NHS Ayrshire and Arran have slightly reduced in recent years but the rate of reduction has been less than for Scotland as a whole.



**Figure 9:** Rates of emergency bed days per 100,000 population (all age). This chart illustrates that the rates of emergency hospital stays in NHS Ayrshire and Arran have slightly reduced in recent years but the rate of reduction has been less than for Scotland as a whole.



### 2.4.3 Substance Use and Abuse

#### State

East Ayrshire generally scores below the Scottish average on health behaviours although the range of metrics covered in the 2014 Health Profile is limited (Table 10). The increased prevalence of smoking and lower participation in sport relative to national averages would be anticipated to lead to increased levels of chronic illness and shorter life expectancy. The hospitalisation data for COPD, coronary heart disease and asthma (above) indicate that the prevalence of heart disease and respiratory illness in East Ayrshire is above the national average, consistent with the high smoking prevalence. Surprisingly, the mortality data do not indicate a substantially shorter life expectancy in East Ayrshire compared with elsewhere in Scotland.

**Table 11:** Information about health behaviours in East Ayrshire from 2018 Health Profile ([https://scotland.shinyapps.io/ScotPHO\\_profiles\\_tool/](https://scotland.shinyapps.io/ScotPHO_profiles_tool/))

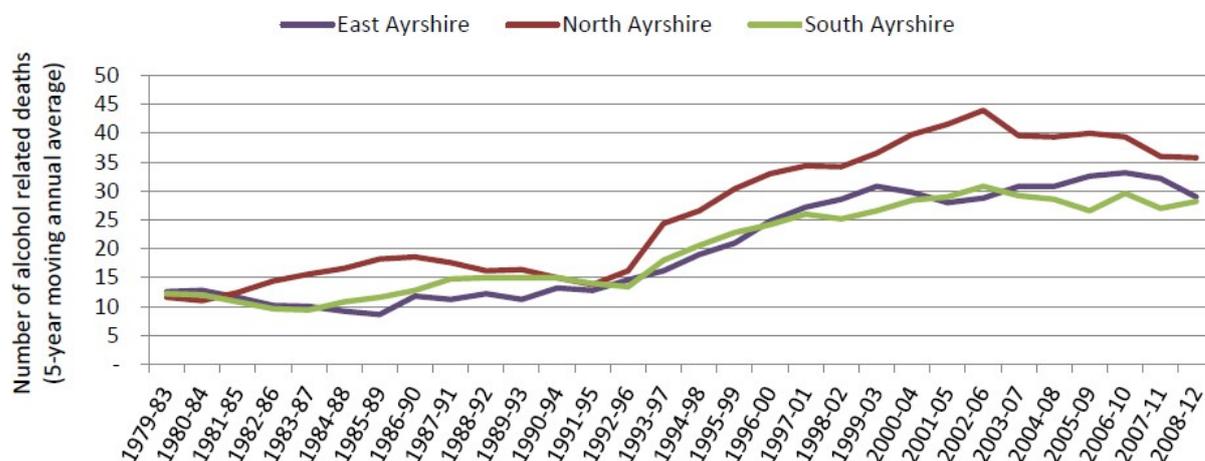
Health behaviour/endpoint	Year	Metric	East Ayrshire	Scotland
Smoking prevalence	2012	%	32.3	22.9
Alcohol-related hospital stays	2018	Per population 100,000	891	738.3
Deaths from alcohol conditions	2017	Per population 100,000	23	18.3
Drug-related hospital stays	2017	Per population 100,000	312	277.2

#### Trend

There are upward trends in alcohol-related deaths and obesity in East Ayrshire (Figs. 8 and 9) that may reflect an increasing prevalence of lifestyle choices that carry an increased risk of premature mortality. There is limited information about trends in smoking prevalence. The Director of Public Health's 2013/14 Report shows a declining prevalence of smoking and drug use in pregnant women but this group may not be representative of the wider population. Across Scotland as a whole, smoking prevalence has declined from 30.7% of adults in 1999 to 23.1% in 2013 but the rate has remained at around 23% since 2011<sup>6</sup>. Lower rates of smoking would be expected to lead to reduced cardiovascular, respiratory and cancer death rates.

<sup>6</sup> <http://www.scotland.gov.uk/Topics/Statistics/Browse/Health/TrendSmoking>

**Figure 10:** Time trends in alcohol related deaths in Ayrshire and Arran (Director of Public Health’s 2013/14 report). This chart illustrates that East Ayrshire has seen an upward trend in the number of alcohol related deaths between 1979 and 2012.



#### 2.4.4 Obesity

##### State

Obesity is one of the most important public health issues in Scotland and East Ayrshire. According to published studies<sup>7</sup>, obesity has a range of associated health conditions including 2 diabetes, heart disease, some types of cancer and poorer mental health.

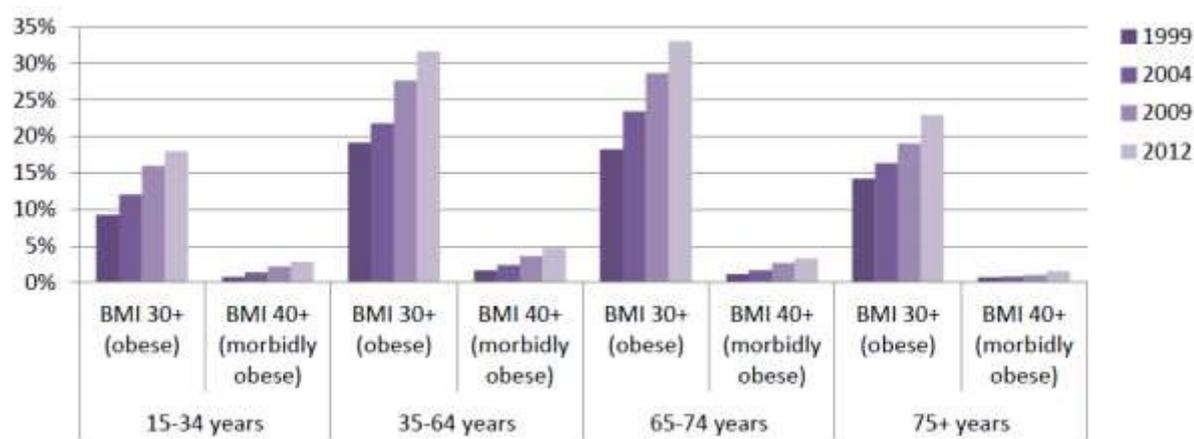
- In 2012, 62% of adults in Ayrshire and Arran were overweight or obese, 28% were obese and 3.8% were morbidly obese.
- This equates to some 190,000 overweight, 87,000 obese and 11,600 morbidly obese adults in the local population. In the same year, 26.6% of Primary 1 school-aged children in Ayrshire and Arran were found to be overweight or obese. These local data also show that higher levels of obesity are associated with deprivation.

##### Trend

Over recent decades there has been an increase in the number of obese adults and children which is reflected in the data for Ayrshire and Arran. The data on Figure 11 below shows the adult population in obese and morbidly obese categories has increased each year between 1999 and 2012 in all age groups. This trend is being tackled through initiatives such as Ayrshire Healthy Weight Strategy (2014 – 2024) which is seeking to promote prevention of obesity through healthy eating, increased activity and education.

<sup>7</sup> Management of Obesity – a National Clinical Guideline (2010) Scottish Intercollegiate Guidelines Network (SIGN 115). Guideline Network (SIGN) Guideline No. 115: Management of Obesity: A national clinical guideline, 2010

**Figure 11:** Percentage of adult population, obese and morbidly obese in Ayrshire and Arran, 1999 to 2012 by age group



## 2.4.5 Physical activity

### State

There are a range of baseline sources which indicate level of physical activity undertaken by residents of East Ayrshire. The Scottish Household Survey (2017) is one source of data on how people use outdoor space and greenspace for recreation:

- 17% of residents who took part in the survey felt that they were within a 10 minute walking distance from their nearest useable greenspace. This compares to 20% of people across Scotland;
- 41% of residents use their nearest greenspace every day/several times a week with 26% never using their local greenspace. However, across Scotland, 37% use their greenspace every day/several times a week with 23% never using the outdoors for recreation.

Data collected by the East Ayrshire Community Health Improvement Partnership (CHIP) recorded attendance at physical and health classes<sup>8</sup>:

- 11,537 attendances at exercise classes, health walks and falls prevention classes
- 3,243 attendances at outreach services such as the CHIP Van events and community visits
- 504 new referrals participated on the Activity on Prescription initiative

In addition, 20,000 attendances were recorded as athletes, officials, volunteers and spectators visited the Ayrshire Athletics Arena in 2013/14 to participate in a range of events.

**Table 12** – Participation in Sport and Exercise during a 4 week period (Scottish Household Survey, 2017). This data shows a lower level of participation in East Ayrshire than within Scotland overall.

Response to Question on Participation in Sport and Exercise during a 4 week period	Responses
<b>East Ayrshire</b>	
Walking (at least 30 minutes)	68
Swimming	12

<sup>8</sup><http://www.eastayrshire.gov.uk/CommunityLifeAndLeisure/ServicesAndAdviceForOlderPeople/ActivitiesForOlderPeople/CHIP.aspx>

Keep Fit /Aerobics	13
Multigym use / Weight Training	7
Running / jogging	8
Cycling (at least 30 minutes)	9
Dancing	3
Football	7
Golf	3
Snooker / Billiards / Pool	6
Bowls	3
Other Sport	4
None of these	21
Any sporting participation (excluding walking)	79
Any sporting participation (including walking)	43
<i>Base</i>	<i>250</i>
<b>Scotland</b>	
Walking (at least 30 minutes)	70
Swimming	18
Keep Fit /Aerobics	15
Multigym use / Weight Training	15
Running / jogging	14
Cycling (at least 30 minutes)	12
Dancing	7
Football	7
Golf	5
Snooker / Billiards / Pool	6
Bowls	2
Other Sport	8
None of these	19
Any sporting participation (excluding walking)	81
Any sporting participation (including walking)	53
<i>Base</i>	<i>9,810</i>

### **Trend**

The Scottish Household Survey published in 2018 (based on 2017 data) showed an upward trend with 79% of people participating in sport, including walking. This is an increase of 6% from the previous year. Walking was by far the biggest activity, over 68% of people having taken a half hour walk for recreational purposes in East Ayrshire.

**Table 13** – Trends in level of sport and exercise between 2012 and 2017 (Scottish Household Survey, 2017). Whilst the data shows a lower level of participation in East Ayrshire than within Scotland overall, the overall trend is an increase in levels of sport.

	2012	2013	2014	2015	2016	2017
<b>East Ayrshire</b>						
Any sporting participation (including walking)	70	73	76	76	73	79
Any sporting participation (excluding walking)	47	45	48	44	39	43
Walking (at least 30 minutes)	56	53	61	63	63	68
<i>Base</i>	<i>220</i>	<i>190</i>	<i>230</i>	<i>220</i>	<i>210</i>	<i>250</i>
<b>Scotland</b>						
Any sporting participation (including walking)	74	78	78	80	79	81

Any sporting participation (excluding walking) Walking (at least 30 minutes)	51 59	52 65	51 64	52 69	51 67	53 70
<i>Base</i>	<i>9,890</i>	<i>9,920</i>	<i>9,800</i>	<i>9410</i>	<i>9640</i>	<i>9810</i>

It is anticipated that events such as the Commonwealth Games held in Glasgow in 2014 will have increased general levels of participation in sport and exercise<sup>9</sup>. SportScotland have reported an increase in membership of sport governing bodies, and more clubs joining Community Sport Hubs of which there are currently 3 in East Ayrshire (Auchinleck, Grange and St Josephs).

#### 2.4.6 Mental Health

##### **State**

Around 1 in 3 people are estimated to be affected by mental illness in any one year in Scotland and improving mental health is a priority for the Scottish Government<sup>10</sup> together with East Ayrshire Health and Social Care Partnership. The Scottish Health Survey provides details of the numbers affected by mental health problems in 2014:

- In 2014, 16% of adults in Scotland exhibited signs of a possible psychiatric disorder (GHQ-12 score of four or more). based on the General Health Questionnaire (GHQ)
- Women were slightly more likely than men to have a high GHQ-12 score (17% four or more, compared with 14% of men).
- High GHQ-12 scores were more common among those aged 16-64 (15-19%) than those aged 65 and over (8-12%).

##### **Trend**

The Scottish Health Survey includes an overview of the trends in mental health and wellbeing for Scotland but not at East Ayrshire level:

- The proportion of adults aged 16 or over with a GHQ12 score of four or higher has shown no significant change since 2003, remaining steady at around 15%.
- There is no change in the numbers by gender, with prevalence remaining at around 13% for men and 17% for women.
- In all surveys since 2003, adults in the 65-74 year age band have consistently shown the lowest proportion scoring 4 or more on GHQ12, at around 11%.
- The highest proportion generally varies each year across the three age bands covering ages 35-64.

<sup>9</sup> <http://www.sportscotland.org.uk/>

<sup>10</sup> <http://www.gov.scot/Resource/0039/00398762.pdf>

## 2.5 Employment and Key Sectors

### State

East Ayrshire has the 4th highest level of unemployment in Scotland according to April 2015 figures from Skills Development Scotland<sup>11</sup> at 3.6% and the second highest youth unemployment rate at 6.6% after North Ayrshire with 6.8%. The overall youth unemployment rate for Scotland is 3.5%. The wider economic status of those in work is similar to the rest of Scotland and shown in Table 13.

**Table 14** – Economic Status East Ayrshire (Adults 16+) from Scottish Household Survey, 2017 which shows a similar level of full time employment but lower levels of self-employed or part time employees.

	Male	Female	All
<b>East Ayrshire</b>			
Self employed	7	4	5
Employed full time	52	38	45
Employed part time	1	15	8
Looking after the home or family	2	10	6
<i>Survey Base (number of people surveyed)</i>	<i>110</i>	<i>140</i>	<i>250</i>
<b>Scotland</b>			
Self employed	9	4	6
Employed full time	47	30	38
Employed part time	4	17	11
Looking after the home or family	1	8	5
<i>Survey Base (number of people surveyed)</i>	<i>4,540</i>	<i>5,270</i>	<i>9,810</i>

### Trend

There have been a range of changes in East Ayrshire noted in the East Ayrshire Economic Development Strategy 2014/2025<sup>12</sup> including:

- Closure of Diageo's Johnnie Walker bottling plant in 2012 which was a major employer in the town with the loss of around 700 jobs
- Loss of construction and engineering firms following the recession
- Loss of several high street chains with shops in East Ayrshire town centres
- Loss of surface coal operators Scottish Coal and ATH Resources resulting in around 300 redundancies. A modest number of new jobs have been created through restoration of some of the sites and continued working under new mineral operators

The public sector is the largest employer in East Ayrshire with other key sectors for East Ayrshire including engineering, food and drink and agriculture. There was a growth in private sector employment in East Ayrshire between 2009 and 2011 in business administration and support services.

<sup>11</sup> <http://www.skillsdevelopmentscotland.co.uk/resources/labour-market-intelligence/national-monthly-unemployment-update/>

<sup>12</sup> <http://www.east-ayrshire.gov.uk/Resources/PDF/E/EconomicDevelopmentStrategy2014-2025.pdf>

**Table 15 – Employment Sector Change between 2007 and 2011** (Extract from East Ayrshire Economic Development Strategy 2014/2025 using data from The Business Register and Employment Survey)<sup>13</sup>

East Ayrshire Employment

	2007	2009	2011	Change	%Change
Agriculture, forestry & fishing	100	-	100	-	0%
Mining, quarrying & utilities	1,200	1,100	1,300	100	10%
Manufacturing	5,000	3,200	3,100	-1,900	-37%
Construction	2,600	2,200	2,100	-500	-20%
Motor trades	1,000	800	700	-300	-29%
Wholesale	900	1,200	1,100	200	24%
Retail	4,300	4,300	4,000	-300	-5%
Transport & storage	1,400	1,600	1,600	200	9%
Accommodation & food services	1,900	2,000	1,600	-300	-15%
Information & communication	300	400	200	-100	-15%
Finance & insurance	700	500	500	-200	-25%
Property	200	300	200	-	5%
Professional, scientific & technical	1,000	1,400	1,100	100	8%
Business administration & support services	3,100	3,400	4,500	1,400	43%
Public administration & defence	2,400	3,300	3,100	700	30%
Education	3,000	2,700	2,800	-200	-6%
Health	7,800	9,500	10,000	2,200	29%
Arts, entertainment, recreation & other services	2,000	1,500	1,900	-100	-3%
<b>Total</b>	<b>38,800</b>	<b>39,500</b>	<b>40,000</b>	<b>1,200</b>	<b>3%</b>

Source: BRES. Change and % Change are for the period 2007-2011. These figures exclude the re-employed, government supported vacancies and HM Forces.

It should be noted that the latest figures available from the Coal Authority indicate East Ayrshire surface coal employment as 215, compared to a peak of 750 in 2011.

## PRESSURES

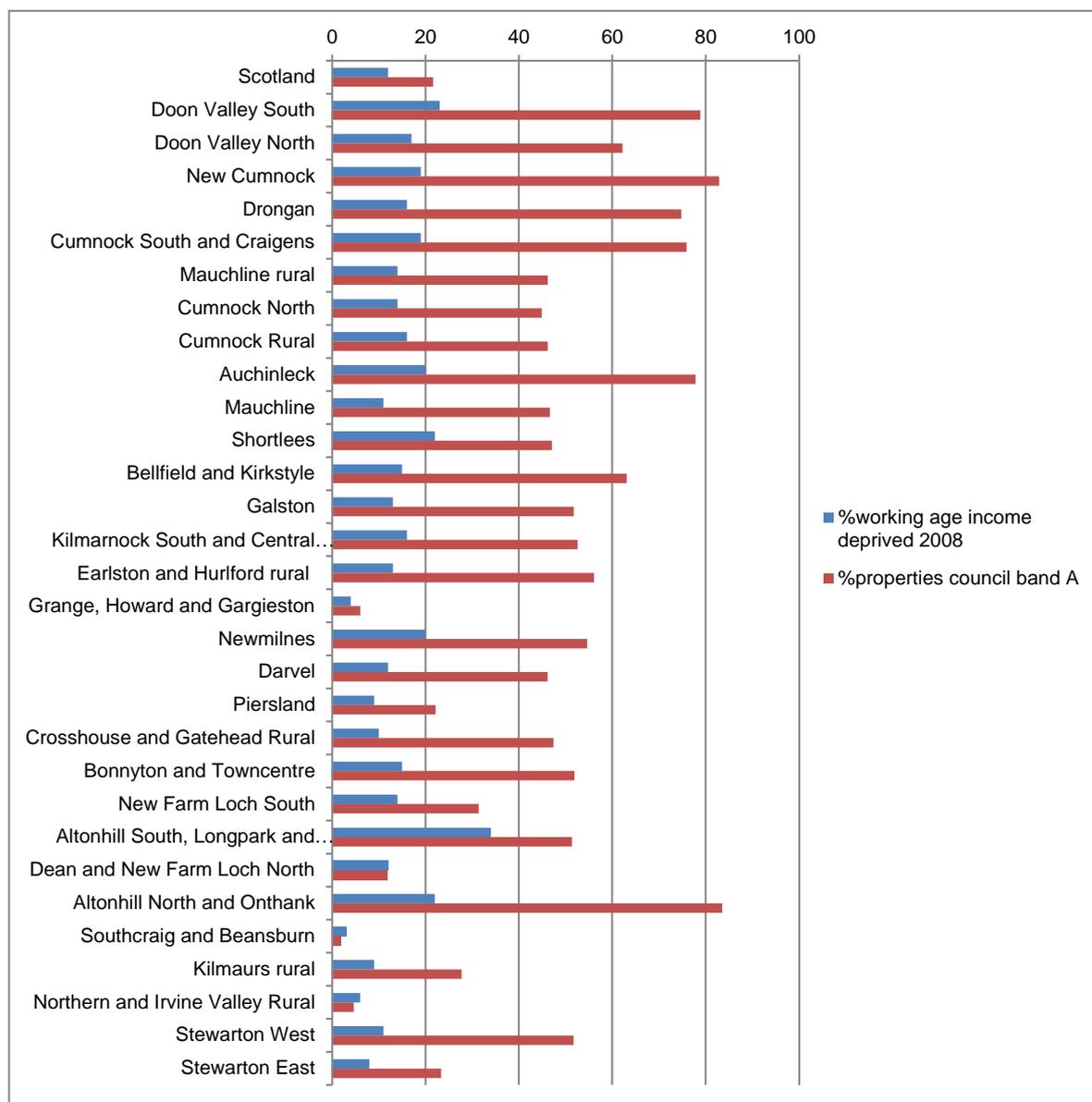
There are a range of pressures which affect and influence both population and health status and trend in Scotland and are also evident in East Ayrshire.

### 3.1 Socio-economic Influences on health

Marked socio-economic inequalities exist within East Ayrshire that would be expected to impact on population health (Fig. 12).

<sup>13</sup> <http://www.ons.gov.uk/ons/guide-method/method-quality/specific/labour-market/business-register-and-employment-survey--bres-/index.html>

**Figure 12:** Two measures of socio-economic inequalities in the East Ayrshire population (“working age deprived” and council tax band with ‘A’ being the lowest tax band) by “intermediate geography” from the Scottish Neighbourhood Statistics website. This illustrates significant variations between localities of East Ayrshire where there has been historic decline in heavy industry / mining for example.

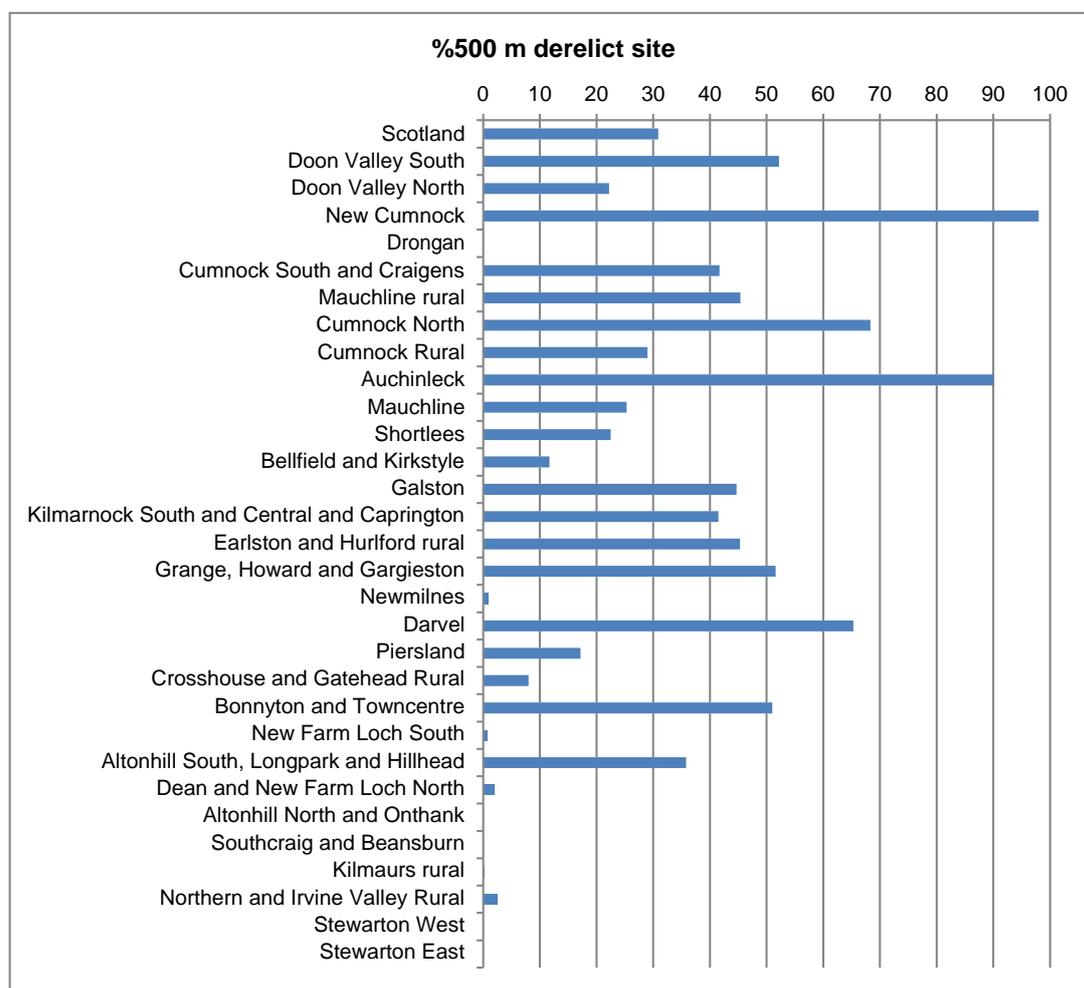


### 3.2 Environment/ Neighbourhood quality

Environmental quality and people’s perception of the quality of their local environment are important determinants of health. People’s perceptions of the quality of their local environment and neighbourhood have an important impact on their mental health and well-being and indirectly on their physical health. On average, the population of East Ayrshire enjoys a lower level of “perceived neighbourhood quality” than the Scottish average, only 45.4% of polled residents rated neighbourhood as a very good place to live compared with 55.2% for Scotland as a whole. The East Ayrshire Community Plan residents survey found that 77% of respondents felt that the quality of life in their town or village was good.

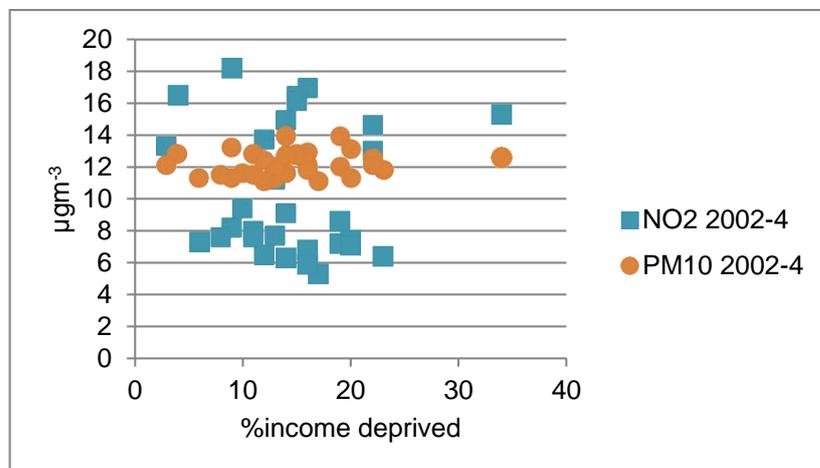
There is limited information about the geographical variation of environmental quality in East Ayrshire. Exposure to air pollution varies across the region as described in Chapter 4 as does proximity to derelict (and potentially contaminated) sites. East Ayrshire scores slightly better than the Scottish average on other measures of neighbourhood quality with only 28.9% living within 500 m of a derelict site compared with the national average of 30.8% and only 12.1% of the population living in the top 15% of access deprived areas as defined at national level. Only 9.3% of the 65+ age group live in the 15% of most access deprived areas. Access provides important opportunities for social contact and networking which are health protective and that may counteract some of the negative effect arising from poor neighbourhood quality.

**Figure 13:** Example of environmental inequality - % population living within 500 m of a derelict site by “intermediate geography” from the Scottish Neighbourhood Statistics website. This chart illustrates significant variations between localities of East Ayrshire due to factors such as past industrial and coal mining heritage.

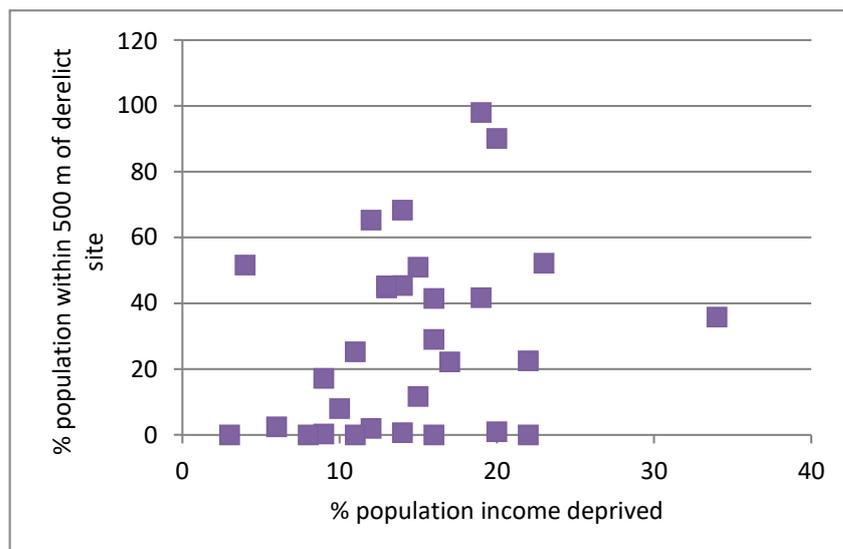


Environmental and social inequalities are often correlated but socio-economic deprivation in East Ayrshire does not appear to be strongly associated with poorer environmental quality, although the evidence base is limited. Deprivation as assessed by %income deprived is not associated with population mean exposure to air pollution or mean proximity to derelict land (Figs. 14 and 15) and a similar impression is gained if the %houses in Council tax band A is used as a different measure of deprivation.

**Figure 14:** Relationship between deprivation (%working population deprived 2008) and population mean exposure to air pollution for “Intermediate Geographies” in East Ayrshire (from Scottish Neighbourhoods Statistics website). This chart illustrates that there is no correlation between the % income deprived and population mean exposure to air pollution.



**Figure 15:** Relationship between deprivation (%working population deprived 2008) and % people within 500 m of a derelict site for “Intermediate Geographies” in East Ayrshire (from Scottish Neighbourhoods Statistics website). This graph illustrates that there is no correlation between the %income deprived and % people within 500 m of a derelict site in East Ayrshire.



### 3.3 Health Inequalities

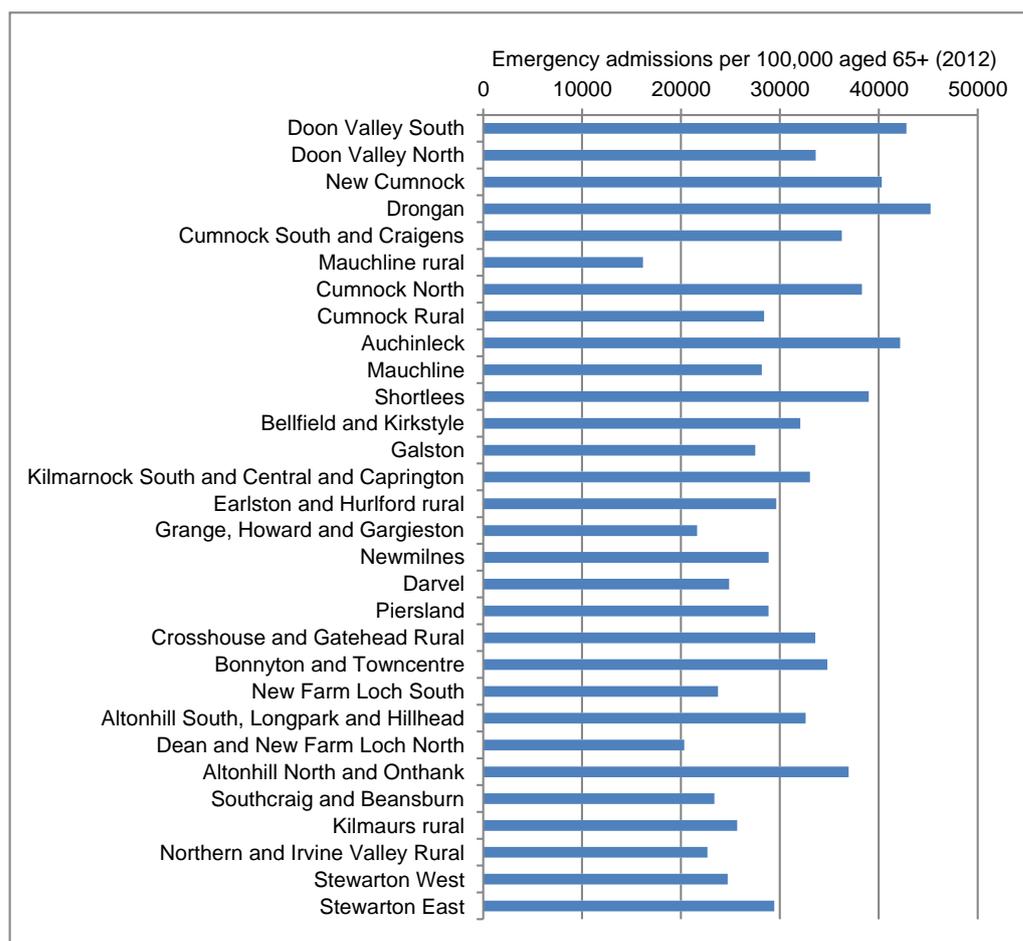
Inequalities have a major impact on population health. There is very little publically available information about health inequalities within East Ayrshire.

The Director of Public Health for Ayrshire and Arran’s 2013/14 Report<sup>14</sup> indicates that Male Life Expectancy in East Ayrshire was almost 6 years shorter in the most deprived 15% of the population than for the least deprived 15%. The equivalent figure for women was about 3.5 years.

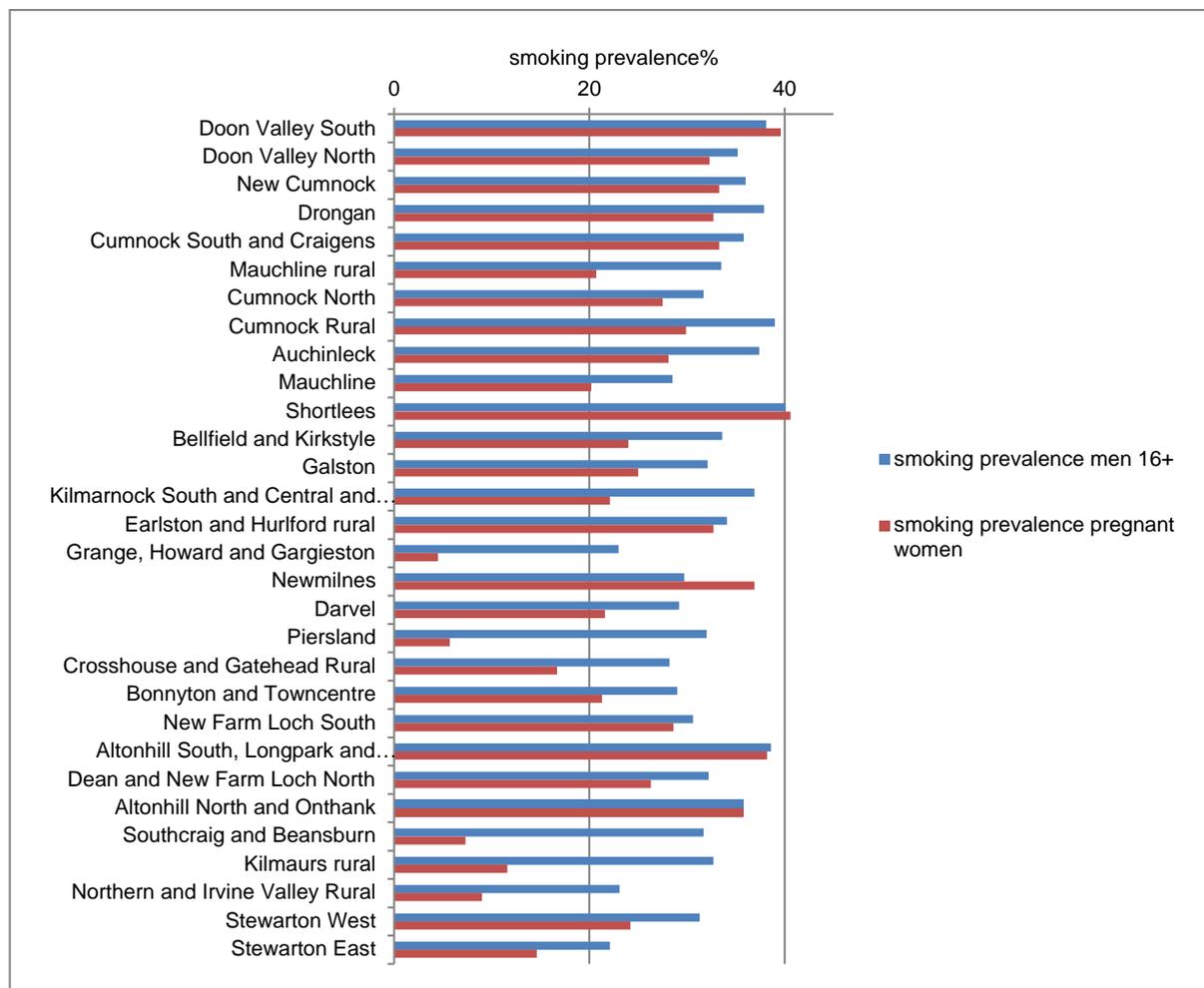
<sup>14</sup> [www.nhsaaa.net](http://www.nhsaaa.net)

The Scottish Neighbourhood Statistics website provides information about emergency hospital admission in people aged over 65 and about smoking habits (Figs.16 and 17). Based on information for “intermediate geographies” for East Ayrshire, there are clear relationships between hospital admissions in older people and deprivation (where %working population that is income deprived is used as a proxy for population wide deprivation; Fig. 17), emergency hospital admissions in older people and smoking prevalence (Fig.18) and between deprivation and smoking status (Fig. 19). It is likely that the higher prevalence of smoking in deprived areas contributes to higher rates of hospital admission but unlikely that smoking is the main cause of the association between deprivation and poor health.

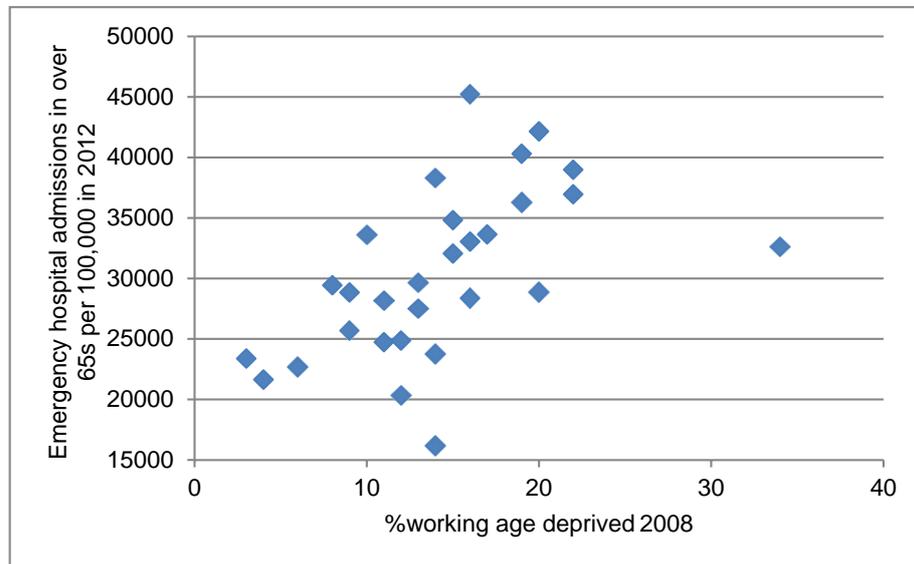
**Figure 16:** Emergency hospital admissions in people aged 65+ years by intermediate geography in East Ayrshire



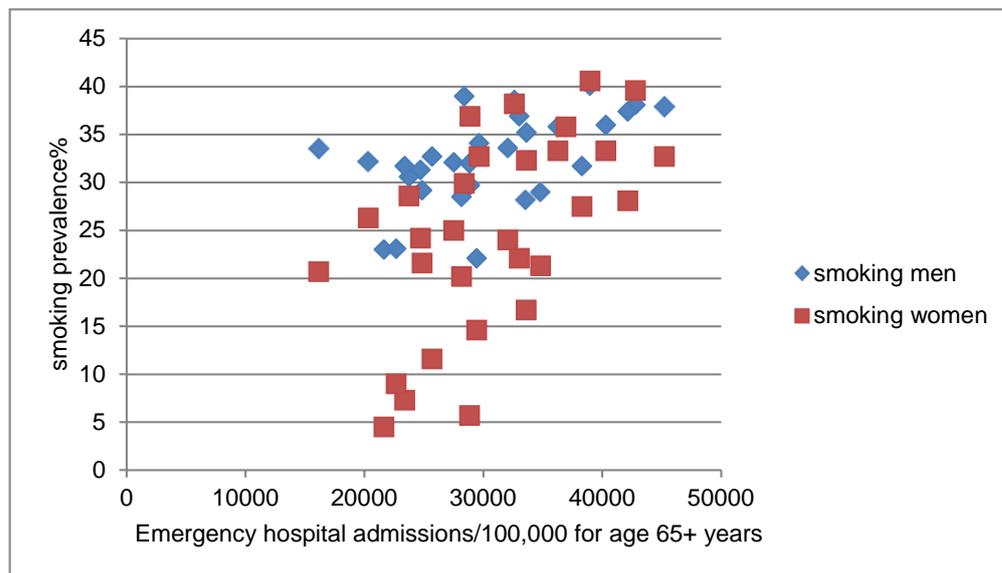
**Figure 17:** Smoking prevalence by intermediate geography in East Ayrshire (Scottish Neighbourhood Statistics); data for men 2003/4, data for women 2011/13. This illustrates significant variations between localities of East Ayrshire typically with higher levels of smoking in former industrial areas / urban housing estates.



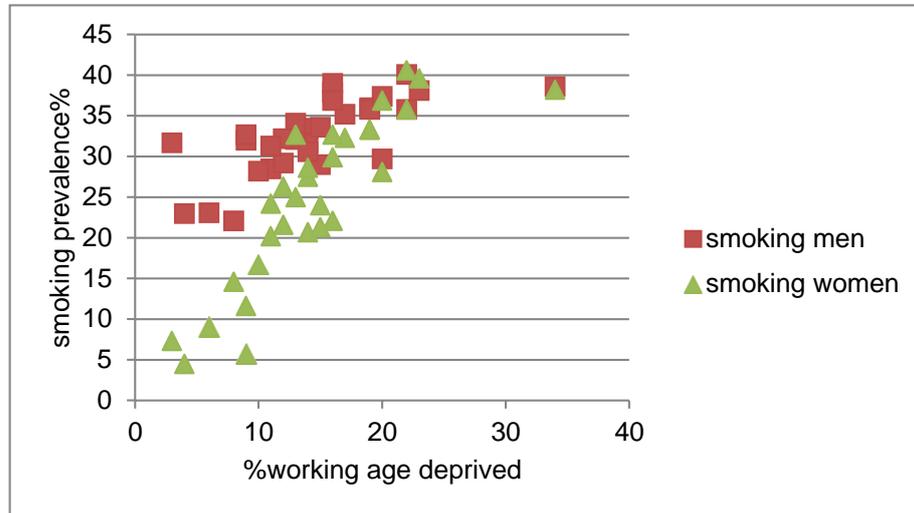
**Figure 18:** Relationship between emergency hospital admissions in people aged 65+ and the %working age people that are income deprived for intermediate geographies in East Ayrshire. This illustrates that there are higher levels of emergency hospital admissions in older people seen in areas with higher levels of deprivation.



**Figure 19:** Relationship between emergency hospital admissions in people aged 65+ and smoking prevalence for intermediate geographies in East Ayrshire. This illustrates that there are higher levels of emergency hospital admissions in older people seen in areas with higher levels of smoking.



**Figure 20:** Relationship between smoking prevalence and the %working age people that are income deprived for intermediate geographies in East Ayrshire. This illustrates that there are generally higher levels of smoking seen in areas with higher levels of deprivation.



## CONCLUSIONS

### 4.1 CONCLUSIONS

#### Population Size and Growth

The population of East Ayrshire has fallen overall since 1988 but with a rise between 2003 and 2011. The population is expected to decline by 0.6% by 2037 (based on 2012 population figures).

#### Age of Population

The age structure of the East Ayrshire population is typical of Scotland but levels of deprivation are higher than the Scottish average. There are marked socio-economic and environmental inequalities within East Ayrshire.

#### Life Expectancy

Life expectancy in East Ayrshire is marginally lower than the national average and reflects the socio-economic and environmental inequalities within East Ayrshire.

#### Health

- Deaths from cancers are slightly higher in East Ayrshire with cardiovascular and cerebrovascular death rates, slightly lower.
- The rate of cancer registrations is similar to that elsewhere in Scotland but rates of hospital admission for COPD and coronary heart disease are much higher than elsewhere in Scotland.
- There are proportionately more emergency hospital admissions than elsewhere in Scotland.
- The health of older people in East Ayrshire (65+years) is markedly poorer than the national average in relation to serious respiratory and cardiovascular disease
- East Ayrshire generally scores below the Scottish average on health behaviours as reflected in alcohol-related deaths, smoking prevalence, participation in exercise and obesity.
- Health in East Ayrshire is currently improving with an ongoing growth in life expectancy and reduction in cardiovascular and respiratory death rates.
- Levels of obesity in East Ayrshire are similar to levels across the rest of Scotland

#### Socio-Economic Impacts

- There is some evidence to link health issues (cancer, heart disease and, obesity) and socio-economic inequalities within East Ayrshire. There is little evidence to link health with environmental inequalities and the evidence base is limited.

## MINERALS - HEALTH EFFECTS ASSOCIATED WITH MINERALS OPERATIONS

### 5.1 Summary

#### ***Health impacts associated with Surface Coaling***

Studies from elsewhere suggest that particle admissions from surface coal mining may have small adverse effects on children's respiratory health in line with the effects reported for particulate matter from other sources.

There is also limited data that suggest a link between emissions from surface coaling and cardiovascular, respiratory and other illness in adults. It has been calculated that exposure to anthropogenic PM<sub>2.5</sub> in East Ayrshire in 2010 was associated with 45 attributable deaths representing a loss of 497 life years. Particulate emissions from surface workings in the recent past may have contributed to about 2 deaths per year in East Ayrshire.

The current scale of surface coal operations is much smaller and the remaining active sites are at much greater distance from residential areas than previously. Current PM emissions from surface mining are likely to contribute to less than one extra death per decade. Although the overall health impact of surface coaling is likely to be exceedingly small, emissions from surface coaling may enhance existing health inequalities within East Ayrshire. People living in the vicinity of surface operations do not necessarily experience any economic or other benefits. Many of the affected communities are socially and economically deprived and have below average baseline health making them more susceptible to the adverse effects of environmental pollution.

Provided effective permit and planning conditions are imposed, population exposure to emissions from future surface coal operations and any associated adverse health effects should be negligible.

#### ***Health Effects associated with Unconventional Gas***

If exploration for unconventional gas is undertaken in East Ayrshire, the human health impacts of emissions from the exploration process are likely to be small. If commercial exploitation of unconventional gas becomes a reality in East Ayrshire, then the potential for adverse effects on health may become much greater. The exploitation of unconventional gas might, however, also bring employment opportunities and community benefits that would be expected to have a positive impact on health. The magnitude of the potential risk to human health will depend on levels of exposure to air and noise pollution which will depend on the location and scale of operations, the planning conditions imposed on developers in relation to noise, traffic and nuisance, the conditions imposed on the operation by SEPA and the effectiveness of regulatory enforcement.

#### ***Case Studies***

There are a range of case studies which are of interest to a review of health impacts of mineral extraction and specifically coal mining in East Ayrshire. As with all research, there will be locational, social and economic factors that would mean that findings cannot be directly related to specific locations in East Ayrshire.

#### **International Example – Appalachians, North America**

There have been a series of studies of health in coal mining areas of the Appalachians that have reported associations between a range of adverse effects and living in a community close to coal mining operations (Kurth et al (2014)<sup>15</sup>). Although these report that

<sup>15</sup> Kurth LM, McCawley M, Hendryx M, Lusk S. J Expo Sci Environ Epidemiol. 2014 Jul;24(4):405-11. Atmospheric particulate matter size distribution and concentration in West Virginia coal mining and non-mining areas

concentrations of PM<sub>10</sub> were significantly greater around mining than non-mining areas of West Virginia, none of the published epidemiological studies specifically considered air quality. People living in these communities are likely to have been exposed to both direct emissions from surface coal operations and smoke from domestic heating in outdoor air.

Overall, the results of the Appalachian studies show an association between living in communities in areas where surface coaling is undertaken and various measures of ill health in individuals with no history of employment in the mining industry. The studies were not, however, designed to demonstrate a relationship between health and emissions from surface coaling.

#### **Study of Effects of Surface Coal Mining on Children's Health - North England**

Pless-Mulloli et al (2000<sup>16</sup>, 2001<sup>17</sup>) and Howel et al (2001)<sup>18</sup> undertook an epidemiological study of the relationship between children's respiratory health and exposure to PM<sub>10</sub> in communities affected by surface coaling. The study enrolled children aged 1-11 years from the general population of five socio-economically matched pairs of non-urban communities in northern England. The committee concluded that the impact of surface coal mining on children's respiratory health is very small and that long term effects were unlikely. The importance of earth moving and excavation as a source of PM<sub>10</sub> was highlighted as an issue that should be addressed by the imposition of appropriate planning conditions.

#### **Douglasdale Health Study - Scotland**

A health study undertaken for the Douglasdale Community in 2009<sup>19</sup> compared the health of communities affected by nearby surface coaling operations (exposed communities) with that of (control) communities without nearby surface mines. The study reported an increase in the incidence of COPD in Douglasdale between 2004 and 2008 which was a period of extensive nearby surface mining activity. This increase was not observed in Dalmellington or Prestwick, although the prevalence of COPD in Dalmellington where extensive surface coal mining had previously been undertaken was above the UK average and that in Prestwick below the UK average. A parallel increase in asthma prevalence was reported for the Douglasdale Medical Practice between 2005 and 2010 whereas the prevalence rates for North or South Lanarkshire showed only a minimal increase over the same time period. There is a strong correlation between poor health status and deprivation and levels of deprivation are likely to have been higher in the coal mining communities than in the control communities. Smoking prevalence is also correlated to deprivation.

#### ***Overall assessment of evidence linking surface coaling operations to adverse health effects***

Overall it seems likely that emissions from surface coaling do adversely affect respiratory health but that much of the poor health seen in communities affected by surface coaling may be due to adverse socio-economic circumstances rather than exposure to emissions from surface coaling.

<sup>16</sup> Pless-Mulloli T, Howel D, King A, Stone I, Merefield J, Bessell J, Darnell R. Living near opencast coal mining sites and children's respiratory health. *Occup Environ Med*. 2000 Mar;57(3):145-51

<sup>17</sup> Pless-Mulloli T, Howel D, Prince H. Prevalence of asthma and other respiratory symptoms in children living near and away from opencast coal mining sites. *Int J Epidemiol*. 2001 Jun;30(3):556-63.

<sup>18</sup> Howel D, Darnell R, Pless-Mulloli T. Children's respiratory health and daily particulate levels in 10 nonurban communities. *Environ Res*. 2001 Sep;87(1):1-9.

<sup>19</sup> The True Cost of Coal to Communities. A health study investigating the coal mining on the health of Douglasdale communities impacts of opencast Coal Health Study - Douglasdale Edition Version 2, December 2010 coalactionsotland.noflag.org.uk/Douglasdale\_v4.pdf

## 5.2 Detailed Review of Adverse Health Effects of Particulate Emissions from Surface Coaling in East Ayrshire

### ***Basis of estimate***

The main impact of emissions from surface coaling or quarrying on health is likely to arise from exposure to airborne particulate matter with a smaller contribution from increased levels of NO<sub>x</sub> emissions. Long-term exposure to airborne particles is associated with higher morbidity and increased mortality risk. Effects are typically associated with exposure to PM<sub>10</sub> - ambient particles that are small enough to penetrate to the lungs – and PM<sub>2.5</sub> – the fraction of PM<sub>10</sub> that that can reach the gas exchange region of the lung in people with existing respiratory issues.

Studies of the effects of PM<sub>10</sub> in large urban populations have found associations between daily changes in the concentration of PM<sub>10</sub> and small changes in the daily death rate, the number of emergency hospital admissions for cardiovascular and respiratory illness and increased numbers of GP consultations for respiratory illness (Department of Health's Committee on the Medical Effects of Air Pollution, COMEAP, 1998<sup>20</sup>; WHO 2000<sup>21</sup>).

### ***Adverse effects of exposure to PM<sub>2.5</sub> in East Ayrshire - from all sources***

Public Health England published estimates of the impact of exposure to airborne particulate on mortality risk for all local authority areas in the UK in 2014<sup>22</sup>. This study estimated that the proportion of deaths in people aged 25+ in East Ayrshire that was attributable to PM<sub>2.5</sub> was 3.5% compared with 3.9% for Scotland as a whole and the total number of attributable deaths in 2010 was 45, representing a loss of 497 life years across the entirety of East Ayrshire.

It is also possible to estimate the impacts of exposure to particulates on other indicators such as rates of emergency hospital admission for cardiovascular and respiratory illness.

The HRAPIE (Health risks of air pollution in Europe; HRAPIE, 2013) report<sup>23</sup> indicates that rates of hospital admission for cardiovascular and respiratory illness increase by about 0.91% and 1.9% per 10 µg<sup>m</sup>-<sup>3</sup> increase in PM<sub>2.5</sub>. This implies that up to about 0.6% or 190 of the 31,790 emergency medical admissions in East Ayrshire in 2011 may have been attributable to population mean exposure to anthropogenic PM<sub>2.5</sub> (6.1 µg<sup>m</sup>-<sup>3</sup>).

### ***Adverse effects of exposure to PM<sub>2.5</sub> in East Ayrshire – from Surface Coaling***

Surface coal mining and quarrying will contribute to population exposure to PM<sub>2.5</sub>, although most of the particles emitted from these operations are of larger size.

The greatest exposure to particulates is typically within 100m of a surface or quarry operation. An estimate of the increment in population mean exposure to PM<sub>2.5</sub> that is attributable to surface coaling operations, can be made on the basis of the numbers of properties at different distances from active surface coal sites and assumptions as to the increment in concentrations of PM<sub>2.5</sub> within each of these distance band.

The impacts of quarry operations affect a much smaller proportion of the East Ayrshire population as there are less active sites. Typically sand and gravel extraction is extracted damp

<sup>20</sup> COMEAP. Quantification of the effects of air pollution on health in the United Kingdom. Committee on the Medical Effects of Air Pollutants. 1998; Department of Health. HMSO.

<sup>21</sup> WHO. Air quality guidelines for Europe (2<sup>nd</sup> Edn) 2000; World Health Organization.

<sup>22</sup> Public Health England (2014) Estimating local mortality burdens associated with particulate air pollution. <https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>

<sup>23</sup> WHO (2013): 'Health risks of air pollution in Europe – HRAPIE project. Recommendations for concentration-response functions for cost-benefit analysis of particulate matter, ozone and nitrogen dioxide'; [http://www.euro.who.int/\\_data/assets/pdf\\_file/0006/238956/Health-risks-of-air-pollution-in-Europe-HRAPIE-project,-Recommendations-for-concentration-response-functions-for-costbenefit-analysis-of-particulate-matter,-ozone-and-nitrogen-dioxide.pdf](http://www.euro.who.int/_data/assets/pdf_file/0006/238956/Health-risks-of-air-pollution-in-Europe-HRAPIE-project,-Recommendations-for-concentration-response-functions-for-costbenefit-analysis-of-particulate-matter,-ozone-and-nitrogen-dioxide.pdf)

and water used in processing which can address some of the potential issues – dust management measures are important considerations in planning and monitoring.

**Table 16:** Estimates of population mean exposure to PM<sub>2.5</sub> arising from currently active OCCSs. This table shows that there are a total of 26 properties within 1000m of active surface coaling sites in East Ayrshire. Based on the number of houses and an assumed occupancy rate of 2 adults aged 30+ per household, the increment in population mean exposure to PM<sub>2.5</sub> in East Ayrshire that is attributable to current surface coaling operations is <0.001 µg<sup>m</sup>-<sup>3</sup>.

Distance band	Properties	Adults aged 30+	Increment in concentration of PM <sub>2.5</sub> µg <sup>m</sup> - <sup>3</sup>	Increment in population mean concentration: Within 1 km of OCCS µg <sup>m</sup> - <sup>3</sup>	Increment in population mean concentration: East Ayrshire µg <sup>m</sup> - <sup>3</sup>
100	1	2	5	1.21	<0.001
250	1	2	2.5		
1000	24	48	1		
total	26	52			

This equates to a predicted associated loss of life expectancy across the entirety of the East Ayrshire population of less than 15 days.

The level of historical exposure would have been greater due to the higher number of operational surface coal sites - 0.282 µg<sup>m</sup>-<sup>3</sup> (Table 16) and loss of life expectancy of 23 years across the East Ayrshire population. In context this is 4.6% of the total mortality burden due to anthropogenic PM<sub>2.5</sub> exposure.

**Table 17:** Estimates of historical population mean exposure to PM<sub>2.5</sub> arising from OCCSs that were operational in the past

Distance band	Properties	Adults aged 30+	Increment in concentration of PM <sub>2.5</sub> µg <sup>m</sup> - <sup>3</sup>	Increment in population mean concentration: Within 1 km of OCCS µg <sup>m</sup> - <sup>3</sup>	Increment in population mean concentration: East Ayrshire µg <sup>m</sup> - <sup>3</sup>
100	290	580	5	1.26	0.282
250	878	1756	2.5		
1000	8342	16684	1		
total	9510	19020			

Current levels of Exposure to PM<sub>2.5</sub> from surface coal mining in East Ayrshire are associated with:

- Minor increased emergency hospital admission (<1 extra admission per decade) based on current levels of operation
- Average number of restricted activity days per person .g. due to respiratory issues that may be attributable to current exposure to PM<sub>2.5</sub> derived from surface coaling would equate to <1 extra day per person per century.

During times of increased operations (pre 2012) the levels of Exposure to PM<sub>2.5</sub> from surface coaling in East Ayrshire is associated with:

- Increased emergency hospital admission (9 emergency admissions per year)
- Approximate number of restricted activity days e.g. due to respiratory issues that may have been attributable to PM<sub>2.5</sub> derived from surface coaling would have been less than 1 extra restricted activity day per person per decade averaged across East Ayrshire as a whole and about 0.14 days per year per person for those living within 1 km of surface coaling sites.

The impact of particulate emissions from future surface coal mining operations on emergency hospital admissions or other health effects such as increased respiratory symptoms will depend on levels of population exposure which in turn will be depend on the proximity of operations to residential receptors, the scale of operations and the effectiveness of dust control measures.

### ***Positive Health Impacts of Minerals Operations***

Most of the attention on surface coal mining has focussed on the potential for adverse health effects to arise but minerals operations also give rise to some community benefits arising from employment and increased spend in local communities. Lower levels of unemployment are likely to be reflected in an improved neighbourhood environment. There are well established relationships between health and well-being and socio-economic status at community level<sup>24</sup> and between employment status and health<sup>25</sup>.

### **5.3 Review of Potential Health Impacts of Unconventional Gas**

No unconventional gas extraction is currently occurring in East Ayrshire and East Ayrshire is not a primary target for unconventional gas exploration at the time of writing and there is a moratorium on granting of consents in place implemented by the Scottish Government. Both these energy sources are controversial and there is considerable public anxiety about their potential to cause environmental pollution and associated adverse health effects. Given the relatively recent development of onshore unconventional gas operations in the UK, however, there is very little information available about their environmental or public health impact and most published reviews have focussed on the potential health issues that might arise as opposed to being based on actual experience. There is a very small quantity of published data from the US that indicates that unconventional gas exploration can release a variety of volatile hydrocarbons (VOCs) into the air including carcinogens such as benzene and groundwater contamination in the US has been widely publicised. The associated public health impacts would depend on the quantity and types of VOCs emitted, their dispersion in the air and the proximity of local communities. Emissions from unconventional gas are likely to be dominated by methane and carbon dioxide that are not of direct concern in relation to human health.

Public Health England (2014)<sup>26</sup> have reviewed the potential health risks associated with shale gas. As a public body, PHE would normally be viewed as a neutral information source but their report on unconventional gas has been heavily criticised by groups opposed to unconventional gas. The review concluded that the potential risks to public health will be low provided operations are properly run and regulated. A major flaw with this conclusion is the implicit assumption that industry will be well regulated and emissions well controlled. PHE indicates that published reports describing potential health risks are typically associated with operational failure and poor regulation. PHE also note, however, that the cumulative risk associated with many small wells, each with an individual small risk, may be much greater than the risk associated with a larger operation. The organisation of the industry may have an important influence on potential emissions and impacts.

The possible areas for unconventional gas exploitation in East Ayrshire largely coincide with the area where coal is present at depths that can be exploited by surface mining. Any human health impacts associated with unconventional gas operations are therefore likely to further enhance the health inequalities that have arisen as a result of the environmental effects of surface coal mining operations.

<sup>24</sup> <http://www.healthscotland.com/equalities/socio-economic-inequalities.aspx>

<sup>25</sup> Waddell G, Burton AK (2006) Is work good for your health and well-being? <https://cardinal-management.co.uk/wp-content/uploads/2016/04/Burton-Waddell-is-work-good-for-you.pdf>

<sup>26</sup> Public Health England (2014) Review of the Potential Public Health Impacts of Exposures to Chemical and Radioactive Pollutants as a Result of the Shale Gas Extraction Process.

If exploration for unconventional gas is undertaken in East Ayrshire, the pollution and human health impacts associated with the exploration process are likely to be small. If commercial exploitation of unconventional gas becomes a reality in East Ayrshire, then the potential for adverse effects on health may become much greater. The potential impacts that would need to be addressed include:

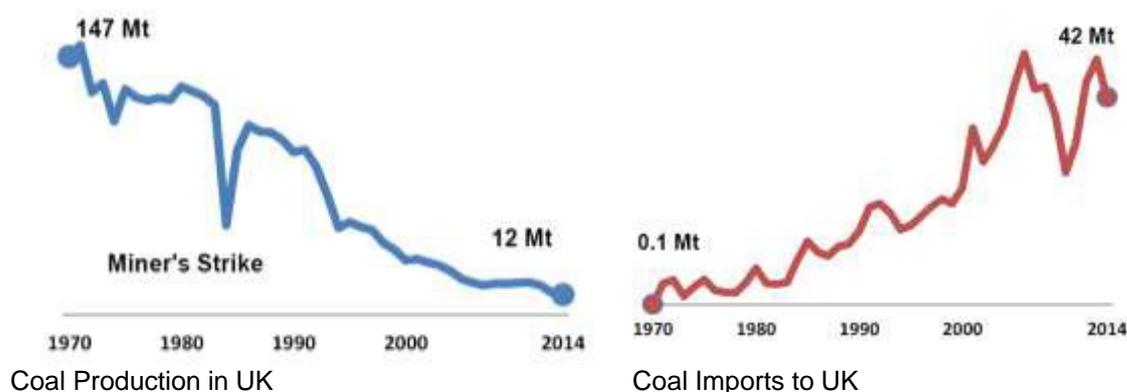
- Potential for contamination of underground and/or surface waters with impact on drinking water supplies. This is likely to give rise to increased water treatment costs rather than being a direct risk to health as the water supplied to consumers must meet the relevant regulatory standards;
- Potential for contamination of private drinking water supplies in rural East Ayrshire. Although private water supplies are not exempt from the requirement to meet regulatory standards, the monitoring of water is likely to be less frequent than from mains supplies;
- Emissions to air may include accidental release of methane and other volatile hydrocarbons, emissions from the flaring of any unwanted by-products and traffic emissions. Noise may be an issue, depending on the proximity of operations to local residents; and
- Possibility of the presence of naturally occurring radioactive materials entering the water environment.

The magnitude of the potential risk to human health will depend on potential levels of exposure to air and noise pollution which will depend on the location and scale of operations, the planning conditions imposed on developers in relation to noise, traffic and nuisance and the conditions imposed by SEPA. Potential exposures will also be determined by the effectiveness with which planning and environmental permitting conditions are policed which will depend on the regulatory resource that is available. The health impacts associated with exploitation of unconventional gas may not be entirely negative as increased employment opportunities and other community benefits would be expected to have a positive impact on health and well-being.

#### 5.4 Economic Activity - Minerals

The production of coal in the UK has dropped significantly and has been recorded as a record low for 2014 (Coal Authority) as shown in Figure 21 below.

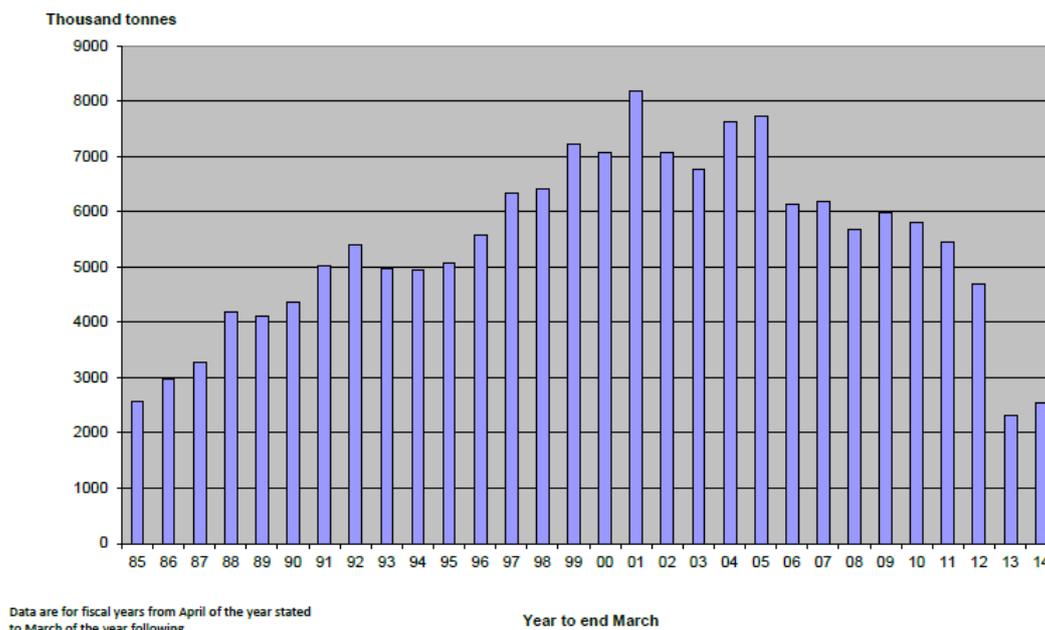
**Figure 21** – UK Coal Production 1970-2014<sup>27</sup> showing a previous record low in production of coal in the UK. Imports of Coal from the three main regions of US, Colombia and Russia are also in decline due to reduced demand from power stations and industry. This downward trend has continued in 2015 for both production and import. In 2015 UK coal production was down 27% on 2014 and at an all-time low. Surface – mined production in 2015 was down 28% on 2014 and also at an all-time low.



<sup>27</sup> Digest of United Kingdom Energy Statistics – Chapter 2 Coal, 2014 (published December 2015)  
<https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes>

While the overall East Ayrshire share of Scottish production in 2015 was 43.5%, this does not reflect significant drops during the year. The drop in East Ayrshire production between Q1 and Q4 2015 was 91%, and in Q4 2015 East Ayrshire produced less than 20% of the Scottish total. This downward trend is expected to continue. East Ayrshire Council are progressing discussions around the management and restoration of some of the sites that were previously abandoned.

**Figure 22** – Coal production in Scotland 1985 – 2014 which shows the decline (source British Geological Survey<sup>28</sup>)



The extent of minerals extraction in East Ayrshire has had wide ranging impacts on the communities which were developed around the mines – a review of historical maps indicates that most villages in Ayrshire were clustered around mining activity due to availability of employment. At its peak there were around 10,000 miners employed in East Ayrshire<sup>29</sup>. The coal mines played an important role in social cohesion with mine worker social committees that arranged events and functions for workers and their families<sup>30</sup>.

Surface coal mining sites continue to be an important source of local employment in East Ayrshire. Following the decline of Scottish Coal and ATH Resources resulting in 311 redundancies, East Ayrshire Council have advanced a series of actions under 'Steps to Recovery'.

Following the redundancies there were 131 training opportunities completed and 147 job outcomes were secured. The current total workforce in East Ayrshire in the coal sector is 215 according to Coal Authority Figures.

<sup>28</sup> <https://www.bgs.ac.uk/mineralsuk/mines/coal/occ/home.html>

<sup>29</sup> 'Report of Independent Review of Regulation of Opencast Coal Operations in East Ayrshire', Jim Mackinnon, Chris Norman and James Fowlie, January 2014.

<sup>30</sup> Barony A Frame Trust - [www.baronyiframe.org](http://www.baronyiframe.org)

East Ayrshire Council commissioned EKOS Limited to complete an economic study<sup>31</sup> on the impact of minerals decline in 2013. This study concluded that the main adverse impacts would be felt within the rural communities around the mines due to job losses and lack of other employment opportunities within these areas.

The study estimated the longer term negative impacts within East Ayrshire to comprise total job losses of 357 (311 direct job losses) and Gross Value Added losses of between £131 and £173 million (direct GVA loss of £114m - £147m). A number of measures to address the issues have subsequently been identified by a range of partner organisations for implementation.

Traditionally, East Ayrshire has experienced lower levels of hard rock and sands and gravel extraction than other parts of Scotland due to location of resource and distance from key markets although there are a number of key sites both operational and recently consented. These sites provide important employment opportunities – quarry operations typically include employees based on site, with indirect additional employment for contractors and support staff to be based at the head office. Quarry working also typically requires mobile plant/machinery onsite for the duration of works which provide work for plant hire / civil engineering firms.

- Tincornhill Quarry at Sorn operated by Breedon Aggregates – operational and under compliance monitoring.
- Clawfin Quarry, Dalmellington East Ayrshire (extension) – Quarry reverted to control under Forestry Permitted Development Rights
- North Drumbois Quarry (hard rock) –operational.
- Garpel Quarry –operational
- Loudounhill Quarry Strathaven Road, Darvel - restoration works concluded and aftercare works remaining.
- The Meadows Quarry, Kilmarnock-operational

## 5.5 Conclusions - Health Impacts and Minerals / Unconventional Gas

Emissions from surface coaling or quarrying could contribute to respiratory and cardiovascular ill health in local communities.

The impact of emissions from surface coaling and quarrying on health in East Ayrshire as a whole are likely to be (or have been) small relative to the impact of emissions from road transport. In communities adjacent to OCCSs, the small increase in local concentrations of PM<sub>10</sub> and NO<sub>x</sub> over background levels is likely to have contributed to a small increased risk of respiratory or cardiovascular illness and a marginal shortening of average life expectancy. The impact of emissions of surface coaling on community health in coal areas is likely to be small relative to the impacts of socio-economic deprivation and there is also likely to be a burden of ill health in these communities arising from former employment in the mining industry. Although, the overall health impact of surface coaling is likely to be very small, surface coaling may have increased existing health inequalities within East Ayrshire. The health impact of emissions from future surface coaling is likely to be smaller than those of past surface operations due to tighter limits on plant emissions and better regulation of sites.

The human health impacts of emissions from exploration for unconventional gas reserves are likely to be small. If commercial exploitation of unconventional gas becomes a reality in East Ayrshire, then the potential for adverse effects on health may become much greater. The exploitation of unconventional gas might, however, also bring employment opportunities and community benefits that would be expected to have a positive impact on health. Provided appropriate regulatory controls are in place, any adverse health impacts should be extremely small.

<sup>31</sup> <http://docs.east-ayrshire.gov.uk/crpadmmin/2012%20agendas/cabinet/5%20february%202014/Economic%20Impact%20Assessment%20-%20Opencast%20closure%20-%20EKOS%20Dec%202013.pdf>

As discussed above, surface sites continue to be an important source of local employment in East Ayrshire with the current total workforce across both Kier and Hargreaves operated sites at 404 employees (including 43 sub-contractor employees).

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## GLOSSARY

**Cardiovascular Death Rate** - number of deaths caused by heart disease

**Cerebrovascular Death Rate** – number of deaths caused by stroke

**Cardiovascular Disease** - Cardiovascular disease (CVD) includes all the diseases of the heart and circulation including coronary heart disease, angina, heart attack, congenital heart disease and stroke

**Chronic Disease** - Long-term conditions or chronic diseases are conditions for which there is currently no cure, and which are managed with drugs and other treatment such as diabetes or COPD

**COPD** - chronic obstructive pulmonary disease including emphysema and chronic bronchitis

**Isechemic Heart Disease** - condition that affects the supply of blood to the heart

**OCCS** – Opencast Coal Site

**PM<sub>10</sub>** – Particulate matter less than 10 µm in size that can penetrate to the lungs

**PM<sub>2.5</sub>** - Particulate matter which are a sub-fraction of PM<sub>10</sub> which are less than 25 µm in size

**µm** - A micron is a unit of length equivalent to a millionth of a meter

**µmgm<sup>-3</sup>** – micrograms per cubic metre



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