The consequences of smoking to mortality rates of Scotland and England

Student name:	Marloes Cantrijn
Student number:	S2947838
Study:	Human Geography & Urban and Regional Planning
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Thesis supervisor:	Adrien Remund

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Summary

This research looks at how smoking has affected mortality rates in Scotland and England. By looking at how smoking prevalence has developed over time by country, age, sex, area deprivation and socio-economic class, by looking at observed life expectancy at birth and by looking at smoking-attributable mortality data. Potential gain of Life Expectancy (PGLE) analyses will be used to calculate how many years of life expectancy smoking has caused the Scottish and English population. The results show that between 1950 and 1970 England has higher PGLE, due to smoking-related causes of death and after 1970 where England's PGLE starts to decrease more rapidly than Scotland's and Scotland's even increases for both men and women. Between 1950 and 2010 England has a higher observed life expectancy at birth than Scotland for both men and women. About a quarter of this difference in observed life expectancy at birth can be explained through smoking-related causes of death.

Introduction

It is now well established that tobacco use, mainly cigarette smoking, is the major risk factor for lung cancer (Harkness et al, 2002). Smoking is considered a life-style with serious consequences over time. In Europe it has been a leading risk factor of premature mortality (Stoeldraaijer et al, 2015), which is concerning for public health, because smoking is one of the biggest avoidable causes of death. It is a major cause of several diseases, like cardiovascular diseases, chronic obstructive pulmonary diseases, a range of cancers and ulcers (Allender et al, 2009). In the UK, in 2013, 21.1% of men and 16.5% of women were smokers (Office for National Statistics, 2014). In 1972 52% of men were smokers and 41% of women (Hunt, et al, 2004). Despite this decrease in the prevalence of smoking in British society, smoking is still considered a serious public health problem in the UK (Allender et al, 2009).

During the last century, systematic inequalities in mortality rates between Scotland and England have been observed. This has even increased since the 1970s (Campbell et al, 2013). Scotland has the highest mortality rates and lowest life expectancy in Western Europe, which is partially attributed to high levels of socio-economic deprivation, principally in comparison with England (Walsh et al, 2010). According to Campbell et al (2013) the differences in mortality between Scotland and England are the consequences of smoking. Within the different UK countries, it is Scotland that has the highest percentage of smokers, namely 21.1% and England with the lowest percentage of smokers, namely 18.4% (Office for National Statistics, 2014).

The aim of this research is to gain insight into the effects smoking has had on the mortality rates of Scotland and England. This is done by answering the following main question: How has smoking affected mortality rates between Scotland and England? The way smoking affects life expectancy is shown in model 1 below.

Model 1: Conceptual model.

Theoretical framework

Smoking-related causes of death

To be able to research how smoking has affected mortality, it is important to define what is considered a smoking related cause of death. When comparing smoking to mortality rates it is important to realize that not all smokers will die a smoking-related death, like lung cancer, and not all smoking-related deaths are of smokers. For example non-smokers can die from lung cancer as well. That is why the concept of smoking attributable mortality is important. Smoking attributable mortality is the number of all deaths in a population caused by smoking (Stoeldraijer et al, 2015). Important also is to define what diseases and conditions can be related to smoking, which then can be related to the deaths of those diseases and conditions. Smoking-related diseases could be, according to the Global Burden of Disease Project, mouth and oral cancer, trachea/bronchus and lung cancer, chronic obstructive pulmonary disease and cardiovascular disease (Allender et al, 2009). For this research the following diseases will be considered as smoking-related causes of death; cancer of lung, cancer of esophagus, pancreas cancer, cancer of the upper respiratory and digestive system, bladder cancer and cancer of the kidney (Janssen et al, 2004).

Smoking trends

Besides considering what a smoking-related cause of death is, it is important to look at what the smoking trends have looked like in these countries. During the 19th century tobacco was smoked in pipes and cigars, but during the first few decades of the 20th century the consumption of manufactured cigarettes increased (Doll et al, 2004). In the UK, up until the 1920s, smoking was something for men only (Hunt, et al, 2004), partly due to cheap cigarettes being made available to young military conscripts from 1939. This caused a trend among men born in the first, second and especially third decade of the 20th century, which showed them still smoking after the age of 60. This eventually led to an increase of lung cancer among men in the UK. By the 1940s lung cancer had become a major cause of death (Doll et al, 2004).

Figure 1 shows the percentage of cigarette smoking prevalence among men and women in Great Britain between 1974 and 2012. It shows that between the 1970s and 1990s the prevalence of smoking in the UK decreased rapidly. After the 1940s, and especially during World War 2 the number of female smokers increased rapidly. It was in the 1970s that the prevalence of smoking among women began to decrease, for men the same decrease had already started in the 1960s. In 1972 52% of men and 41% of women smoked, but in 1998, only 28% of men and 26% of women smoked. Figure 1 also shows that men have always been smoking in larger proportion than women, but this gap has narrowed over the years (Hunt et al, 2004).

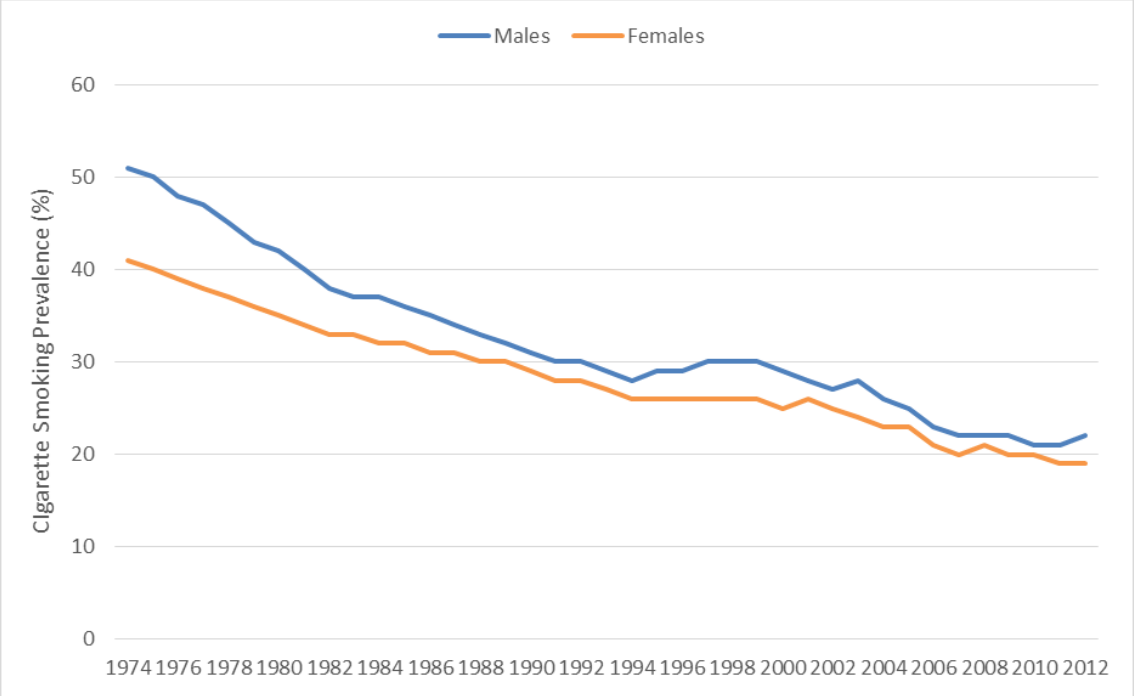

Figure 1: Cigarette smoking prevalence among adults aged 16 and over in Great Britain between 1974 and 2012. Data Source: Cancer Research UK.

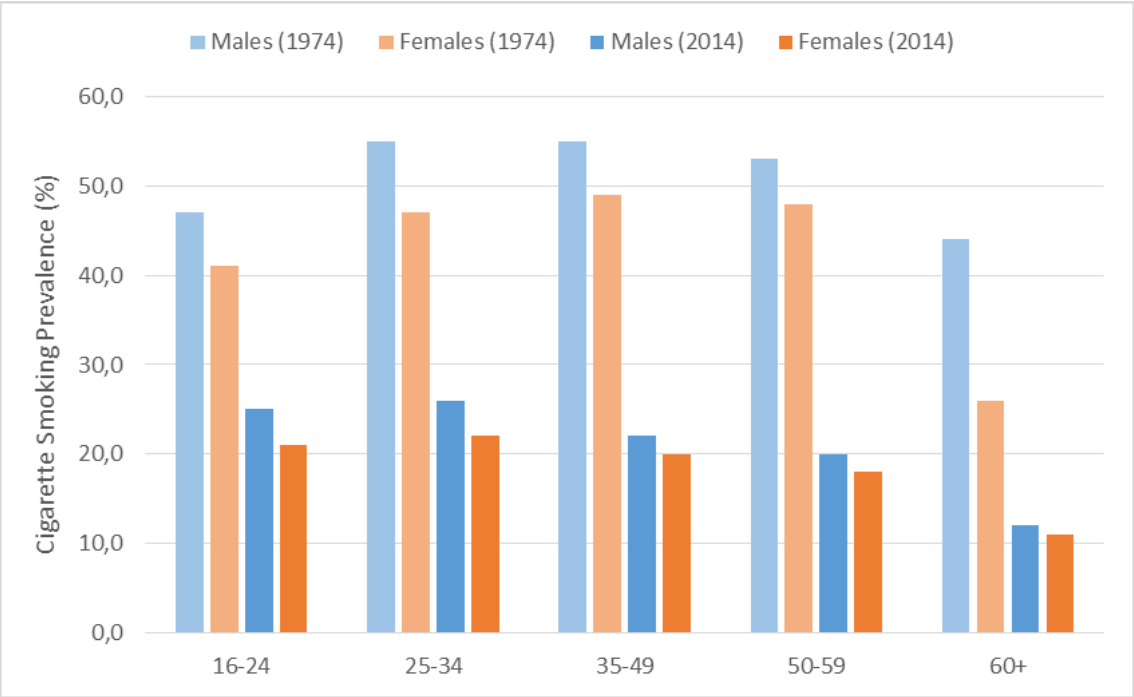

Figure 2: Cigarette smoking prevalence by age among adults aged 16 and over in Great Britain between 1974 and 2014. Data source: Office for National Statistics.

Figure 2 shows the percentages of cigarette smoking prevalence by age among adults aged 16 and over in Great Britain between 1974 and 2014. It shows that smoking prevalence between 1974 and 2014 dropped significantly. In 1974 between the ages of 16 and 24, 47% of men and 41% of women were smoking. In 2014 only 25% of men and 21% of women of the same age group were smoking. When looking at the age group 25-34 the percentages of both men and women, both in 1974 and 2014 increase slightly. Whereas by age group 35-49, the percentages for men in 1974 remain the same and for women in 1974 increases slightly, but their counterparts in 2014 start decreasing. It is by age group 50-59 that the percentages start to decrease in 1974 as well. For age group 60 and over, figure 2 shows a significant drop in percentage for female smokers. For women in 1974 between the ages of 50 and 59, 48% were smokers, by age 60 and over this percentage has dropped to 26%. As previously shown in figure 1, in 1974 there was a bigger gap in smoking prevalence between men and women in 1974 as in more recent years. Figure 2 shows that when looking at different age groups women are only slightly behind men when it comes to smoking prevalence, except for women in 1974 aged 60 and over. So after 40 years smoking prevalence was almost cut in half.

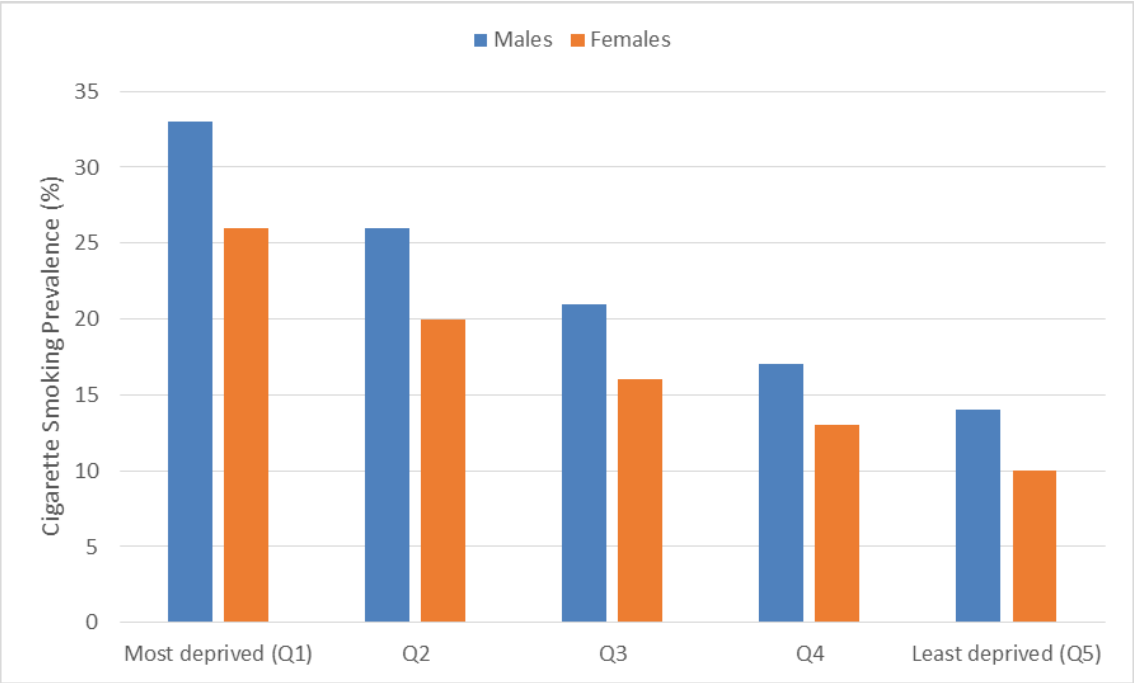

Figure 3: Cigarette smoking prevalence by area deprivation among adults aged 18 and over in England in 2012. Data source: Cancer Research UK.

Figure 3 shows the cigarette smoking prevalence by area deprivation among adults aged 19 and over in England in 2012. In this figure, by Cancer Research UK, data on the prevalence of smoking in 2012, for adults aged 18 and over, from the 2012 Integrated Household Survey (IHS) was linked to the 2010 Index of Multiple Deprivation. The IMD is a measure of area deprivation which considers income, education, employment, health and crime amongst others. Areas are then arranged on a scale of five categories from most deprived (Q1) to least deprived (Q5) (Office for National Statistics, 2014). Figure 3 shows that men and women are more likely to smoke if living in the most deprived areas. The percentage of male smokers in the most deprived areas is 32.9%, for females it is 26.1%. For both sexes these percentages are more than double of the percentage of smokers in the least deprived areas, which is 14.3% for males and 10.2% for females (Office for National Statistics, 2014). People living in the most deprived areas aren't just more likely to smoke, they are also less likely to give it up. According to the Office for National Statistics (2014) out of all people who had ever smoked, 46.5% of men and 48.5% of women in the most deprived areas would eventually give up smoking. In the least deprived areas this percentage is 74% for men and 76% for women. So living in a lesser deprived area can mean that a quarter more people are more likely to quit smoking. Even though figure 3 shows data from England, the same trend can be observed in Scotland.

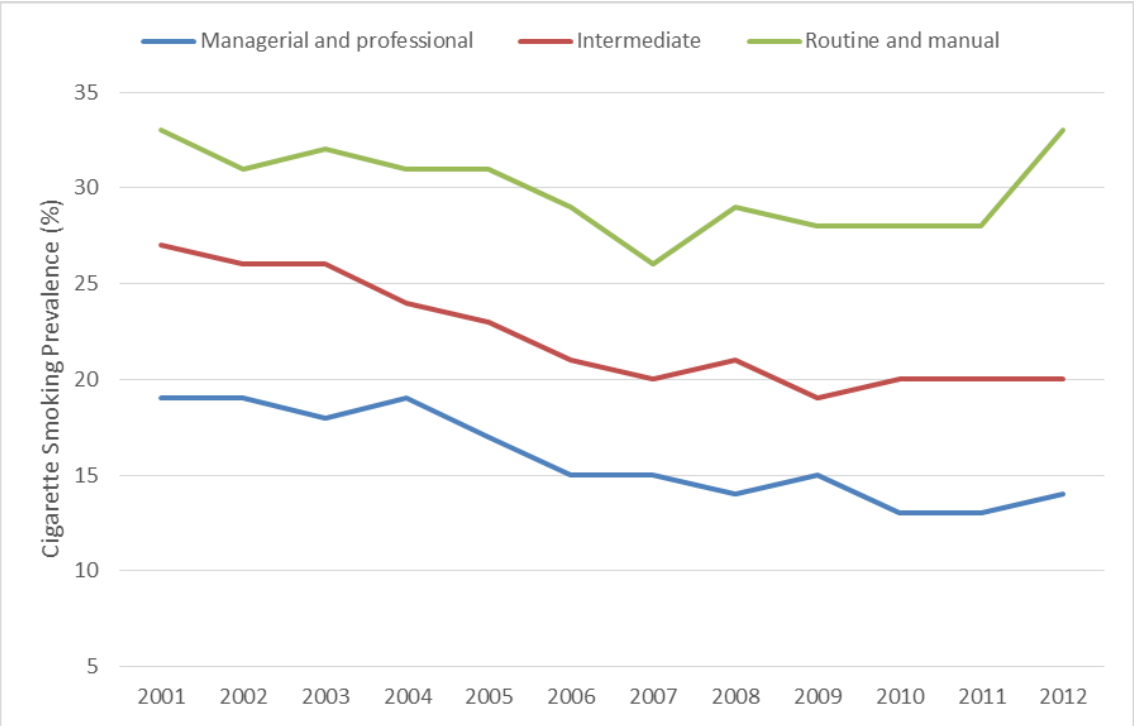

Figure 4: Cigarette smoking prevalence by socio-economic classification among adults aged 16 and over in Great Britain between 2001 and 2012. Source: Cancer Research UK.

Figure 4 shows the cigarette smoking prevalence by socio-economic classification among adults aged 16 and over in Great Britain between 2001 and 2012. It shows that adults in routine and manual jobs are more likely to smoke, compared to adults in managerial and professional jobs. In 2001 33% of routine and manual workers in Great Britain smoked and only 19% of adults working managerial and professional jobs. In 2007 smoking rates among routine and manual workers dropped to 26%, but in 2012 this was back up to 33%. Whereas for managerial and professional smoking rates have dropped to 14% in 2012. There seems to be no difference between men and women. A survey from the Office of National Statistics in 2002 shows that in 2000, 15% of male professionals smoked and 39% of unskilled male manual workers, and for women this ranged from 13% for professionals to 34% of unskilled female manual workers (Hunt et al, 2004). A later survey in 2014 showed similar percentages and no significant difference between Scotland and England (Office for National Statistics, 2015). These trends show that smoking is a habit more easily obtained and maintained by people who occupy a lower social class, which is consistent with figure 3, since people living in more deprived areas are also more likely to occupy routine and manual jobs (Hunt et al, 2004).

Smoking-related death rates

According to Doll et al (2004), who made observations of the smoking behavior of almost 35.000 male British doctors for 50 years, mortality rates for life-long non-smokers have reduced in the five decades between the year 1950 and 2000, mostly due to both prevention of and improved treatment of various diseases common among elderly people. But looking at the same mortality rates for smokers, it seems the effects of cigarette smoking has completely eliminated these reductions in mortality rates seen among non-smokers. For example comparing the death rates of those born in the 1870s at ages 70-89 during the 1950s and those born in the 1910s and observed at age 70-89 during the 1990s, it can be seen the death rates for smokers has increased. For those smokers born in the 1910s, approximately half of them will eventually die because of smoking-related diseases. And then for those men born in the 1920s it gets even worse. The probability of death in the middle ages, which is 25-69, was 15% for non-smokers and 43% for smokers. It is indicated that about two thirds of smokers born in the 1920s will eventually die from smoking-related diseases. It can be seen that those who stopped at about age 50 gained about six years of life expectancy, those who stopped at about age 40 about nine years and those who stopped before middle age gained about 10 years and had a similar pattern of survival to that of men who had never smoked. These statistics can also be applied to female smokers (Doll et al, 2004).

Anti-smoking legislation and campaigns

Until the mid-1990s, No Smoking Day was the main campaign to support smokers to quit smoking. The campaign started in 1984, when the smoking prevalence among adults was 33%. No Smoking Day's organization uses its funds to attract the public's attention on smoking and health and to support local activities that are actively helping smokers quit smoking. Over the decades since the launch of No Smoking Day the percentage of people attempting to quit smoking during three months after No Smoking Day has decreased from 18% in 1986 to 15% in 2004. Not all of these people have quitted smoking permanently however, because only 0.5% of people stopped completely for these three months in 1986 and 0.7% in 2004. Nowadays there are hundreds of anti-smoking campaigns and measures in the UK. (Owen & Youdan, 2006). For example Scotland has implemented a prohibition on smoking in enclosed public places in 2005 (Fowkes et al, 2008). But still it seems rare to get people to give up smoking completely (Owen & Youdan, 2006).

In 1998, the Department of Health published Britain's first ever white paper on smoking called 'Smoking kills, a white paper on tobacco'. It introduced a number of measures to help reduce smoking, especially among children and young people, to help adults, especially the most disadvantaged to give up smoking and to offer help to pregnant women who smoke. It introduced measures to reduce sales of tobacco products, like bans on tobacco advertising, tougher enforcement on under age sales and increasing taxes on tobacco products. But also measures to help people quit smoking, like the smoking cessation services of the National Health Service and nation-wide campaigns to promote health and showcase the risks of smoking (Department of health, 1998).

Life expectancy

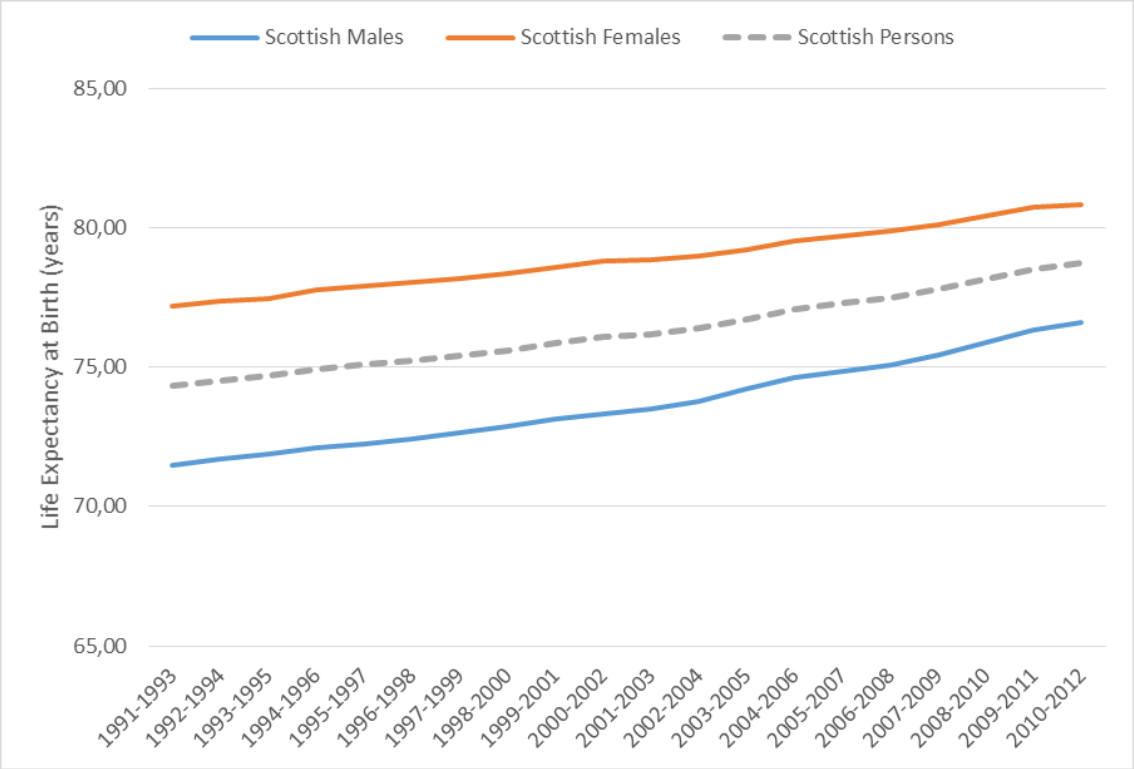

Figure 5: Life expectancy at birth by sex in Scotland between 1991-1993 and 2010-2012. Data source: Office for National Statistics.

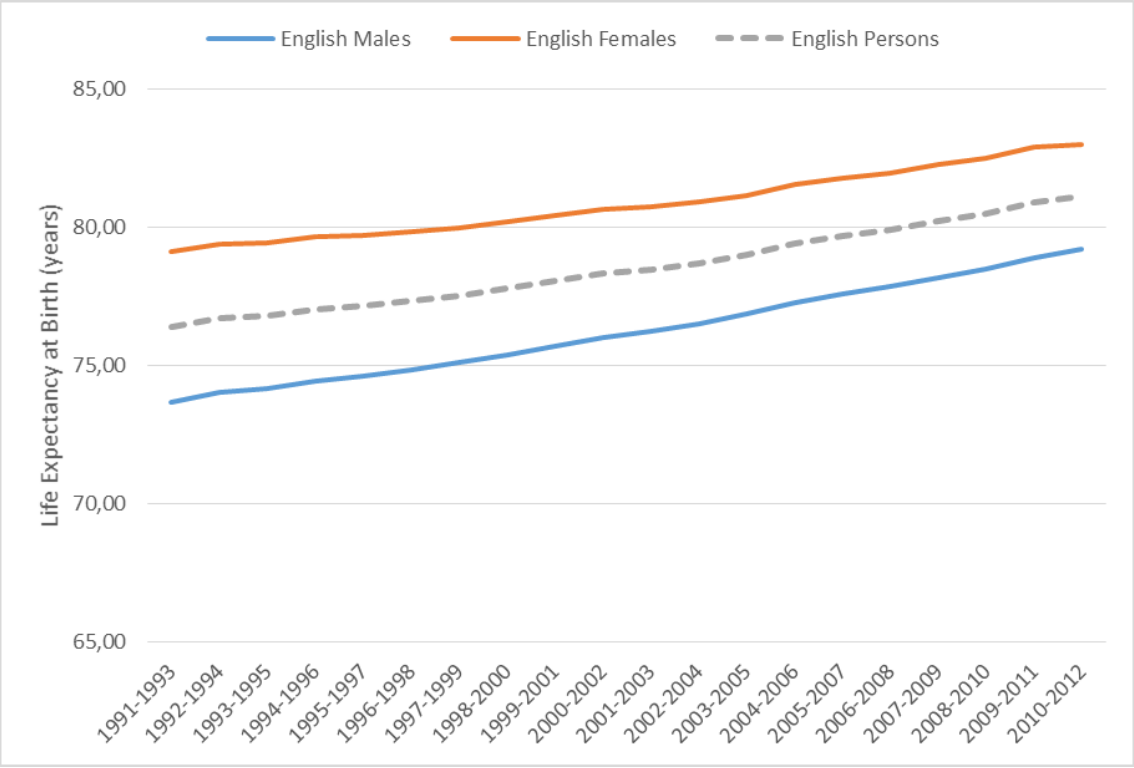

Figure 6: Life Expectancy at birth by sex in England between 1991-1993 and 2010-2012. Data source: Office for National Statistics.

As mentioned earlier, Scotland has the lowest life expectancy in Western Europe (Walsh et al, 2010). Figure 5 and 6 show the life expectancy at birth by sex of Scotland and England between 1991 and 2012. They show that England has a higher life expectancy than Scotland for each of the three groups. English women had the highest life expectancy rate at birth since 1991. Their life expectancy has increased from 79.12 years in 1991-1993 to 83.01 years in 2010-2012. Scottish women have had the second highest life expectancy rate at birth with a life expectancy of 77.17 years in 1991-1993 and 80.83 in 2010-2012. For Scottish women and English women, their life expectancy at birth increased by almost four years between 1991-1993 and 2010-2012.

English men had a life expectancy at birth of 73.69 years in 1991-1993 and of 79.21 years in 2010-2012. This is an increase of 5.52 years. Scottish men had a life expectancy at birth of 71.47 years in 1991-1993 and of 76.61 years in 2010-2012. This is an increase of 5.14 years. So male life expectancy in Scotland and England is increasing slightly faster than female life expectancy in Scotland and England, but Scottish men and women both lack behind their English counterparts.

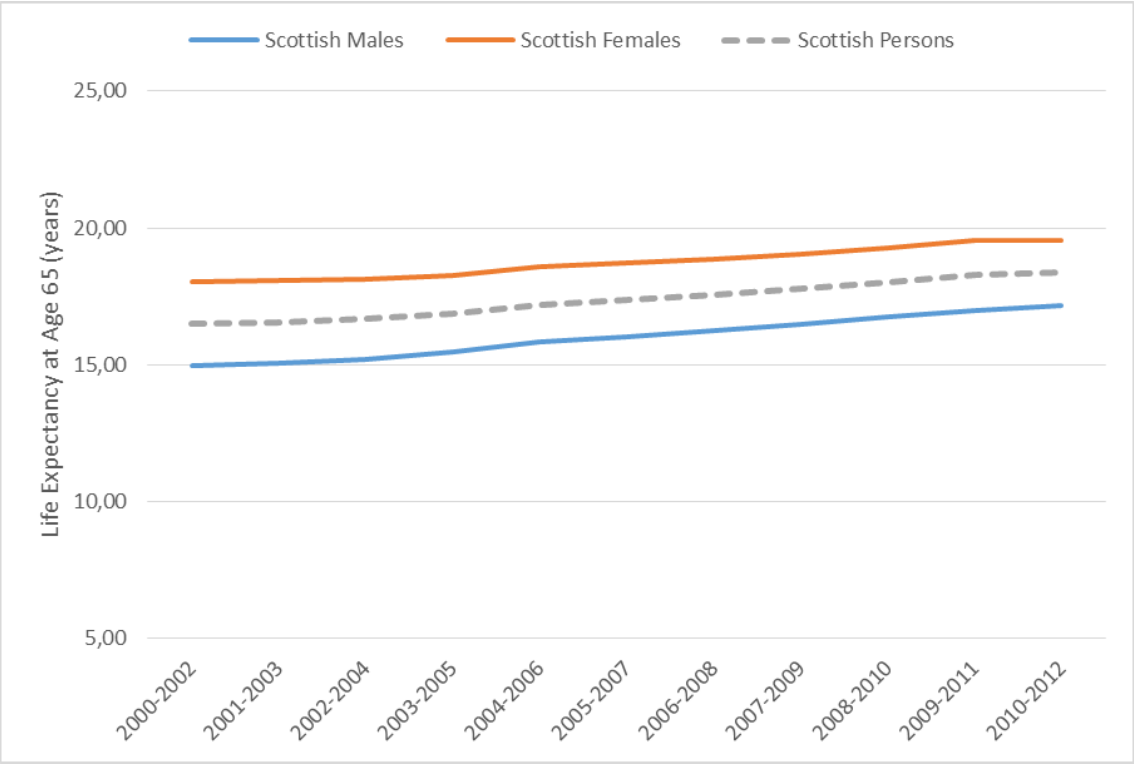

Figure 7: Life expectancy at age 65 by sex in Scotland between 2000-2002 and 2010-2012. Data source: Office for National Statistics.

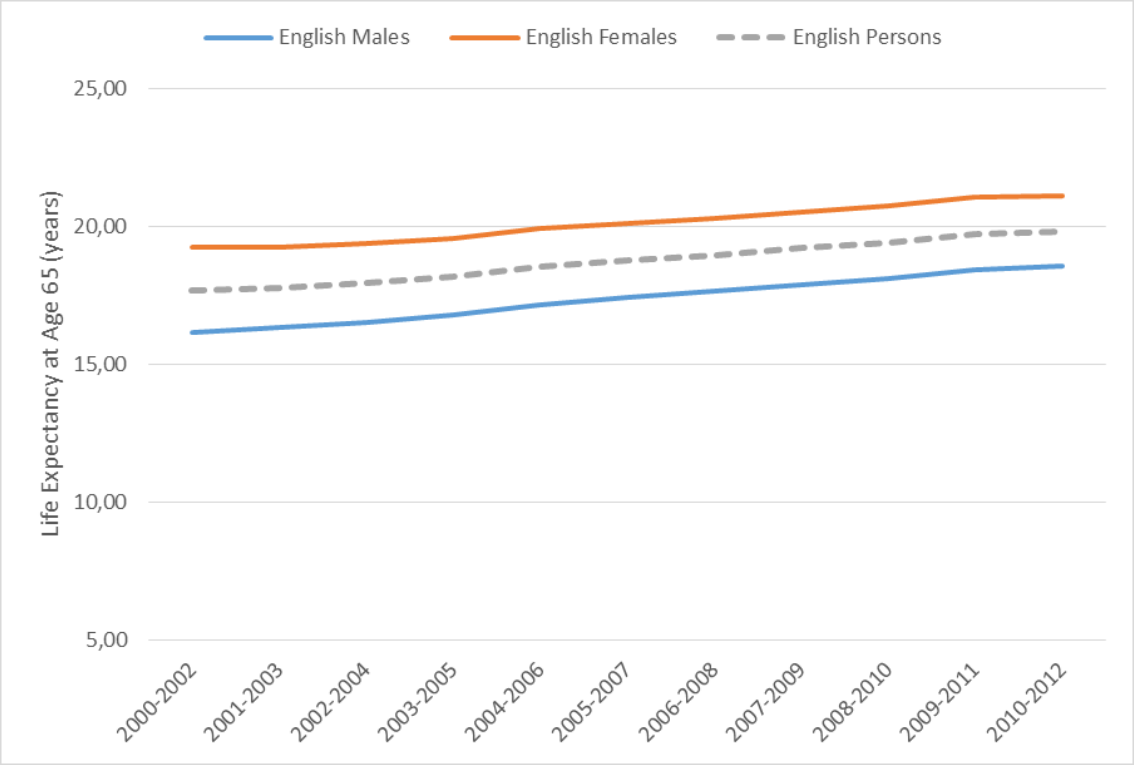

Figure 8: Life expectancy at age 65 by sex in England between 2000-2002 and 2010-2012. Data source: Office for National Statistics.

Figure 7 and 8 show the life expectancy at age 65 by sex in Scotland and England between 2000-2002 and 2010-2012. These figures show similar trends as figure 5 and 6. English women lead with a life expectancy at age 65 in 2000-2002 of 19.23 years and of 21.10 years in 2010-2012. They are followed by the Scottish women, who had a life expectancy at age 65 in 2000-2002 of 18.04 years and of 19.55 years in 2010-2012. Then come the English men, who had a life expectancy at age 65 in 2000-2002 of 16.13 years and of 18.56 years in 2010-2012. And finally the Scottish men who had a life expectancy at age 65 in 2000-2002 of 14.98 years and of 17.16 years in 2010-2012.

Methodology

The overarching theme of this research was convergences and divergences in the epidemiological transition. This research has focused on the difference in mortality rates between Scotland and England. Secondary data is the most feasible in the context of this thesis. The database of the World Health Organization was chosen to collect data from, because this database had both countries and contained all the necessary causes of deaths, while also having data from 1950 onwards. One minor issue with this database however is that England and Wales are grouped together, even though the intention of this research was to compare Scotland and England, it is unavoidable that Wales will be included as well. But since the population of Wales is small compared to England and Scotland, it will unlikely change the outcome of the results in a significant way. That is why Wales won't be mentioned when discussing the data from the WHO database.

The World Health Organization website provides information for each country on how the data entered the database. For both England and Scotland all deaths are reported in a civil registry. The responsibility for the final data at the national level in England lies with the Central statistical office, but in Scotland with the General Register Office for Scotland. For both countries the causes of death are a part of the information collected in their compulsory national death registration system (WHO, 2005).

Both countries have legal requirements in place to ensure the completeness of the registered deaths and the estimated completeness is 90+% for England and 100% for Scotland. Deaths of foreign residents, tourists, non-permanent residents, asylum seekers, illegal immigrants and any person that happened in these countries have been included in these countries respective databases, but the deaths of nationals, also including military personnel, dying abroad is not included. So when talking about death rates in Scotland and England, it will include any death that has occurred inside each country's respective border, and not only the deaths of Scots or Englishmen. The ministry of Defense is responsible for registering deaths of military personnel dying abroad. Overall the percentage of all deaths, which occurred in these respective countries 90+% of those deaths are included in the cause of death statistics provided to WHO for England and 100% for Scotland (WHO, 2005).

Interestingly in England 70-79 percent of registered deaths are certified by medical doctors, while this is 90-100 percent in Scotland. For registered deaths certified by a coroner or other medicolegal authority this percentage is 20-29 percent for England and 0-9 percent for Scotland. For both countries about half the registered deaths occur in a hospital or other medical institution and 8 percent for England and 10-19 percent for Scotland of registered deaths had an autopsy. Also in both countries follow-up enquiries were undertaken in case of doubt or inconsistency about the cause of death. Both countries also have a centralized coding procedure, where in England a clinical coder and in Scotland an administration officer or clerk provide the cause of death in an automated computerized system (WHO, 2005).

According to Mathers et al (2005) the status of global data on death registration can be assessed through examining indicators of data quality, which includes timeliness, completeness and coverage of registration and the proportion of deaths assigned to ill-defined causes. Countries are placed into three categories: high-quality data, medium-quality data and low-quality data. Each category has a set of criteria to determine which country falls in which category. According the Mathers et al (2005) the United Kingdom falls into the high-quality data category. The criteria for this category include usage of ICD-9 or ICD-10 coding, a completeness rating of 90% or higher and ill-defined codes appear on less than 10% of death registrations. The UK passes all criteria and thus it can be said that the data on death registration is of high quality (Mathers et al, 2005).

For this research a PGLE analysis has been used to show how the smoking-related causes of death have costs Scotland and England years in life expectancy. The PGLE, which stands for potential gains in life expectancy, is the added years of life expectancy for the population if the death from one or multiple causes of death were removed or eliminated as a competing risk of death. So it shows how many years of life expectancy a population were to gain if certain causes of death were removed from the equation. The PGLE can be calculated using observed life expectancy rates at birth and cause specific mortality data by age cohorts. Calculating the PGLE for a set number of years and it shows how smoking has affected the life expectancy in Scotland and England (Lai & Hardy, 1999).

As mentioned earlier the following diseases will be considered as smoking-related causes of death; cancer of lung, cancer of esophagus, pancreas cancer, cancer of the upper respiratory and digestive system, bladder cancer and cancer of the kidney (Janssen et al, 2004). Because this research will look at data from 1950 and onwards, older ICD versions will be used. Throughout these ICD versions the causes of death have changed over time.

Janssen et al (2004)	ICD7 - 1950/1960	ICD8 - 1970	ICD9 - 1980/1990	Detailed ICD9-2000 (England only)	ICD10 - 2000 (Scotland only)	ICD10 - 2010
MN of trachea, bronchus and lung	-	-	-	-	-	-
MN of oesophagus	-	-	-	-	-	-
MN of pancreas	Not present	Not present	-	-	-	-
MN of lip, oral cavity and pharynx	MN of buccal cavity and pharynx	MN of buccal cavity and pharynx	-	MN of lip, gum, oropharynx, nasopharynx and hypopharynx	MN of lip, gum and palate, and oropharynx, nasopharynx and hypopharynx	MN of lip, gum and palate, and oropharynx, nasopharynx and hypopharynx
MN of bladder	Not present	Not present	-	-	-	-
Chronic lower respiratory diseases: Emphysema, chronic bronchitis and asthma	Bronchitis, chronic and unqualified	Bronchitis, emphysema and asthma	Bronchitis, chronic and unspecified, emphysema and asthma	Bronchitis, chronic, emphysema and asthma	Bronchitis, chronic and unspecified, emphysema and asthma	Bronchitis, chronic and unspecified, emphysema and asthma

Table 1: Variations in causes of deaths throughout ICD versions. Source: WHO database.

In table 1 the different variations within the WHO database ICD versions on the causes of deaths mentioned in the article by Janssen et al (2004) are presented. The first column shows the causes of death as they are mentioned by Janssen et al (2004). The second till seventh column show whether the definitions of the causes of death have remained the same, changed or weren't present yet in that particular ICD version. The table shows that the malignant neoplasms of trachea, bronchus and lung and the malignant neoplasm of oesophagus remain the same throughout the ICD versions. This is displayed by a dash. The table also shows that the malignant neoplasm of pancreas and of the bladder are not present in ICD7 and ICD8, but are from ICD9 onwards and from then on remain the same. The website of the World Health Organization doesn't give insight as to why this is, but this could affect the results. It means that less causes of death are used when working with ICD7 and ICD8, which means less data that is put into the PGLE analysis. This means that any peak in PGLE in 1980, compared to 1970, should be taken with a grain of salt, because it could be explained by the increase in number of causes of death that is used. Something similar is happening with the malignant neoplasm of lip, oral cavity and pharynx, which changes the most throughout the ICD versions and becomes much more broadened in the new versions. This also results in more causes of death being used from ICD9 and ICD10. The chronic lower respiratory diseases only have a few changes throughout the versions, but nothing significant.

Results

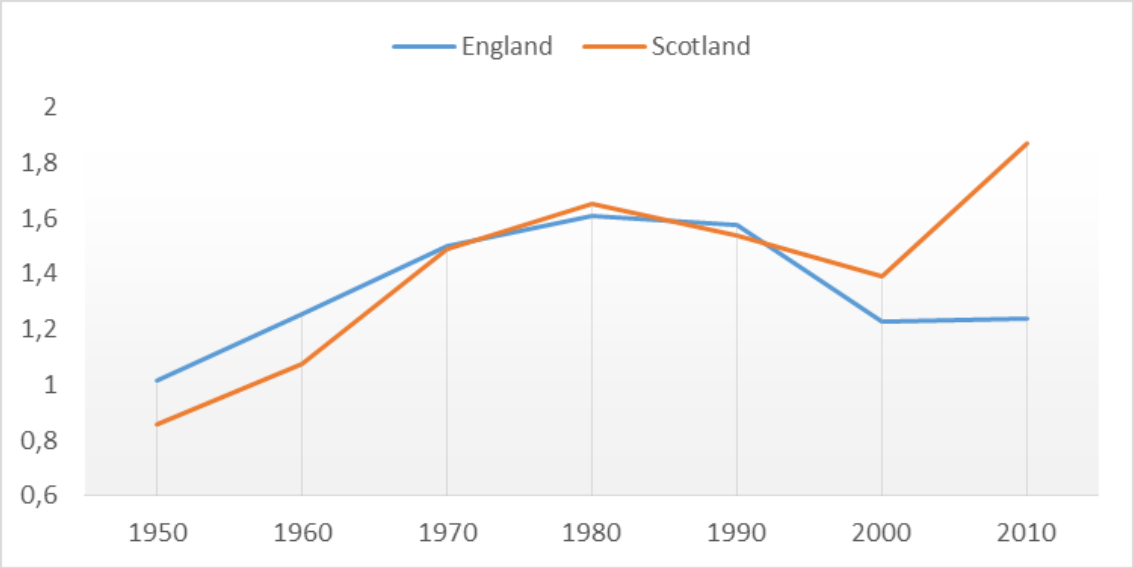

Figure 9: Potential gain of life expectancy of both sexes in Scotland and England between 1950 and 2010. Data source: World Health Organization.

Figure 9 shows the years of life expectancy lost for both men and women, due to the smoking-related causes of death, between 1950 and 2010. In 1950 England has a higher PGLE of 1.013 years than Scotland, which has a PGLE of 0.855 years. From 1970 until 1990 Scotland and England are almost equal, with Scotland just peaking ahead in 1980 it is Scotland with a PGLE of 1.654 years, while England has a PGLE of 1.608 years. But after 1990 England's PGLE decreases more rapidly than Scotland's. In 2000 England's PGLE is 1.227 years, whereas Scotland's is 1.392 years. In 2010 Scotland experiences a rapid increase in PGLE, with a PGLE of 1.871 years, whereas England's PGLE remains steady at 1.237 years. This is a difference of 0.634 years. As shown earlier in figures 5 and 6, in 2010-2012 the life expectancy at birth for Scottish persons was 78.72 years and for English persons 81.11 years. This is a difference of 2.39 years, of which 0.634 years can be explained in smoking-attributable mortality. So about a quarter of the difference in life expectancy can be explained through smoking-related causes of death.

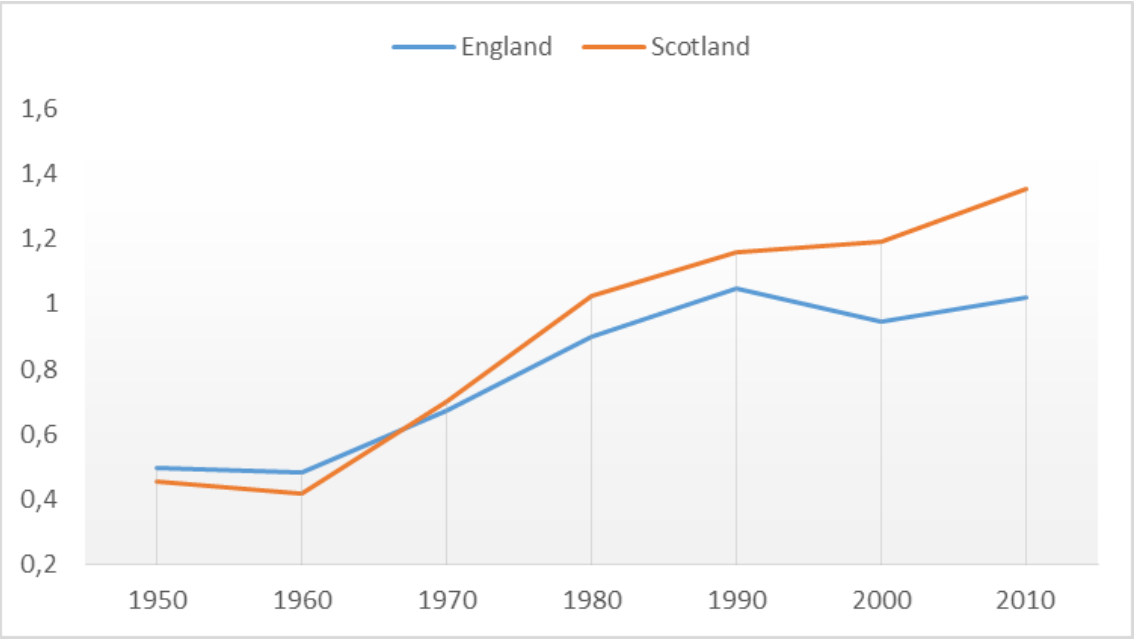

Figure 10: Potential gain of life expectancy of women in Scotland and England between 1950 and 2010. Data source: World Health Organization.

Figure 10 shows the potential gain of life expectancy of women in Scotland and England, due to smoking-related causes of death, between 1950 and 2010. It shows how in 1950 the PGLE for both England and Scotland is very close, with English women at 0.497 years and Scottish women at 0.455 years. From the mid-1960s however Scotland's PGLE increases at a higher pace than England's. For England's PGLE it even decreases after 1990. In 2010 Scottish women have a PGLE of 1.354 years and English women have a PGLE of 1.019 years. As shown earlier in figures 5 and 6, in 2010-2012 the life expectancy at birth for Scottish women was 80.83 years and for English women 83.01 years. This is a difference of 2.18 years, of which 0.335 years can be explained in smoking-attributable mortality. About 15% of the difference can be explained through smoking-related causes of death.

In the UK, up until the 1920s, smoking was something for men only. After this time, and especially during World War 2 the number of female smokers increased rapidly. It was in the 1970s that the prevalence of smoking among women began to increase. Most of the women born in the 1950s would start smoking in their twenties, in the 1970s. It was during the 1970s that the promotion of images of women smoking were part of a sort of 'second wave' feminism, promoting both femininity and independence (Hunt et al, 2004). So this lead to a later increase and peak of smoking-related diseases, like lung cancer, for women in comparison to men (Harkness et al, 2002).

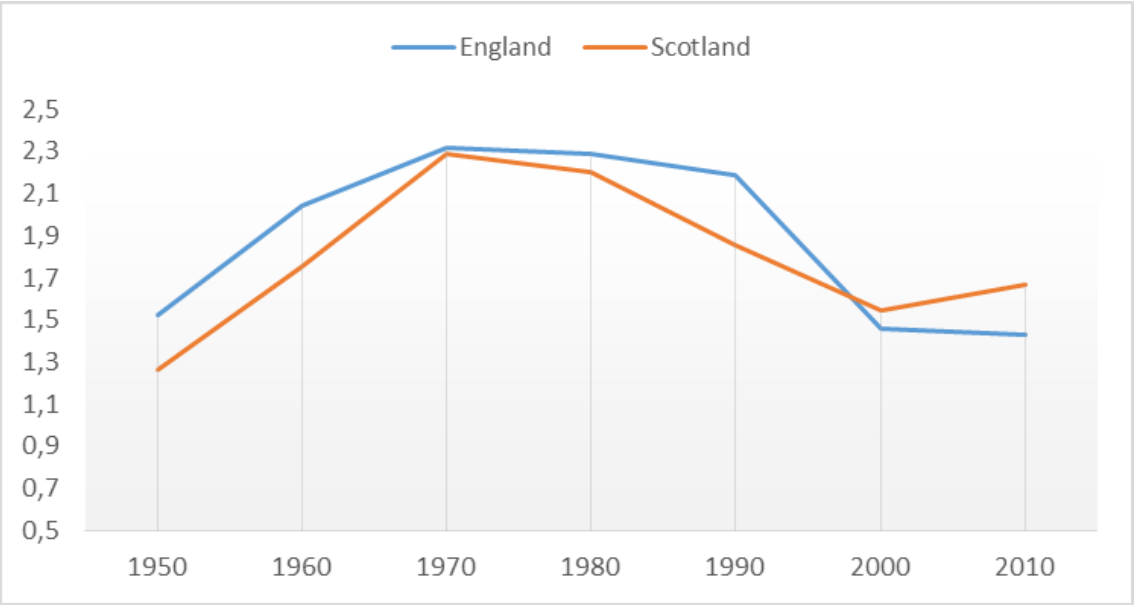

Figure 11: Potential gain of life expectancy of men in Scotland and England between 1950 and 2010. Data source: World Health Organization.

Figure 11 shows the potential gain of life expectancy of men in Scotland and England, due to smoking-related causes of death, between 1950 and 2010. Here it is interesting the PGLE for men is much higher than for the women. In 1950 Scottish men have a PGLE of 1.263 years and English men have a PGLE of 1.526, which is already higher than the highest PGLE for women. For men the PGLE of both countries becomes almost even in 1970, with Scottish men at 2.290 years and English men at 2.318 years. After 1970 the PGLE for Scottish men decreased more rapidly than the PGLE for English men until 1990. In 1990 Scottish men have a PGLE of 1.854 years and English men have a PGLE of 2.189 years. By 2010 the PGLE for Scotland has increased again, whereas for England it has remained steady. In 2010 the PGLE for Scottish men is 1.664 years and for English men 1.429 years. As shown earlier in figures 5 and 6, in 2010-2012 the life expectancy at birth for Scottish men was 76.71 years and for English men 79.21 years. This is a difference of 2.5 years, of which 0.235 years can be explained in smoking-attributable mortality. About 10% of the difference can be explained through smoking-related causes of death.

As mentioned earlier military conscription of 18 year olds men in 1939 and cheap, low cost cigarettes provided to these conscripts, caused these young men to start smoking young and most likely persist this habit throughout the rest of their lives. It is observed that daily cigarette consumption in terms of number of cigarettes showed per day, was also three times larger during World War 1 and World War 2, than in other years before, between and after both wars. So these young men would have had a more intense early exposure, than men born a decade or two earlier or later (Doll et al, 2004).

Socio-economic circumstances could play a role as well. As shown earlier in figure 3, people living in more deprived areas are more likely to smoke. In comparison to England, Scotland has relatively higher levels of socio-economic deprivation. These higher levels of socio-economic deprivation exist in all geographical regions of Scotland, but most evidently in West Central Scotland, with Glasgow at the center. In this region mortality rates are higher

and improving more slowly, compared to other similar regions in England (Walsh et al, 2010). This Greater Glasgow region also has higher smoking rates than other parts of the UK. In the 1995 Scottish Health Survey, 33% of men and 36% of women aged between 16 and 64 were smokers (Hunt et al, 2004). One conclusion by Campbell et al (2013) is that policies of the conservative governments from 1979 onwards had particularly negative consequences for Scotland, but that those consequences built on a slight disadvantage already established in the early 1970s. Scotland was exposed to a sustained political attack after 1979 and that this and growing social inequalities within Scotland, which the attack created, had and have long term implications for mortality (Campbell et al, 2013).

In general about half of all persistent cigarette smokers will eventually die because of smoking, and about a quarter while still in middle age, so between the ages of 35 and 69. On the scale of national mortality rates, after a large increase in cigarette smoking by young people, the full effects can take more than 50 years to mature (Doll et al, 2004). Looking at the peak in 1970 for both countries, this seems consistent with the trend of higher smoking rate among young men during World War 2, these men would have started smoking in their early twenties and according to Doll et al (2004), any person who would start smoking at a young and keep smoking during the rest of their lives, the full effects can take more than 50 years to mature. But like for those men born in the 1920s the probability of death in the middle ages, which is 25-69, was 15% for non-smokers and 43% for smokers. It is indicated that about two thirds of smokers born in the 1920s will eventually die from smoking-related diseases (Doll et al, 2004). So for those men being around 20 years old in 1939 and taking up smoking, they would be in around 50 years old in 1970, which puts them in that category of middle age smokers with a probability of dying due to smoking-related disease of 43%.

Conclusions

Scotland has the highest mortality rates and lowest life expectancy in Western Europe, especially in comparison with England (Walsh et al, 2010). This has been attributed to the consequences of smoking (Campbell et al, 2013). Within the different UK countries, it is Scotland that has the highest percentage of smokers, namely 21.1% and England with the lowest percentage of smokers, namely 18.4% (Office for National Statistics, 2014). In the UK, up until the 1920s, smoking was something for men only. After this time, and especially during World War 2 the number of female smokers increased rapidly (Hunt et al, 2004). For men this was due to cheap cigarettes being made available to young military conscripts from 1939 (Doll et al, 2004). Socio-economic circumstances play a role as well. Men and women living in more deprived areas are more likely to smoke and less likely to quit. In comparison to England, Scotland has relatively higher levels of socio-economic deprivation (Office for National Statistics, 2014). In general about half of all persistent cigarette smokers will eventually die because of smoking, and about a quarter while still in middle age, so between the ages of 35 and 69. On the scale of national mortality rates, after a large increase in cigarette smoking by young people, the full effects can take more than 50 years to mature (Doll et al, 2004).

The results show that between 1950 and 1970 England has higher PGLE, due to smoking-related causes of death and after 1970 where England's PGLE starts to decrease more rapidly than Scotland's and Scotland's even increases for both men and women. Between 1950 and 2010 England has a higher observed life expectancy at birth than Scotland for both men and women. About a quarter of this difference in observed life expectancy at birth can be explained through smoking-related causes of death.

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