# Social Inequalities in the Leading Causes of Early Death

## A Life Course Approach

UCL Institute of Health Equity

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## About the Department of Health

The Department of Health (DH) helps people to live better for longer through leading, shaping and funding health and care in England, making sure people have the support, care and treatment they need, with the compassion, respect and dignity they deserve. The Department takes a comprehensive approach to tackling health inequalities that addresses the wider social determinants, along with differences in access to and outcomes from health services, and one that promotes healthier lifestyles for all. DH has commissioned the UCL Institute of Health Equity to build on the work of the post-2010 strategic review of health inequalities (the Marmot review), to develop the evidence base around the wider social factors that shape health outcomes and contribute to health inequalities, and to support programmes and policy making at local, national and international level.

## About the UCL Institute of Health Equity

The Institute is led by Professor Sir Michael Marmot and seeks to increase health equity through action on the social determinants of health, specifically in four areas: influencing global, national and local policies; advising on and learning from practice; building the evidence base; and capacity-building. The Institute builds on previous work to tackle inequalities in health led by Professor Sir Michael Marmot and his team, including the Commission on Social Determinants of Health, Fair Society Healthy Lives (the Marmot Review) and the Review of Social Determinants of Health and the Health Divide for the WHO European Region. **www.instituteofhealthequity.org**

## About this report

This report was written for the Department of Health by **Jill Roberts** and **Ruth Bell** of the UCL Institute of Health Equity.

The author is grateful to the Department of Health and to all of those who contributed to the programme of work and commented on the report. A list of these expert reviewers and other contributors is provided in an Appendix.

# CONTENTS

## EXAMPLES OF MECHANISMS UNDERLYING SOCIAL INEQUALITIES IN EARLY DEATH

**STILLBIRTHS**

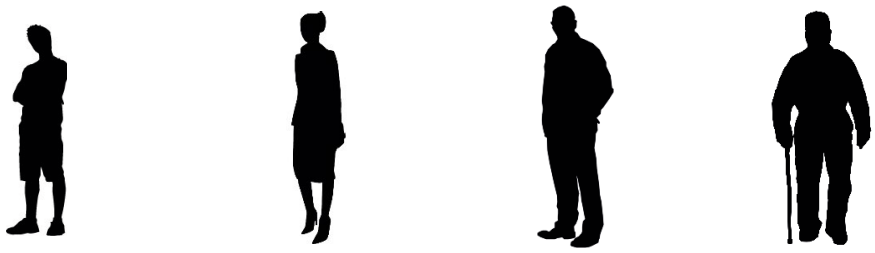
ACCESS TO CARE
EARLY DETECTION RATES
TERMINATION RATES
MATERNAL LIFESTYLE BEHAVIOURS I.E. UNHEALTHY DIET SMOKING
PSYCHOLOGICAL STRESS

MATERNAL LIFESTYLE BEHAVIOURS – I.E. UNHEALTHY DIET SMOKING
TERMINATION RATES
UPTAKE OF RECOMMENDED INFANT SLEEPING POSITION

ADHERENCE TO TREATMENT
INTAKE OF VITAMIN FOLATE OR IRON SUPPLEMENTATION
BIRTH WEIGHT - LINKED TO NEGATIVE MATERNAL BEHAVIOURS THAT FOLLOW A SOCIAL GRADIENT

STRESS FACTORS - LINKED TO PARENTAL UNEMPLOYMENT LOW INCOME AND DEPLETED RESILIENCE - ASSOCIATED WITH SOCIAL ISOLATION MENTAL ILL HEALTH DOMESTIC ABUSE AND SUBSTANCE MISUSE
PRIOR EXPERIENCE OF BEING A VICTIM OF OR WITNESSING VIOLENCE

SHORT GESTATION AND LOW BIRTH WEIGHT
VARIATIONS IN EMERGENCY ADMISSION RATES – LINKED TO AVAILABILITY OF COMMUNITY-BASED SUPPORT
EFFECTIVE MANAGEMENT OF CONDITIONS
THRESHOLDS FOR SEEKING EMERGENCY ADMISSION AND DECIDING TO ADMIT



HAZARDOUS ENVIRONMENTS
HOUSING DENSITY
HOUSING CONDITIONS
TRAFFIC VOLUME AND LEVELS OF ILLEGAL DRIVING
PARENTAL FACTORS SUCH AS MENTAL ILL-HEALTH
UNEMPLOYMENT AND LOW INCOME
EXPOSURE TO STRESSFUL LIFE EVENTS
ADOLESCENT MENTAL HEALTH

EMPLOYMENT STATUS / WORK QUALITY
PERCEIVED ACCULTURATION
MENTAL HEALTH AND SELF-HARM RATES
EXPOSURE TO ADVERSE EXPERIENCES IN CHILDHOOD
LIFESTYLE BEHAVIOURS
USE OF PREVENTATIVE SERVICES
UPTAKE OF HPV VACCINATIONS
TOBACCO USE
ALCOHOL CONSUMPTION
EARLY SEXUAL EXPERIENCES
SCREENING RATES
SHIFT WORK

DIET AND LIFESTYLE BEHAVIOURS
ACCESS TO CARE AND UPTAKE OF PREVENTATIVE SERVICES
CHILDHOOD IQ
OBESITY
MENTAL HEALTH AND PSYCHOLOGICAL / PHYSIOLOGICAL RESPONSES TO ADVERSE CIRCUMSTANCES
SOCIAL ISOLATION AND LONLINESS

DIET AND LIFESTYLE BEHAVIOURS
DISEASE AWARENESS
HEALTH PROFESSIONALS' CULTURAL COMPETENCE
HOUSING CONDITIONS

# EXECUTIVE SUMMARY

This evidence review analyses data from the World Health Organisation's Detailed Mortality Database, and summarises the literature to show that:

- the leading causes of death change across the life course
- there are marked social inequalities in each of the leading causes of death (within top 5 broad causes), by total number of deaths, across the life course
- social and economic circumstances from birth accumulate and impact a person's likelihood of an early death
- different mortality rates for the leading causes of death are evident across comparative European countries

This evidence is summarised for specific age groups across the life course below:

## Stillbirths

The leading cause of stillbirth is short gestation and low birth weight. There are social inequalities in stillbirth associated with differences in:

- access to care and early detection rates
- termination rates (women from disadvantaged areas and from some ethnic groups are less likely to terminate a pregnancy affected by a severe congenital anomaly)
- maternal lifestyle behaviours, such as unhealthy diet and smoking, which are associated with an increased risk of stillbirth
- psychological stress, which is again positively associated with increased risk of stillbirth

## Infants
### 1.8% of all premature deaths, 2010

Over half of infant deaths are attributed to conditions originating in the perinatal period, with the leading cause being short gestation and low birth weight. Congenital anomalies, birth asphyxia and Sudden Death Syndrome are other leading causes. There are social inequalities evident for all leading causes of infant death, such that increased risk of infant death is associated with risky lifestyle behaviours and lower uptake of health-protective behaviours. Mechanisms suggested as underlying these inequalities are differences in:

- maternal lifestyle behaviours during pregnancy and breastfeeding rates
- termination rates (see above)
- uptake of recommended infant sleeping position (prone position).

## Children, ages 1–4
### 0.3% of all premature deaths, 2010

'Injuries and poisoning' is the leading cause of death for boys whereas cancer is the leading cause for girls. Social inequalities are found in all leading causes of death among young children, including unintentional drowning and suffocation, and deaths from leukaemia, Hodgkin lymphoma and cerebral palsy. The mechanisms suggested as underlying these social inequalities include social differences in:

- adherence to treatment
- intake of vitamin, folate or iron supplementation
- birth weight, linked to lifestyle behaviours

## Children, ages 5–9
### 0.2% of all premature deaths, 2010

Cancer, particularly brain cancer, is the leading cause of death for both girls and boys of this age group, causing around one in four of all deaths. Deaths by injury and poisoning cause more deaths in this age group for boys than girls. Deaths from congenital anomalies and child homicide are other leading causes. There is limited evidence on social inequalities in childhood brain cancers. Research reveals socioeconomic inequalities in child homicide rates. The association between poverty, child maltreatment and homicide is most commonly explained by stress factors linked to unemployment, low income and depleted resilience, as well as prior experience of being a victim of or witnessing violence.

## Children, ages 10–14
### 0.2% of all premature deaths, 2010

More than twice as many boys than girls die from external causes (particularly road crashes and unintentional drowning) between the ages of 10 and 14. Brain cancer and cancer of the blood, bone marrow and lymph nodes, as well as diseases of the nervous system, epilepsy and cerebral palsy are other leading causes of deaths for this age group. There is evidence of social inequalities in epilepsy and cerebral palsy, attributed in differences in short gestation and low birth weight, and infections during pregnancy. Variations in emergency admission rates, believed to be because of differences in the availability of community-based support, effective ongoing management of conditions and thresholds for seeking admission, contribute to social inequalities.

## Young people, ages 15–19
### 0.6% of all premature deaths, 2010

External causes of death – particularly road crashes, suicide and self-harm – are the leading causes of death for both

sexes at this age. Other European countries, however, have comparatively higher rates of mortality than the UK. Socioeconomic inequalities in the leading causes of death for young people aged 15–19 are attributed to differences in:

- housing conditions and housing density
- proximity to traffic, exposure to hazardous or illegal driving
- parental mental health, employment, income, education/skills and relationship status
- Exposure to stressful life events
- Adolescent mental health

## Young adults, ages 20–34
## 3.5% of all premature deaths, 2010

Suicide and intentional self-harm is the leading cause of death for young adults. Compared with EU19 countries (the 15 EU countries prior to the accession of the 10 new members in May 2004 plus the four eastern European members of the OECD), the UK has the sixth lowest suicide and self-harm mortality rate for young adults (aged 20–34). Road crashes, brain cancer, cancer of the blood, bone marrow and lymph nodes, cervical cancer and breast cancer are the other leading causes of death. Social inequalities in these leading causes of death are attributed to differences in:

- employment status/work quality
- perceived acculturation[1]
- mental health and self-harm rates
- exposure to adverse experiences in childhood
- lifestyle behaviours
- use of preventive services
- uptake of HPV vaccinations
- tobacco use
- alcohol consumption
- early sexual experiences
- screening rates
- shift work

## Adults, ages 35–64
## 45% of all premature deaths, 2010

Deaths as a result of disease and related causes, specifically cancer, ischaemic (coronary) heart disease, heart attacks, chronic liver disease and cirrhosis are the leading causes of death among adult men and women. Suicide and intentional self-harm remain a leading cause of death among adult men.

Mechanisms posited as underlying social inequalities in leading causes of death in adults include social differences in:

- diet and lifestyle behaviours
- access to care and uptake of preventive services
- childhood cognitive development
- obesity
- mental health, and physiological and psychological responses to adverse circumstances
- social isolation/loneliness

## Adults, ages 65–74
## 48.4% of all premature deaths, 2010

Cancer – particularly lung cancer and cancer of the colon, rectum and anus – and ischaemic (coronary) heart disease continue to be the leading causes of death among older adults. Cerebrovascular disease, chronic lower respiratory diseases and pneumonia emerge as other leading causes. The mechanisms suggested as underlying social inequalities in the leading causes of death in older adults include social differences in:

- lifestyle behaviours – unhealthy behaviours associated with increased risk of early death
- disease awareness, with lower awareness associated with increased risk of early death
- health professionals' cultural competence
- housing conditions, with poorer conditions associated with increased risk of early death

## Conclusion

This evidence review shows marked social inequalities for the leading causes of death across the life course. Risk factors associated with premature mortality are also known to accumulate over time. A sizeable proportion of the burden of disease and premature death is therefore estimated to be a result of social inequalities throughout life, and differences in access to and use of healthcare services, which are amenable to policy and practice interventions.

Social inequalities in mortality are unjust. It is unacceptable that we can identify which children are more likely to have an early death because of the conditions in which they are born. Health care systems along with other sectors, including education, welfare, social care, employment, transport, community and voluntary, and the built environment, need to continue to work together to build on promising policies and practices to prevent early death across the life course, and from the earliest possible opportunity.

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[1] *The degree to which ethnic-cultural minorities engage in the customs, tenets, principles and behaviours of their own culture versus the dominant*

# INTRODUCTION

Social inequalities contribute significantly to premature mortality. To save the most lives, social inequalities in the principal causes of early death at different life course stages must be identified and addressed, and understanding is required of how the effects of social disadvantage and adverse experiences, starting before birth, accumulate over the life course.

If the whole population had the mortality rate of those with university education, every year 202,000 premature deaths (40% of deaths) would be prevented. Put another way, 2.5 million life years would be gained (12).

From our review of the evidence, research on social inequalities linked specifically to the leading causes of early death has not been previously collated and considered from a life course perspective.

This paper analyses mortality data from the World Health Organisation's (WHO) European Detailed Mortality Database (DMDB) to identify the leading causes of early death in the UK across the life course. The review then summarises the evidence on social inequalities in these specific causes of death.

For example:

- The risk associated with some congenital anomalies is higher in women of lower socioeconomic status, lower education and among ethnic minority groups.
- Research reveals deep socioeconomic inequalities in rates of child homicide.
- Inequalities in cardiovascular disease (CVD) mortality exist by ethnicity and gender, and between geographical areas and socioeconomic groups.

There is also evidence that UK mortality rates for some of the leading causes of early death are higher than in some other comparable European countries, such as Germany, France and Spain.

Overall, this review shows that much of the burden of disease and premature death is a result of social inequalities, and thus is avoidable and unjust.

Throughout the paper, evidence and resources are highlighted in boxes such as this one. These are labelled in the following ways:

**Key messages**

Summaries of the key findings proposed in this paper.

**Leading causes of mortality**

These have been determined by total number of deaths for age groups across the life course.

# SOCIAL INEQUALITIES IN HEALTH
## A case of life or early death

1

Social inequalities in health arise because of inequalities in the conditions in which people are born, grow, live, work and age – all of which are fundamentally driven by inequities in power and resources (financial, social and natural).

The key social determinants of health (SDH) include:

- socioeconomic status (SES), often measured by income, education and/or employment
- race/ethnicity
- age
- gender
- geographical context, including environmental factors such as community SES and strength, and levels of crime
- macro-structural factors, such as economic, social, education and health care policies and budgets.

Some of these factors are fixed demographic characteristics. However, even these individual characteristics are associated with social status and power, and thus a person's or family's access to:

- material resources for a healthy life, such as income, nutritious foods, and quality housing and employment
- psychosocial resources to enable individuals to have control over their lives, such as education, social networks, social support and self-esteem

Biological factors can also be altered by external factors, for example, exposure to adverse experiences in childhood [1].

A lack of material and psychosocial resources can be a considerable source of stress, and is associated with harmful behaviours including smoking, substance misuse, having a sedentary lifestyle, eating an unhealthy diet, alcohol misuse, engaging in unsafe sexual practices and illegal driving.

These material and psychosocial resources, and associated behaviours and biological factors, are the mediating pathways through which social factors – the key social determinants of health – affect whether, and for how long, a person survives and thrives.

### The life expectancy gap – death is certain, but the timing isn't…

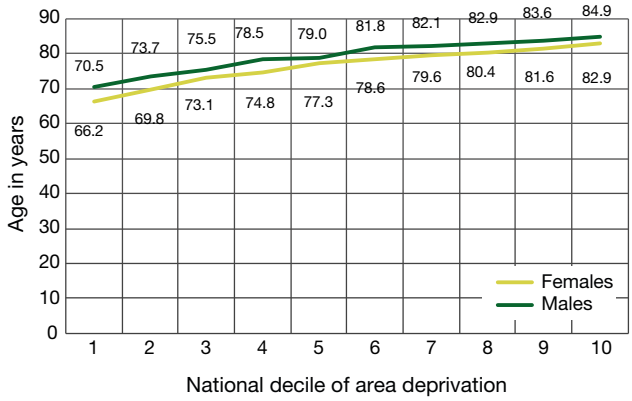
Mortality can generally be split into two categories: premature death that occurs from birth to under 75 years of age, and deaths at an older age. Latest analyses of the WHO's European Detailed Mortality Database (DMDB) show that in the UK, around two in five men (42%) die before their 75th birthday, compared with one in four women (26%) [2].

The Office for National Statistics (ONS) defines premature mortality using the age threshold of 75, but it is appreciated that this is an arbitrary figure [3]. Advances in healthcare, as well as increasing life expectancies, different life expectancies between men and women, and differences in life expectancy by SES, mean that definitions of premature mortality are likely to change over time [3]. There is also evidence of social and regional inequalities in the likelihood of a person living beyond the age of 75, and in a person having a healthy life for longer – measured as a person's disability-free life expectancy (DFLE), for instance.

Research has identified a strong association between both individual and area-based deprivation and life expectancy [4, 5]. The latest ONS statistical bulletin on life expectancy at birth by local areas in England and Wales 2011–13 highlights a North–South divide, with life expectancy generally lower in the North of England [6]. Male life expectancy at birth is highest in South Cambridgeshire (83 years) and lowest in Blackpool (74.3 years). For females, life expectancy at birth is highest in Chiltern at 86.4 years and lowest in Manchester (80 years) [6].

Figure 1 shows that females in the most disadvantaged areas can expect to spend 16.7 percentage points less of their lives in 'good' health (disability free) than females in the least disadvantaged areas (66.2% compared with 82.9%), while males in the most disadvantaged areas can expect to spend 14.4 percentage points less of their lives in 'good' health than males in the least disadvantaged areas (70.5% compared with 84.9%).

***Figure 1***
*Proportion of life in 'good health' (disability free) for males and females by national deciles of area deprivation in England, 2011-13*




Source: [275]

A report by the ONS found that in 2002–2006 boys and girls whose parents had an occupation classified as higher managers or professionals could expect to live 5.8 years and 4.2 years longer, respectively, than boys and girls whose parents were in 'routine' occupations such as waiters and cleaners [7].

What drives these differences? A number of studies have attempted to understand the relative contributions of different factors to health and survival – that is, health behaviours, clinical care, social and economic factors and the physical environment – but they have arrived at very different estimates due to different methodologies and outcomes used. The causal pathways to lifelong health and wellbeing are complicated. However, the complexity of these pathways means that a purely biological or medical approach to understanding life and death is clearly insufficient [8].

Although there have been efforts to define and quantify premature deaths that are 'avoidable' – either through health care interventions ('amenable' deaths) or broader public health interventions that aim to address the wider determinants of health ('preventable' deaths) [9] – definitions of 'avoidable' deaths rarely consider the mediating pathways through which the social determinants of health impact on mortality outcomes [9, 10]. Nor do they consider the causal pathways across the life course: how social and economic circumstances from birth can accumulate and impact on health behaviours, which may increase a person's likelihood of an early death from all and specific causes [9, 10].

For many of the leading causes and determinants of death across the life course, this report shows that there is a social gradient such that if cause-specific mortality rates followed the distribution of rates for the most advantaged groups in society, or rates in the most affluent areas, many deaths, across all age groups, could be avoided [12].

Inequities in health – those health inequalities that arrive as a result of the conditions in which people are born, grow, live, work and age, and the health systems put in place to prevent, diagnose and deal with ill-health – are judged to be avoidable by reasonable action, and are thus unjust [11]. This evidence review attempts to cut through contentious definitions of premature and avoidable mortality to show that much of the burden of disease and premature death is a result of social inequalities, and is thus avoidable and unacceptable [11].

This review also shows that there are a number of common risk factors for many of the leading causes and determinants of an early death, including:

- lifestyle behaviours (such as smoking, alcohol misuse, living a sedentary lifestyle, eating an unhealthy diet)
- life stressors (such as low income, poor quality work, and poor housing and neighbouring conditions)
- inequalities in access to and use of healthcare and social services.

Inequalities in life and death are thus rooted in inequalities in power and resources (financial, social and natural), which lead to differential exposures to determinants of health in early life, social and physical environments, work and social stratification, and differential vulnerabilities [11]. Socioeconomic differences in health can set in before birth and accumulate over the lifecourse. But they are not inevitable and can be improved.

# METHODOLOGICAL CONSIDERATIONS

2

## Early mortality – grouping causes and ages for ranking

The ordering of 'leading causes of deaths' depends on the ways in which researchers and organisations group or split death registration data. For example, grouping deaths by broad causes, such as grouping all cancer deaths together, will lead to different leading causes of death being identified than if narrow groups are used, such as different types of cancer.

Causes of death are also defined differently for various purposes. The ONS, for example, reports on avoidable mortality in England and Wales to help with the development of public health initiatives (as opposed to disease control and prevention), but there is little consensus among researchers about how to define avoidable mortality [10]. Vastly different estimates of deaths from avoidable causes are calculated and published as a consequence – ranging from 23% of all deaths registered in England and Wales [10], to a sizeable two-thirds [13].

Most routine national and international mortality statistics are based on each death being assigned a single underlying cause of death, as defined in the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) [14], with version 11 due by 2017 [15], although there are variations in coding practices between countries.

## Mortality databases selected for use in this review

In this review, the leading causes of death across the life course have been identified using the WHO's European Detailed Mortality Database (DMDB).

The DMDB enables comparison of UK leading causes of death statistics with other European countries. The UK death rates for identified leading causes of death (total numbers of death) across the life course are compared across EU19 countries (excluding Greece – see below). These countries are the 15 EU countries prior to the accession of 10 further countries on 1 May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom (EU15), plus the four eastern European member countries of the OECD – Czech Republic, Hungary, Poland and the Slovak Republic. Despite being part of the EU15, this review does not include Greece in the comparison as it is coded using ICD-9, as opposed to ICD-10, so is not directly comparable with the other EU19 countries.

The DMDB also allows for easy aggregation of causes of death into cause-groups based on the EUROSTAT list of 65 causes. These cause-groups closely align with death cause-groups commonly used in the literature. Mortality data has also been aggregated into age groups appropriate for this review:

- Under 1
- 1–4 years
- 5–9 years
- 10–14 years
- 15–19 years
- 20–34 years
- 35–64 years
- 65–74 years

As stillbirth is a cause of death not well aligned with the ICD-10, the leading causes of stillbirth were identified from the literature.

This evidence review highlights how social inequalities and social gradients are found in all causes of death. It identifies the leading causes of death based on total numbers of deaths (all causes), and provides evidence from the literature of wider social inequalities in these leading causes of early death.

## Further methodological considerations

The ICD-10 lists 1,662 different causes of death. As previously noted, this review has aggregated these causes into broader groups, based on the Eurostat list of cause groups (see Appendix B), which closely align with mortality keywords found in the literature. This review focuses on the leading causes of death (total number) by age group, and summarises social inequalities in these identified leading causes. Broad cause-groups have been included in the analysis, although it also reports on the leading specific causes of death within these broad cause-groups.

For some age groups, the leading causes of early death are the same or similar. To prevent repetition, information on social inequalities is presented for each leading cause of death only once, and under the age group associated with a peak in numbers of death from that specific cause.

## Limitations

When reporting on social inequalities in the leading causes of death, the age groups reported in the literature do not always correspond with the broad age groups used in this review. Nevertheless, where possible, the literature has been separated broadly into studies that have focused on inequalities in:

- infant and child cause-specific mortality and morbidity; and
- cause-specific deaths in young, working age and older adults

Similarly, where gender differences have been identified, relevant findings have been extrapolated and presented.

The latest UK data available through the DMDB is from 2010. As the number of deaths in certain age groups, particularly children, is relatively low, the leading causes of death will change from year to year. European comparisons are made with countries that also capture data using the ICD-10. The latest data for each country has been used (ranging from 2010–2012). Variations in coding and death registration practices may also account for some of the differences between countries.

This evidence review aims to provide an overview of social inequalities in the leading causes of mortality across the life course; it is not a systematic review. The aim of this review is to provide evidence for health equity advocacy, and service planning for health and public health services, as well as for services that impact the social determinants of health. This review also aims to help set the agenda for more targeted reviews.

# STILLBIRTH

3

## Key messages

**STILL BIRTHS**

Research has found significant differences between the most and least socioeconomically disadvantaged groups in almost all causes of stillbirth. Social inequalities in stillbirths are known to be associated with differences in:

- access to care and early detection rates
- termination rates
- lifestyle behaviours, such as an unhealthy diet (linked to obesity), and smoking
- psychological stress

## Leading causes of stillbirth

The UK definition of stillbirth is the loss of a baby after 24 completed weeks of pregnancy [16]. However, the definition of stillbirth recommended by the WHO for international comparison is a baby born with no signs of life at or after 28 weeks' gestation [17]. Euro-Peristat has shown that the UK has among the highest stillbirth rate in Europe at 3.8 per 1,000 births, compared to 1.5 per 1,000 births in the Czech Republic [18] (see Figure 2).

Despite a considerable reduction in stillbirths in high-income countries in the 1940s, more recently, the decline has slowed or halted [276]. Eleven babies are stillborn every day in the UK [19]. In 2013 there were 3,284 stillbirths in England and Wales [20]. This is equivalent to a stillbirth rate for England and Wales of 4.7 per 1,000 total births – or around one in every 200 births [19]. There is also within-country variation: a rate of 3.7 per 1,000 in the South West of England compared with 5.5 in London [21].

Classifying stillbirths into specific causes is extremely challenging, and in the UK a third of stillbirths are unexplained [22], but they are known to be linked to certain factors, including:

- Congenital anomalies – a genetic physical anomaly in the baby, including fetal growth restrictions; this is the single largest risk factor [23]
- Childbirth complications – problems with the placenta, umbilical cord, maternal bleeding
- Maternal infections or conditions in pregnancy – such as liver disorders or pre-eclampsia, which cause high blood pressure in the mother
- Maternal disorders, especially hypertension and diabetes [24, 25]

## Social inequalities in the leading causes of stillbirths

Research has found significant differences between the most and least socioeconomically disadvantaged groups in all causes of stillbirth (congenital anomalies, pre-eclampsia, antepartum haemorrhage, maternal disorder, other infections) except mechanical events – that is, problems with breech or the umbilical cord – that occur during labour [25].

For example, a significant risk of stillbirth is associated with Black, Asian and minority ethnic (BAME) populations, as well as with maternal obesity, smoking, pre-existing diabetes, history of mental health problems, antepartum haemorrhage and fetal growth restriction [23]. The potentially modifiable risk factors of maternal obesity, smoking in pregnancy and fetal growth restriction account for over half (56.1%) of stillbirths [23].

Another study has found that stillbirth rates are twice as high in the most disadvantaged areas compared with the least disadvantaged [25]. The same study reported that if the stillbirth rate of the least disadvantaged areas were seen throughout the population, there would be a third fewer stillbirths – equivalent to over a 1,000 fewer in England and Wales. Many stillbirths are therefore potentially preventable – further evidenced by regional and national variations.

## Mediating mechanisms – access to and use of health services

A number of mechanisms are thought to link socioeconomic deprivation with risk of stillbirth. For example, inequalities in access to care for pre-eclampsia may also impact on stillbirth rates as demonstrated by a Belgian study, where severe pre-eclampsia was found to affect more women from socially disadvantaged backgrounds with lower access to care than better-off women [26]. A UK study also found that rates of

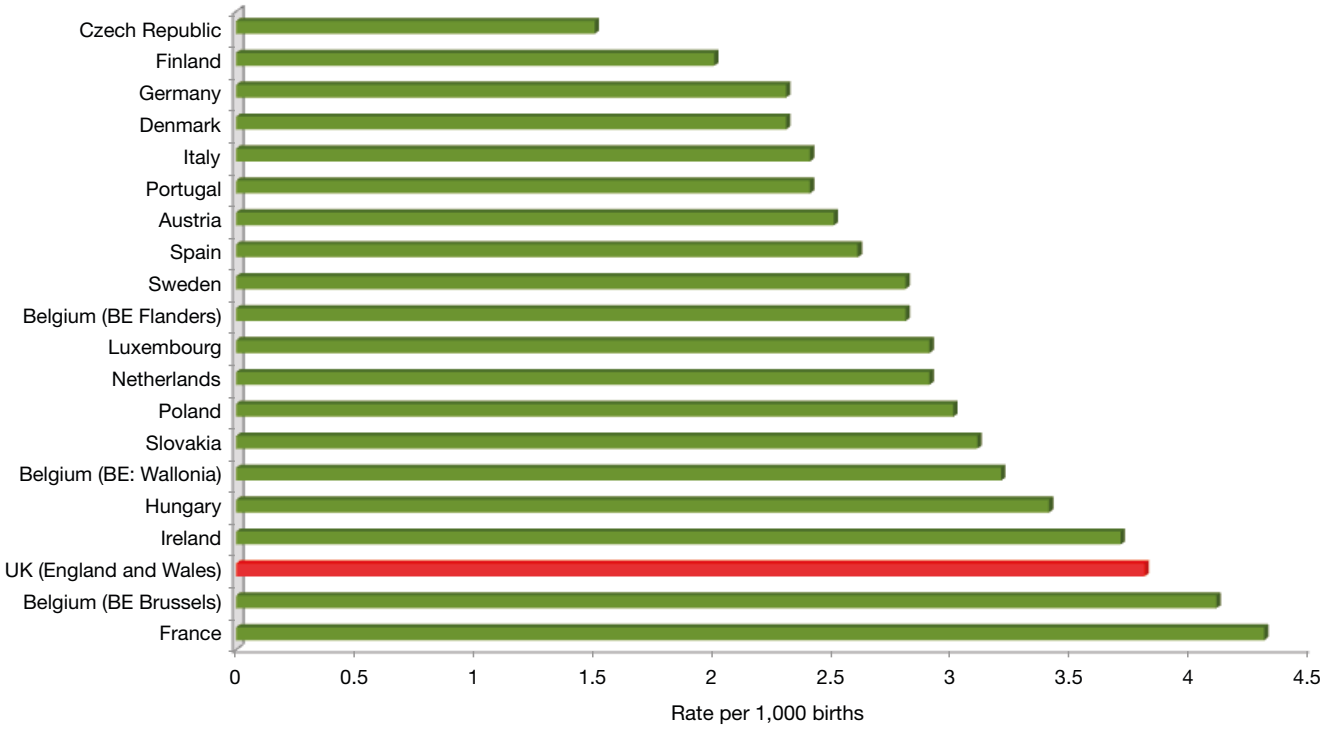
early detection of severe fetal anomalies were slightly lower in more disadvantaged areas, leading to socioeconomic variation in termination rates, which could partly explain the social gradient in stillbirths [27]. Women from disadvantaged areas who have been identified as having a fetus with a severe anomaly are less likely to terminate the pregnancy than women with higher socioeconomic status [27]. Where fetuses with a severe anomaly were identified, rates of termination were considerably lower for Pakistani (Asian or Asian British) mothers (42% compared with 71% for white British mothers) [27].

## Mediating mechanisms – maternal lifestyle behaviours

Social inequalities have also been identified in the underlying rates of pre-eclampsia as a result of maternal obesity and diabetes, which are higher among socially disadvantaged women [28]. Other lifestyle factors are also linked to deprivation and contribute to health inequalities. Rates of smoking, for example, have been shown to be higher in more disadvantaged areas [29]. In England, from April 2013 to 31 March 2014, 12% of mothers were recorded as smokers at the time of delivery. The smoking prevalence is different throughout the country. For example, 5.1% of mothers were recorded as smokers at time of delivery in London, compared with 20.6% in Durham, Darlington and Tees [30].

However, studies focusing on the potential link between deprivation and the mechanisms involved with the risk of stillbirth have found that such factors are only partially explanatory [31]. For example, a US study found that even after adjusting for factors such as maternal smoking and hypertension, babies were more likely to be small for gestational age if the mothers lived in disadvantaged areas. It was suggested that additional factors such as psychological stress might be causing the infants to be born small for gestational age [32].

*Figure 2*
*Fetal mortality rate per 1,000 total births, at or after 28 weeks of gestation, EU19 countries, 2010*




Source: Euro-Peristat [277]

# INFANT DEATHS (0–1)

4

## Key messages

**INFANT DEATHS**

Over half of all infant deaths for both girls and boys are attributed to conditions that originate in the perinatal period. The leading causes are short gestation and low birth weight. The UK has the third highest rate in the EU19 of infant deaths by short gestation and low birth weight (Figure 4), and the fourth highest rate of infant mortality overall (Figure 3).

Around one in four deaths of infant girls and boys is because of congenital anomalies. Birth asphyxia is one of the leading causes of death for girls. Compared with other EU19 countries, the UK has the highest rate of deaths by birth asphyxia (Figure 5), and the UK has the fifth highest rates of death by Sudden Infant Death Syndrome for infants under 1 (SIDS; Figure 6), above only France, Ireland, Belgium and Slovak Republic. SIDS is a leading cause of infant deaths in the UK, responsible for one in 20 of all infant deaths for both girls and boys.

Social inequalities are found to influence the leading causes of infant deaths. The mechanisms suggested as underlying these social inequalities include social differences in:

- lifestyle behaviours, including substance misuse, smoking and nutrition during pregnancy
- breastfeeding rates
- termination rates
- uptake of recommended infant sleeping position (placing baby to sleep on his/her back).

Infant death (death in children under one year old) can be divided into neonatal mortality (death up to 27 days after live birth) and post-neonatal mortality (death between 28 days and one year) [33].

Sixty per cent of child and adolescent deaths occur during the first year of a child's life, and in the UK around 70% of infant deaths occur in the neonatal period [34].

Although the infant mortality rate in England and Wales, and for the UK, has been steadily declining, the death rate per 1,000 live births is still one of the worst among high-income countries (see Figure 3).

## Leading causes of infant deaths

### Males

Infant deaths comprised 1.7% of all male premature deaths in 2010. The total number of deaths in males under age one was 1,915.

**The leading causes of death among infant males (under one) are:**

- conditions that originate in the perinatal period (54%; 1,034 deaths) – the main cause being disorders related to short gestation (before 37 weeks of gestation) and low birth weight (born weighing under 2,500 grams) (548 deaths), followed by necrotizing enterocolitis, a bowel disorder (99 deaths), and chronic respiratory diseases and other respiratory conditions (82 deaths) – both of which are related to short gestation
- Congenital anomalies (congenital causes and chromosomal abnormalities) (23%; 449 deaths) including congenital malformations of the heart (67 deaths) and lungs (60 deaths)
- Sudden Infant Death Syndrome (5%; 105 deaths)

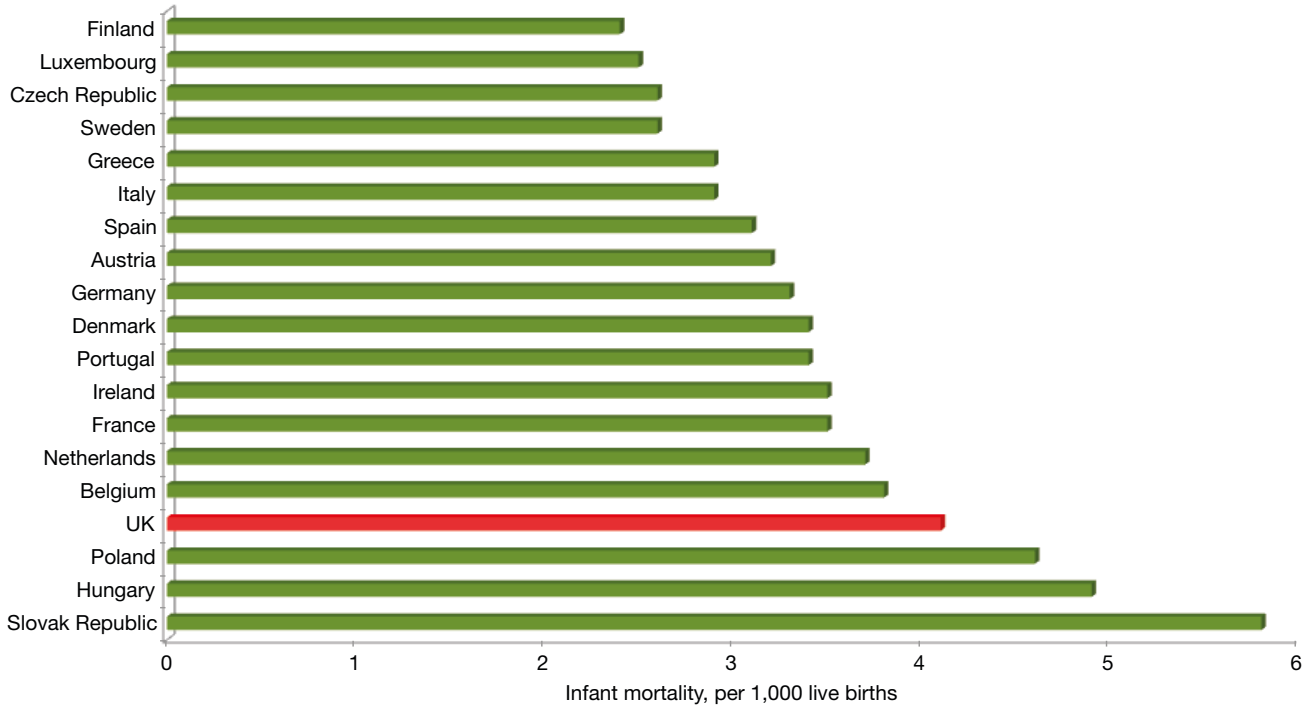
### Females

Infant deaths comprised just over 2% of all female premature deaths in 2010. The total number of deaths in females under age one was 1,589.

**The leading causes of death among infant females (under one) are:**

- conditions that originate in the perinatal period (53%; 839 deaths) – the main cause being disorders related to short gestation (before 37 weeks of gestation) and low birth weight (born weighing under 2,500 grams) (434 deaths), followed by birth asphyxia (109 deaths), chronic respiratory diseases and other respiratory conditions (69 deaths), and infection and inflammation of the intestine (59 deaths)
- congenital anomalies (congenital causes and chromosomal abnormalities) (26%; 417 deaths), the leading cause being Edward's syndrome and Patau's syndrome (65 deaths) also known as Trisomy 18 and 13 respectively, genetic conditions caused by an additional copy of number 18 and 13 chromosome, followed by congenital malformations of the heart (62 deaths)
- Sudden Infant Death Syndrome (5%; 86 deaths)

*Figure 3*
*Rates of infant mortality per 1,000, males and females, EU19, 2012*




Source: Eurostat statistics database [35]

## Social inequalities in the leading causes of infant deaths

### Short gestation and low birth-weight

More than half of all deaths attributed to conditions that originate in the perinatal period are specifically linked to pre-term delivery and low birth weight. The UK has the third highest rate among comparable European countries, for infants under 1 (see Figure 4).

Risk factors for both short gestation and low birth weight include low and high maternal age (for example, in teenage pregnancies there is competition for nutrients between the fetus and the still-growing mother, while advanced maternal age – defined as over 35 – is associated with several adverse pregnancy outcomes), as well as smoking and disadvantaged circumstances [36, 37, 278].

#### Socioeconomic status

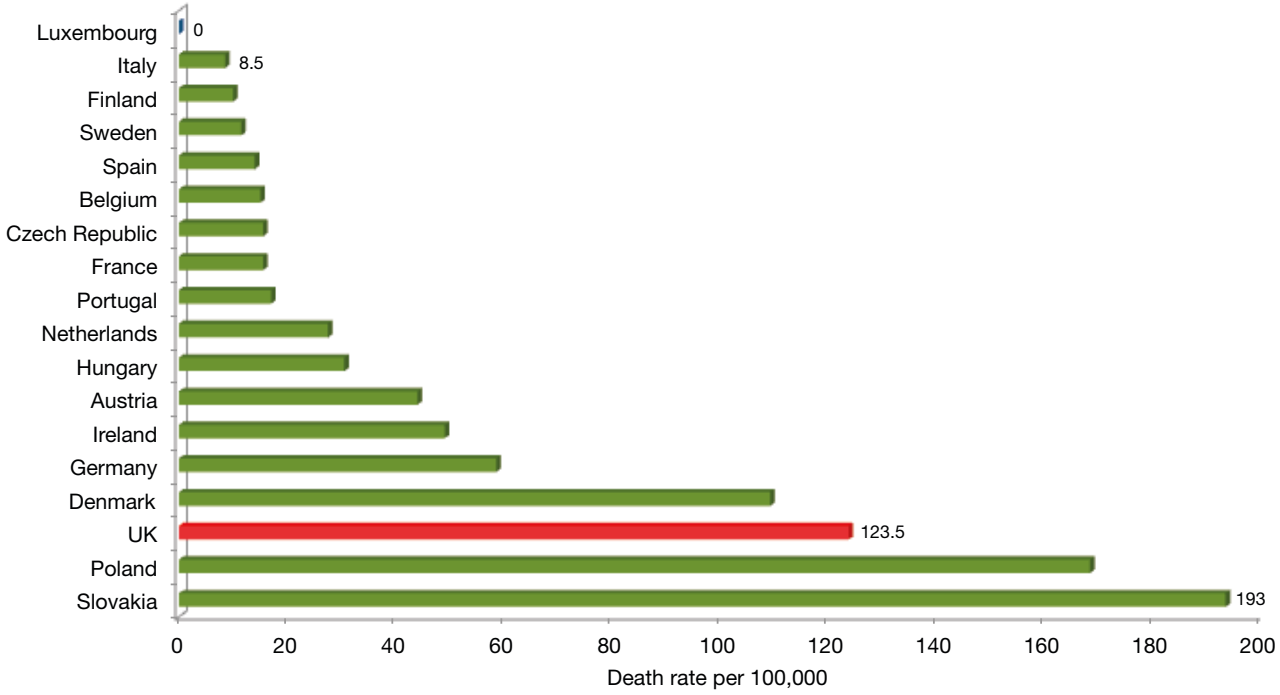
Babies born into poorer families in low socioeconomic status neighbourhoods are more likely to die than children from richer families [37-39]. Lower SES is associated with higher levels of maternal distress and anxiety, which in turn can independently contribute to adverse fetal and neonatal outcomes[38], and relates directly to the material conditions that influence health, such as lifestyle and the ability to afford a healthy life. Studies have shown that among children of depressed mothers, the risk of low birth weight is approximately doubled [40].

#### Maternal lifestyle behaviours

Low birth weight is also associated with negative maternal health behaviours such as substance abuse, poor nutrition during pregnancy and smoking [38]. All of these behaviours are found to be more prevalent among mothers from disadvantaged socioeconomic groups [41]. For example, in the UK smoking during pregnancy is more common in more disadvantaged socioeconomic groups [34]. There is also a strong relationship between obesity and social deprivation, particularly for women [42, 43, 278, 280], as well as between lower breastfeeding rates and lower socioeconomic status [281, 282]. Overweight and obesity in women, especially during pregnancy, contributes to an increased risk of preterm birth and induced preterm birth [283]. Higher prevalence of obesity among women of lower socioeconomic position is likely to be associated with consumption of less healthy diets and lower levels of physical activity compared with women of higher socioeconomic position [284-288].

Surviving infants who are born to overweight or obese mothers, and who are not breastfed, are more likely to have an unhealthy diet and poor eating habits, and become

*Figure 4*
*Rates of short gestation and low birth weight, per 100,000, males and females under one year, EU19, latest ICD-10 codes (2009–2012)*




Source: European Detailed Mortality Database (DMDB) [2]

overweight or obese themselves [279]. Overweight and obesity is a leading cause of disease and life-threatening conditions, such as diabetes and fatty non-alcoholic liver disease, which are referred to later in the report. Research has found that every month of breastfeeding is associated with a 4% decrease in the risk of obesity [289].

Inadequate intake of folic acid is also linked to low birth weight. There is evidence that women of higher social status are more likely to know the benefits of taking supplemental folic acid and to be aware of the correct timing, potentially leading to a widening of socioeconomic inequalities in infant mortality [44].

### Race/ethnicity

Racial/ethnic disparities are evident in low birth weight delivery. For example, findings from the Millennium Cohort Study suggest that women from certain ethnic groups (black African, black Caribbean, Asian, Indian, Pakistani and Bangladeshi) have higher adjusted risks of having a preterm and low birth weight baby than white women [45]. Another study found that Caribbean and Pakistani babies are more than twice as likely to die before the age of one compared with white British or Bangladeshi babies, partly due to a higher prevalence of preterm birth and congenital anomalies respectively within the Caribbean and Pakistani ethnic groups [290]. These racial/ethnic disparities are thought to be explained through a variety of socioeconomic, behavioural, biological and genetic factors [46-48].

Calculations based on data from the Millennium Cohort Study estimate that if all births in the UK followed the distribution of weight of the most advantaged babies in society, there would be 34% fewer low birth weight births in the UK [49]. Applying this to the number of deaths attributed to short gestation and low birth weight in the UK, this is equivalent to approximately 314 low gestation and low birth deaths that could be prevented each year.

## Bowel disorder

For babies born prematurely, receiving only breast milk, as opposed to being fed formula milk, has been found to be associated with a reduction in bowel conditions such as the potentially life-threatening necrotising enterocolitis [50, 291]. Breastfeeding is less common in less advantaged socioeconomic groups [51].

## Chronic respiratory diseases

There is evidence that socioeconomic status is more important for more severe than less severe respiratory conditions [52]. This social gradient is believed to be explained by a combination of mediating factors, the most significant being diet, local deprivation and maternal smoking [52], as well as cold and damp housing [292].

## Birth asphyxia

There is evidence of a relationship between birth asphyxia – a condition that occurs when a baby's brain and other organs do not get enough oxygen before, during or immediately after birth – and social factors, although different measures associated with maternal factors are used within studies. For example, a Swedish-based study found that asphyxia was associated with the lone parent status of the mother [53], and other factors including maternal age and smoking habits were not found to be linked to increased risk of birth asphyxia [53]. Meanwhile, an Australian study found an association between economic status (employment status of mother) and asphyxia: unemployed mothers were 3.6 times more likely to be associated with birth asphyxia than mothers who reported being an unskilled manual worker (3.84) or a housewife (2.48), although the drivers of this association require further investigation [54].

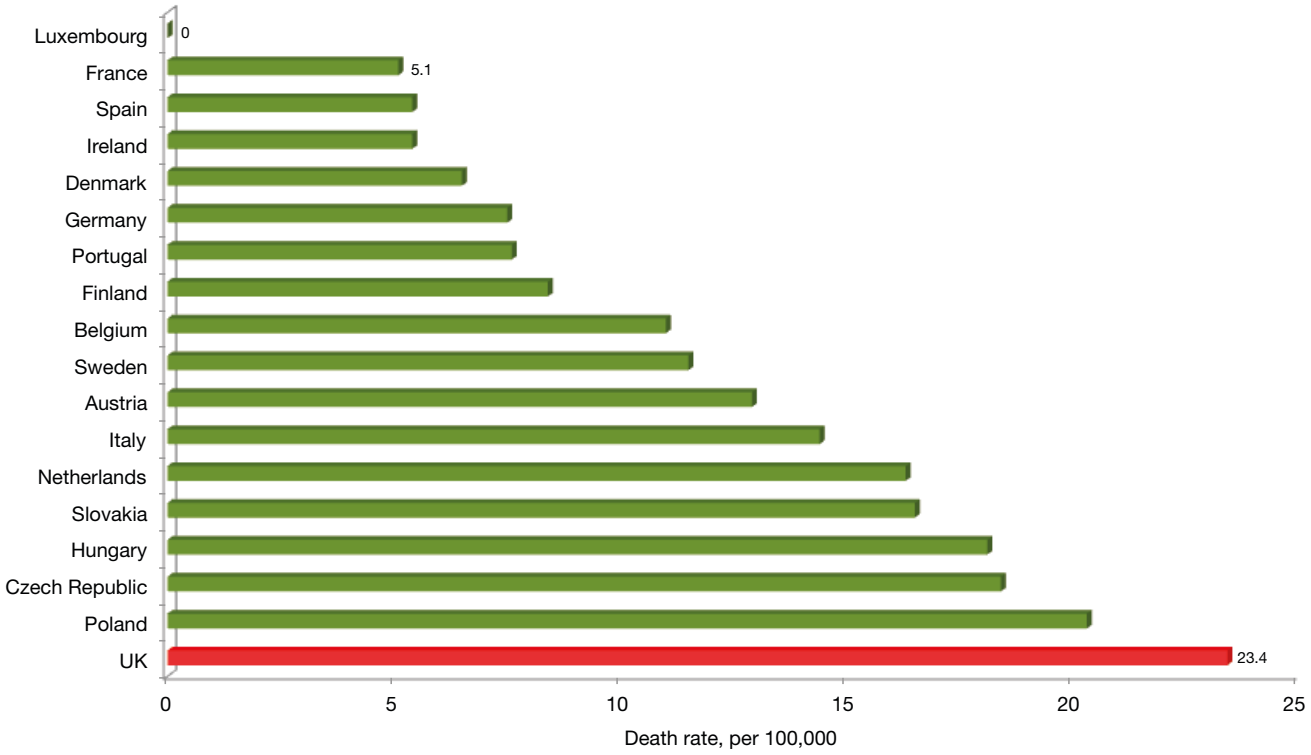
The UK has the highest rate of infant deaths by birth asphyxia, compared with other European countries (EU19) (see Figure 5).

## Congenital anomalies – congenital malformations of the heart and lung

There is some evidence that congenital causes and chromosomal abnormalities are more common among resource-constrained families and countries [55-59], although some research reports no association between SES and certain types of congenital anomalies, notably heart anomalies [60–68]. One UK-based study found that rates of mortality as a result of congenital heart anomolies were lowest in the least disadvantaged areas (4.26 deaths per 1,000 births), rising with each quintile to a rate of 12.3 in the most disadvantaged areas [55]. A US study similarly found that risk of infant death from congenital heart anomalies was associated with disadvantaged areas, maternal education and operator or labourer occupations [69]. Another study found that the risk of congenital anomalies appears to be greatest for disadvantaged households jointly defined by the socioeconomic indicators of parental education, parental occupation and household income [70].

A UK study reported a 98% higher neonatal mortality rate associated with a congenital anomaly in the most disadvantaged areas compared with the least disadvantaged [27].

*Figure 5*
*Rates of birth asphyxia, per 100,000, males and females under one year, EU19, latest ICD-10 codes (2009–2012)*




Source: European Detailed Mortality Database [2]

However, the study also found that the rate of termination after antenatal diagnosis (and there was no evidence that antenatal diagnosis varied with deprivation) was lower in the most disadvantaged areas compared with the least disadvantaged areas, resulting in socioeconomic inequalities in live-born infants with a congenital anomaly and subsequent mortality rates. There is also some evidence from the US that describes racial/ethnic disparities (notably between black and Hispanic children, compared with non-Hispanic white children) in early childhood mortality among infants with congenital heart anomalies [71].

Wide-ranging differences in antenatal congenital anomaly screening policies have been identified [293], which can affect differences between and within European countries in their antenatal diagnosis rates.

## Sudden Infant Death Syndrome (SIDS)

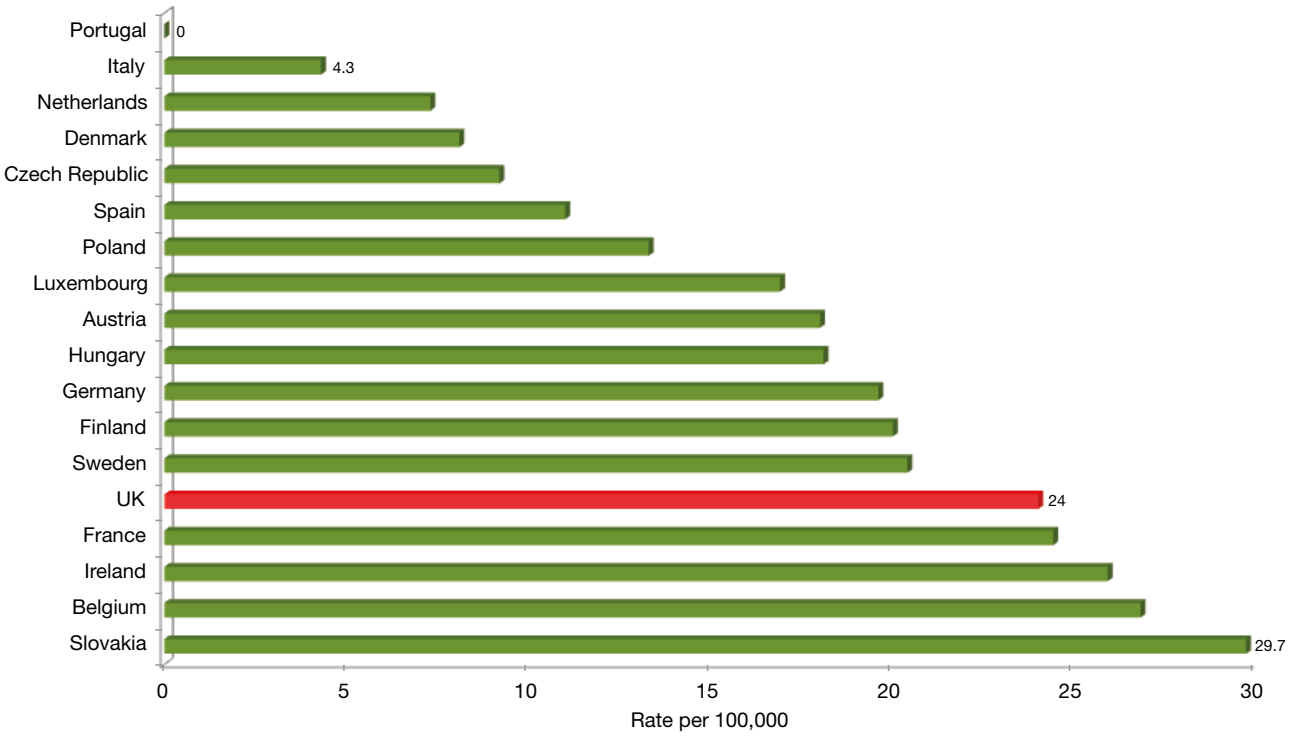
There is consistent and strong evidence of a link between individual and area social deprivation and SIDS, which holds for different measures of deprivation, including deprivation quintiles [72], areas of poverty [73], household overcrowding conditions [74], social class [75] and receipt of income support [76].

Maternal behaviour partly impacts the likelihood of a child dying from SIDS. For example, prenatal smoking is associated with a 200% higher incidence of SIDS [77], and smoking during pregnancy is higher among less advantaged groups [34], while breastfeeding, less common in less advantaged groups, is a known protective factor for SIDS [51]. For example, one study found that breastfeeding reduced the risk of SIDS by around 50% for as long as the infant is breastfed [294].

Figure 6 shows that the UK has the fifth highest rate of sudden infant death syndrome, for infants under 1, compared with other European countries (EU19).

Furthermore, a Scottish study found that rates of SIDS have declined more slowly among women from disadvantaged backgrounds compared with mothers from more advantaged backgrounds, believed to be because of slower uptake of recommended changes in infant sleeping position (placing a baby to sleep on his or her back) among mothers from disadvantaged backgrounds [78].

***Figure 6***
*Rates of sudden infant death syndrome (SIDS), per 100,000, males and females under one year, EU19, latest ICD-10 codes (2009–2012)*




Source: European Detailed Mortality Database [2]

# CHILDHOOD DEATHS

5

## Children ages 1–4

### Key messages

**CHILD DEATHS, AGES 1–4**

'Injuries and poisoning from external causes' is the leading cause of death for boys aged 1–4, whereas cancer is the leading cause for girls of the same age. A similar proportion of girls and boys aged 1–4 die of cancers and congenital anomalies, and are affected by diseases of the nervous system and the sense organs, including cerebral palsy.

Social inequalities are found to affect all of the leading causes of death among young children, including unintentional drowning and suffocation, and deaths from leukaemia and Hodgkin lymphoma. Social inequalities are attributed to differences in:

- adherence to treatment
- intake of vitamin, folate or iron supplementation
- birth weight, which is linked to negative maternal behaviours that follow a social gradient

However, further research is needed to clarify the mechanisms posited as underlying social inequalities in unintentional drowning and suffocation.

## Leading causes of childhood death, ages 1–4

### Males

Deaths between the ages of 1 and 4 years comprised 0.3% of all male premature deaths in 2010. The total number of deaths in males aged 1–4 was 306.

The leading causes of death among boys aged 1–4 are:

- injuries and poisoning from external causes (16%; 48 deaths) – including road crashes (9), unintentional drowning (8), and unintentional strangulation (6)
- Cancers (14%; 41 deaths) – the most common cancers being cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue), including Hodgkin lymphoma and leukaemia (12) and brain cancer (10)
- Congenital anomalies (congenital causes and chromosomal abnormalities) (14%; 41 deaths)

### Females

Deaths between the ages of 1 and 4 years comprised 0.3% of all female premature deaths in 2010. The total number of deaths in females aged 1–4 was 255.

The leading causes of death among girls aged 1–4 are:

- cancers (16%; 42 deaths) – the most common cancers being cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue), including Hodgkin lymphoma and leukaemia (8), and brain cancer (7)
- diseases of the nervous system and the sense organs (16%; 42 deaths) – including epilepsy (7) and cerebral palsy (6)
- congenital anomalies (congenital malformations and chromosomal abnormalities) (15%; 37 deaths)

## Social inequalities in the leading causes of childhood deaths, ages 1–4

For an overview of social inequalities in **road crashes**, please see social inequalities in the leading causes of death in young people, ages 15–19, and for **congenital anomalies**, please see previous section – social inequalities in the leading causes of infant deaths.

## Unintentional drowning and strangulation

Research has found that in England and Wales, children (aged 0–4) of parents who have either never worked or who are long-term unemployed are 3.9 times more at risk of death by drowning than children in the managerial/professional class [79]. And children in the routine/manual class are 1.7 times more at risk than more advantaged children [79]. US research has also identified racial and ethnic disparities in both drowning death rates and basic swimming skills, with the highest drowning death rates among American Indian/Alaska native children at 2.57 per 100,000, compared with 1.9 for black children, 1.37 for Hispanic children and 1.32 for white children [80]. In the UK, the rate of unintentional drowning and strangulation (children aged 1-4 years) is 0.7 per 100,000 (see Figure 7).

A socioeconomic gradient has also been identified for risk of unintentional suffocation. Infants and children aged 0–1 and 1–4 whose parents have never worked or who are long-term unemployed are 13.6 and 8.6 times more at risk, respectively, of death as a result of unintentional strangulation than children whose parents are allocated to the managerial/professional class [79].

US research has similarly reported an increased risk of unintentional infant suffocation and strangulation in bed for children of mothers who are younger, of lower educational attainment and who smoke during pregnancy. Racial disparities have also been identified, with non-Hispanic blacks and American Indians associated with a higher incidence of unintentional suffocation/strangulation than non-Hispanic whites [81].

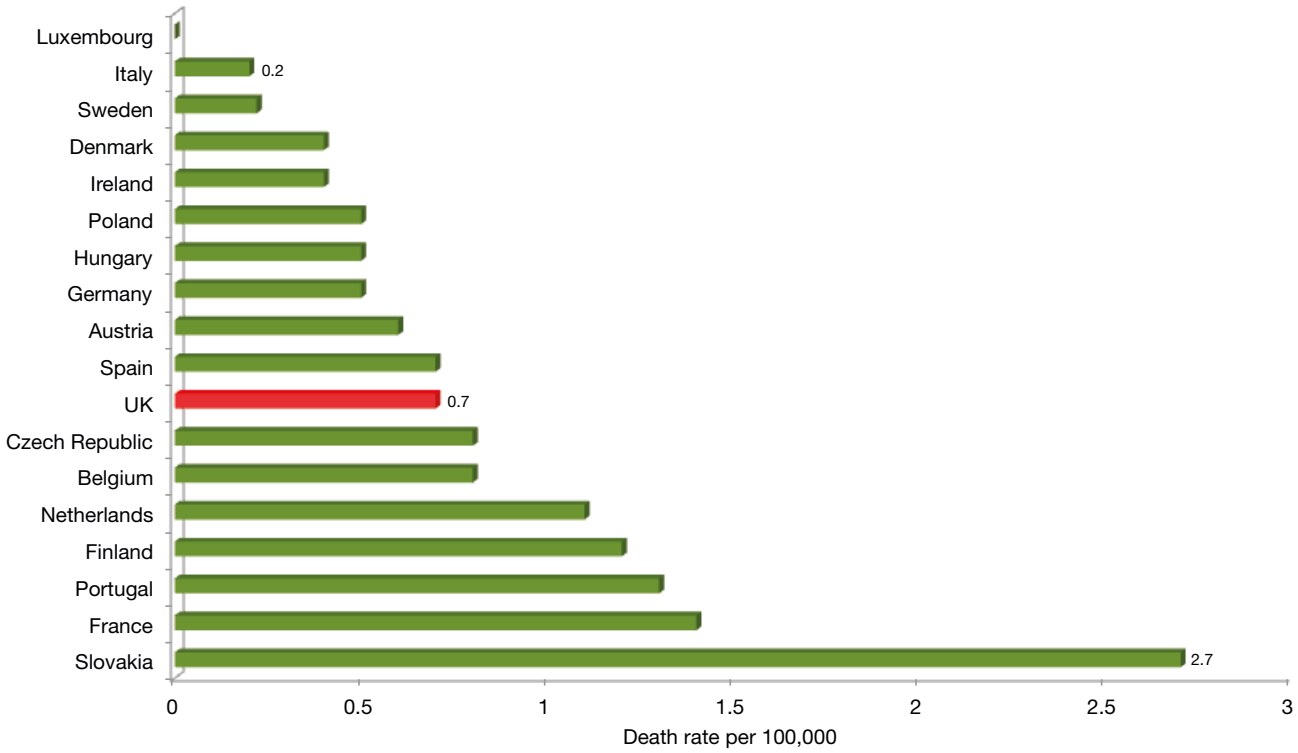
Further research is needed, however, to clarify the mechanisms underlying these socioeconomic differences.

## Cancers in childhood – leukaemia and Hodgkin lymphoma

A study examining socioeconomic variation in survival from leukaemia in Northern England, 1968–2010, found that even after adjusting for potential confounders (including diagnostic type and white blood cell count), children in the lowest social class group had a 96% higher mortality risk compared with children in families in the highest social class. Inequalities in cancer survival rates among children are thought to be explained by a number of intervening factors. Stage at diagnosis has been found to be the most important factor in adult cancer survival, affected by delays in health-seeking behaviour and provision of health care [82]. A social gradient in stage at diagnosis is evident [82].

The rate of leukaemia and Hodgkin lymphoma in the UK (children aged 1-4 years) is 0.7 per 100,000 (see Figure 8).

***Figure 7***
*Rates of unintentional drowning and strangulation, per 100,000, males and females, 1–4 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB [2]

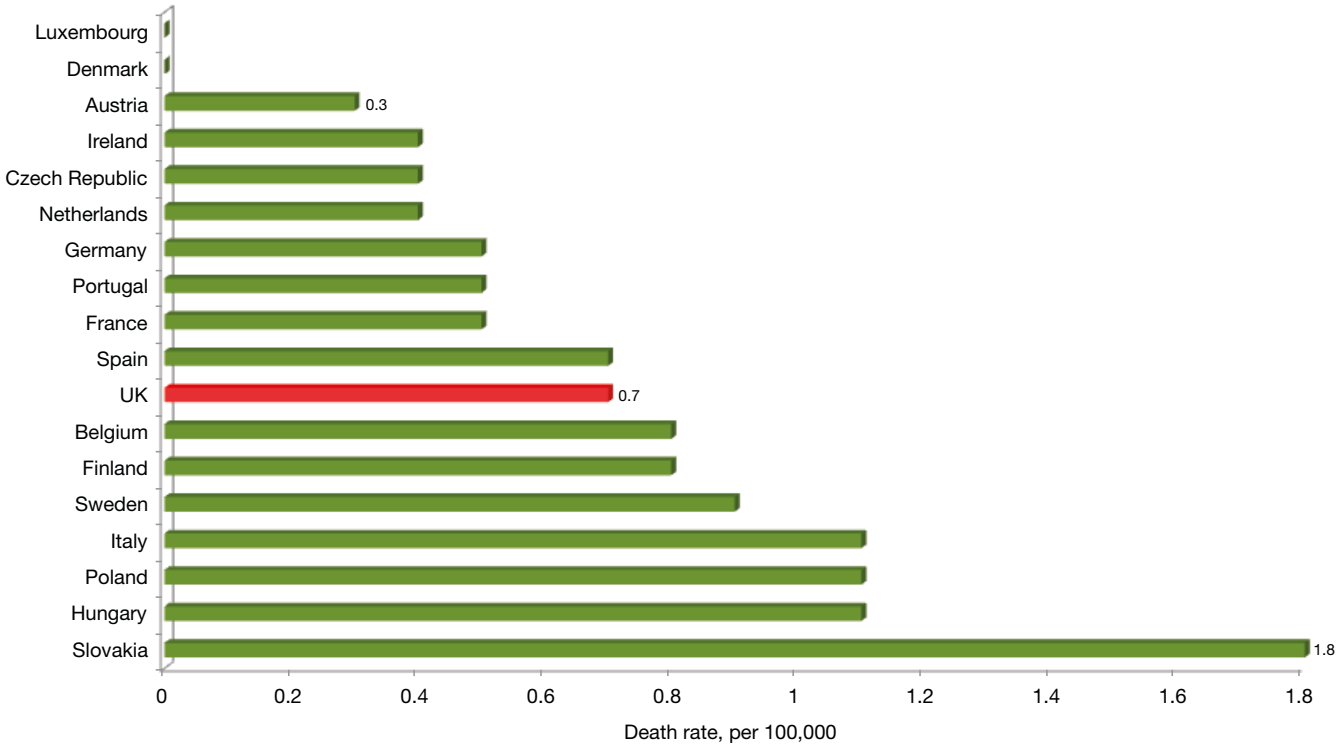
For children, white blood cell count is often used as a proxy for disease stage. However, the above study did not find an association between white blood cell count and socioeconomic position. Instead, wider disparities seen in 5- and 10-year survival, compared with 1-year survival, suggests that non-adherence to treatment may be a more important factor than diagnostic delay [82, 83]. Unintentional non-adherence is far more common than intentional non-adherence, and although such patterns increase with age, they are also found among young cancer patients [84, 85] and patients from disadvantaged socioeconomic backgrounds [86]. Research has also found that short- and long-term breastfeeding reduces the risk of childhood acute lymphoblastic leukaemia (ALL) and acute myeloblastic leukaemia (AML) [295], but breastfeeding follows a social gradient [296].

These findings of higher survival among the more advantaged social groups are consistent with the findings of another large follow-up study using data from the UK Childhood Cancer Study, which found that overall, children whose fathers were recorded on their birth certificate as being in semi-skilled/unskilled occupations were at a greater risk of dying (1.12, 0.97–1.29) than children whose fathers were registered at the time of their birth as being in professional or managerial occupations [87].

However, other studies have found either no [88, 89] or weak [90] associations between cancer survival and socioeconomic position, indicating that further research is necessary to understand the factors underlying disparities in childhood cancer survival, where these have been identified.

There is limited evidence on social inequalities in Hodgkin lymphoma survival. However, some research suggests that vitamin, folate or iron supplementation is associated with a reduced risk of non-Hodgkin lymphoma and tumours and, less clearly, with leukaemia [91], yet poor folic acid uptake just before and during pregnancy has been associated with lower socioeconomic status, minority ethnicity status and unintentional pregnancy [92].

*Figure 8*
*Rates of leukaemia and Hodgkin lymphoma, per 100,000, males and females, 1–4 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB [2]

## Children ages 5–9

### Key messages

**CHILD DEATHS, AGES 5–9**

Cancer is the leading cause of death for both girls and boys aged 5–9 years, causing around one in four of all deaths at this age. Brain cancer is the form of cancer that kills the most children in this age group. As with boys aged 1–4, deaths by injury and poisoning from external causes cause more deaths in this age group for boys than girls, whereas deaths resulting from congenital anomalies are the second most common cause of death for girls in this age group.

There is limited evidence on social inequalities in brain cancers in children and young people. However, as with Hodgkin lymphoma, some research suggests that folic acid supplements taken before and possibly during pregnancy may protect against childhood brain tumours.

Research reveals deep socioeconomic inequalities in rates of child homicide. The association between poverty, child maltreatment and homicide is most commonly explained by stress factors linked to unemployment, low income and depleted resilience, including social isolation, mental ill health, domestic abuse and substance misuse.

## Leading causes of childhood death, ages 5–9

### Males

Deaths between the ages of 5 and 9 years comprised 0.16% of all male premature deaths in 2010. The total number of deaths in males aged 5–9 was 181.

The leading causes of death among boys aged 5–9 are:

- cancers (24%; 44 deaths) – the most common cancers being brain cancer (23 deaths), and cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue) (6 deaths)
- injuries and poisoning from external causes (18.8%; 34 deaths) – including road crashes (15 deaths), unintentional drowning (4 deaths), and homicide and assault (3 deaths)
- diseases of the nervous system and the sense organs (15%; 27 deaths) – including cerebral palsy (11 deaths) and epilepsy (6 deaths)

### Females

Deaths between the ages of 5 and 9 years comprised just under 0.2% of all female premature deaths in 2010. The total number of deaths in females aged 5–9 was 145.

The leading causes of death among girls aged 5–9 are:

- cancers (26%; 37 deaths) – the most common cancers being brain cancer (11 deaths) and cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue) (9 deaths)
- congenital anomalies (congenital causes and chromosomal abnormalities) (15%; 22 deaths), the leading cause being congenital malformations of the heart (5 deaths)
- diseases of the respiratory system (13%; 19 deaths)

## Social inequalities in the leading causes of death in children ages 5–9

### Cancers – brain cancers

There is limited evidence on social inequalities in brain cancers in children and young people. The SEARCH collaborative study of brain tumours in children and young people found that use of anaesthetic ‘gas’ was associated with an increased risk of childhood brain tumours (CBT) (odds ratio = 1.5, 95% confidence interval [1.1, 2.0]), but no other part of the pregnancy, delivery and early neonatal period or of the mother’s previous reproductive history was associated with risk for childhood brain tumours [97].

As with non-Hodgkin lymphoma, some research suggests that folic acid supplements taken before and possibly during pregnancy may protect against brain tumours in children and young people [98]. Furthermore, as previously noted, poor folic acid uptake has been linked with lower socioeconomic status, minority ethnic status and unintentional pregnancy [92].

## Child homicide and assault

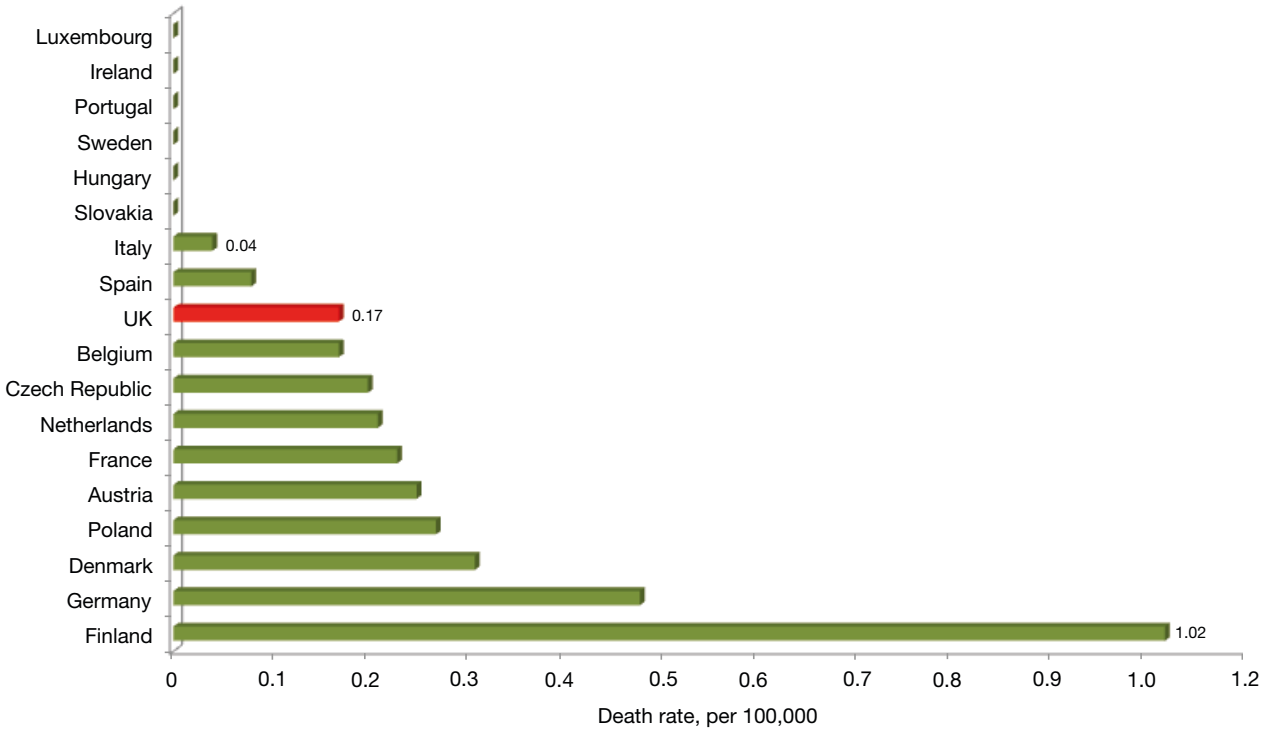
International research reveals deep socioeconomic inequalities in rates of child homicide [99, 100]. For example, a US study found a link between being from an area with a low median income and higher rates of mortality after intentional trauma [101].

Although the majority of parents from disadvantaged backgrounds do not maltreat their children, and child maltreatment occurs across all socioeconomic groups, there is evidence that being in a lower socioeconomic group is associated with a more significant level and rate of abuse [102, 103], while other studies have found that children who live in the most disadvantaged neighbourhoods have a ten times greater chance of being subject to a child protection plan and an eleven-fold greater chance of being taken into care than children in the least disadvantaged areas [104]. Figure 9 shows that the UK has a death rate of 0.17 per 100,000 for homicide and assault of children aged 5-9 years. Finland has the highest rate of homicide and assault for this age group (1.02) compared with other European countries (EU19). This may be linked to Finland's high rates for both suicide and self-harm (young people aged 15–19 years – see Figure 10 – and 20–34 years – see Figure 12), and alcoholic liver disease (females aged 35-64 years, see Figure 16). Both suicide and homicide rates have been linked to levels of alcohol consumption and heavy drinking in Finland [312–314].

The association between poverty, child maltreatment and homicide is 'circular and interdependent as opposed to linear and causal'[105] and is most commonly explained by stress factors linked to unemployment, low income and depleted resilience associated with, for example, social isolation, mental ill health, domestic abuse and substance misuse [102, 106]. For example, parents with a low income are four times more likely to feel 'chronically stressed' than parents with higher incomes [107]. An unsafe environment and the impact of parental stress have also been found to be factors in a number of serious case reviews [108], and for children subject to child protection plans [8]. High population density is associated with higher numbers of homicides [8].

Children from black and mixed ethnic backgrounds are disproportionately over-represented on child protection registers, in the care system and in children in need statistics. This is believed to be because of a variety of issues including racial discrimination, language barriers and inadequate or inappropriate services [109]. However, socio-demographic characteristics including parental education and total family income, are thought to largely explain the ethnic differences in the overall risk of child maltreatment except for children of mixed race [110].

***Figure 9***
*Rates of homicide and assault, per 100,000, males and females, 5–9 years, EU19*




Source: DMDB [2]

# DEATHS AMONG YOUNG PEOPLE

6

## Young people, ages 10–14

### KEY MESSAGES

**DEATHS AMONG YOUNG PEOPLE, AGES 10–14**

More than twice as many boys as girls die from external causes (particularly road crashes and unintentional drowning) between the ages of 10 and 14. Cancer is the leading cause of death for a slightly larger proportion of girls than boys – particularly brain cancer and cancer of the blood, bone marrow and lymph nodes. Diseases of the nervous system become one of the leading causes of death for both girls and boys by the time they reach the ages of 10–14. Epilepsy and cerebral palsy are also one of the leading causes of death for both males and females.

There is evidence of social inequalities in epilepsy and cerebral palsy, attributed in differences in short gestation and low birth weight, and infections during pregnancy. Variations in emergency admission rates, believed to be because of differences in the availability of community-based support, effective ongoing management of conditions and thresholds for seeking admission, contribute to social inequalities.

## Cerebral palsy

Risk factors for cerebral palsy include low birth weight, premature birth and infections during pregnancy. Birth weight, prematurity and cerebral palsy are therefore closely linked outcomes [93], so we would expect social inequalities in short gestation and low birth weight to be the same as for cerebral palsy. Associations between cerebral palsy and area deprivation have been identified, although the effect of area deprivation is believed to act largely through low birth weight [94, 95]. For example, a UK-based study found a prevalence of cerebral palsy 1.5–1.6 times higher in the most disadvantaged areas compared with the most affluent[96]. The same study estimated that up to 17% of cerebral palsy cases might be preventable in terms of the reduction to be expected if the whole population had the same 'health experience' of the most advantaged in society [96].

## Leading causes of deaths in young people, ages 10–14

### Males

Deaths in males between the ages of 10–14 years comprised just under 0.2% of all male premature deaths in 2010. The total number of deaths in males aged 10–14 was 198.

The leading causes of death among boys aged 10–14 are:

- injuries and poisoning from external causes (31%; 61 deaths) – including road crashes (23 deaths) and unintentional drowning (6)
- cancers (22%; 44 deaths) – the most common cancers being cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue) (14 deaths), and brain cancer (13 deaths)
- diseases of the nervous system and the sense organs (15%; 29 deaths) – including epilepsy (9) and cerebral palsy (5)

### Females

Deaths in females between the ages of 10–14 years comprised just under 0.2% of all female premature deaths in 2010. The total number of deaths in females aged 10–14 was 169.

The leading causes of death among girls aged 10–14 are:

- cancers (27%; 45 deaths) – the most common cancers being brain cancer (16 deaths), and cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue) (11 deaths)
- injuries and poisoning from external causes (18%; 30 deaths) – including road crashes (11 deaths), and unintentional drowning (3)
- diseases of the nervous system and the sense organs (16%; 27 deaths) – including cerebral palsy (10) and epilepsy (4)

## Epilepsy

Epilepsy is more common in socioeconomically disadvantaged populations. There are also variations in emergency admission rates for children with epilepsy, believed to be because of differences in the availability of community-based support, effective ongoing management of seizures, and thresholds for seeking admission and deciding to admit a child [282.

## Young people, ages 15–19

### KEY MESSAGES

**DEATHS AMONG YOUNG PEOPLE, AGES 15–19**

External causes of death are now the leading cause of death for both girls and boys. Between the ages of 15–19, there is evidence of a rapid increase in the number of deaths attributed to road crashes, suicide and self-harm – although compared with the other EU19 countries, the UK has relatively low rates of death from these external causes. Although the leading causes of death for both males and females aged 15–19 are similar, a significantly higher proportion of boys aged 15–19 (three fifths) die from injuries and poisoning from external causes than girls (two-fifths).

The socioeconomic gradient in the leading causes of death for young people aged 15–19 is attributed to differences in relation to:

- housing conditions
- housing density with high levels of on-street parking
- proximity to high volumes of traffic
- exposure to hazardous and illegal driving
- parental mental health, employment, income, education/skills and relationship status

## Leading causes of deaths in young people, ages 15–19

### Males

Deaths in males between the ages of 15–19 years comprised 0.7% of all male premature deaths in 2010. The total number of deaths in males aged 15–19 was 741.

The leading causes of death among males aged 15–19 are:

- injuries and poisoning from external causes (60%; 445 deaths) – including road crashes (184 deaths), suicide and intentional self-harm (89 deaths)
- cancers (11%; 79 deaths) – the most common cancer being cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue) (28 deaths)
- diseases of the nervous system and the sense organs (9%; 66 deaths) – including primary disorders of muscles (23), epilepsy (20) and cerebral palsy (14)

### Females

Deaths in females between the ages of 15–19 years comprised 0.5% of all female premature deaths in 2010. The total number of deaths in females aged 15–19 was 412.

The leading causes of death among females aged 15–19 are:

- injuries and poisoning from external causes (39%; 162 deaths) – including road crashes (57 deaths), suicide and intentional self-harm (39 deaths)
- cancers (17%; 70 deaths) – the most common cancer being cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue) (21 deaths)
- diseases of the nervous system and the sense organs (10%; 40 deaths) – including epilepsy (17), and cerebral palsy (8)

## Social inequalities in the leading causes of death in young people, ages 15–19

Behaviours such as smoking, alcohol misuse, drug misuse, poor diet and physical inactivity are thought to contribute to substantial morbidity and mortality throughout the life course. These behaviours are often initiated during adolescence, increasing during the teenage years and into adulthood [111, 112].

## Road crashes

The death rate for road crashes is known to increase with socioeconomic disadvantage [113]. For example, the Child Accident Prevention Trust found disproportionate rates of road crashes among children and young people in disadvantaged areas [114]. Similarly, the Office for National Statistics (ONS) found that young people aged 15, whose parents were in the managerial and professional class were 3.6 times less likely to die as a result of transport crashes than young people whose parents had never worked or who were long-term unemployed [79]. A Swedish study also found particularly marked social patterning for severe injuries and fatalities as a result of car crashes among young people from disadvantaged socioeconomic backgrounds [115].

The below Figure 10 shows rates of death by transport crashes for young people aged 10-14 and 15-19 (combined). Compared with other European countries (EU19), the UK has the sixth lowest rate (3.7 per 100,000). Lower rates in Spain, the Netherlands, Sweden, Portugal and Denmark, however, show that a considerable number of deaths can be prevented each year.

Children and young people in disadvantaged communities appear to be at greater risk of road injury because they often live in more hazardous environments with high density housing, close proximity to high volumes of traffic (often travelling above the NICE recommended 20mph in zones where people live, shop and work [297], and high levels of on-street parking [8]. Children from disadvantaged backgrounds are also more likely to be living in poor quality, overcrowded housing [116]. BAME groups are around six times more likely than non BAME groups to be living in overcrowded households [117]. All of these children have fewer alternatives to the street as a place to socialise and play outside the home, and are more likely to walk and have less access to safe play spaces and supervised facilities, so have higher exposure to traffic risk [118]. They also live in environments with greater levels of hazardous and illegal driving behaviour, with an absence of consistent, visible enforcement [118].

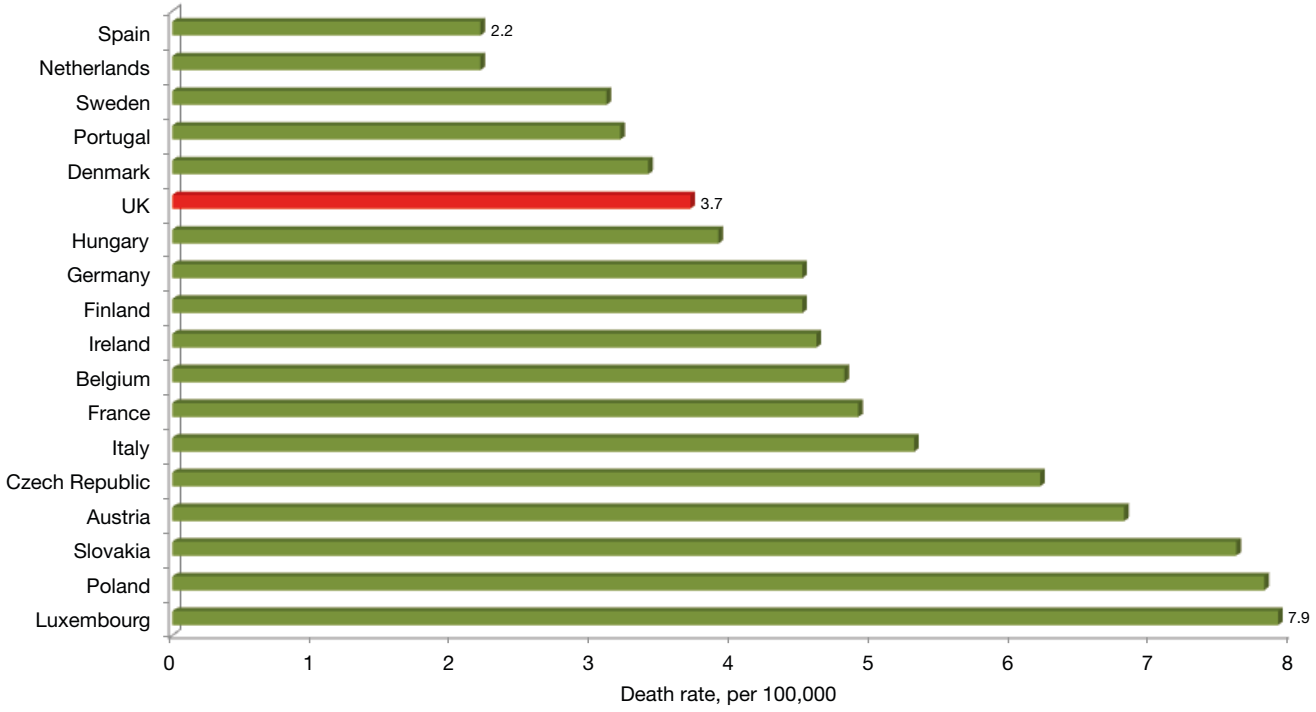
## Suicide and intentional self-harm

Suicide is one of the leading causes of death for both young males and females, although it is more common among boys. Young people in more disadvantaged areas are also more likely to commit suicide than those in more affluent areas [119], with the social gradient most marked among males [49]. The UK's death rate for suicide and intentional self-harm (young people aged 15-19 years) is 3.3 per 100,000 (see Figure 11). Although the UK has the fourth lowest death rate compared with other European countries (EU19) for this age group, many lives could be saved each year if the UK had the mortality rate seen in Portugal, Italy and Spain.

### Parental factors

Studies have identified a number of parental factors associated with an increased risk of suicide in young people,

*Figure 10*
*Rates of death by transport crashes, per 100,000, males and females, 10–19 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB [2]

including parental suicide or early death, admission to hospital for a mental illness, unemployment, low income, low education/skills and divorce [120].

There is a social gradient in many of these factors. For example, those in more disadvantaged socioeconomic positions are more likely to be unemployed with a loss of regular income than those in more advantaged positions [121] and the material and psychosocial impacts of low income may contribute to the link between unemployment and poor health [121]. Inequalities in educational outcomes also mirror those for health and are subject to a similar social gradient [12]. Additionally, unemployment and recessions, particularly dips in the housing market, may be associated with family instability, which may lead to family breakdown [122].

### Individual characteristics

Mental illness in siblings, and mental illness and dropping out of school in the young people themselves, as well as personal vulnerabilities and exposure to stressful life events and circumstances [124], are also associated with increased risk of suicide [120][123]. Although suicidal ideation and behaviours in young people appear to be a consequence of interplay between multiple parental, family and individual risk factors [123], as illustrated above, the strongest risk factor for suicide among young people is mental illness in the young people themselves [120].

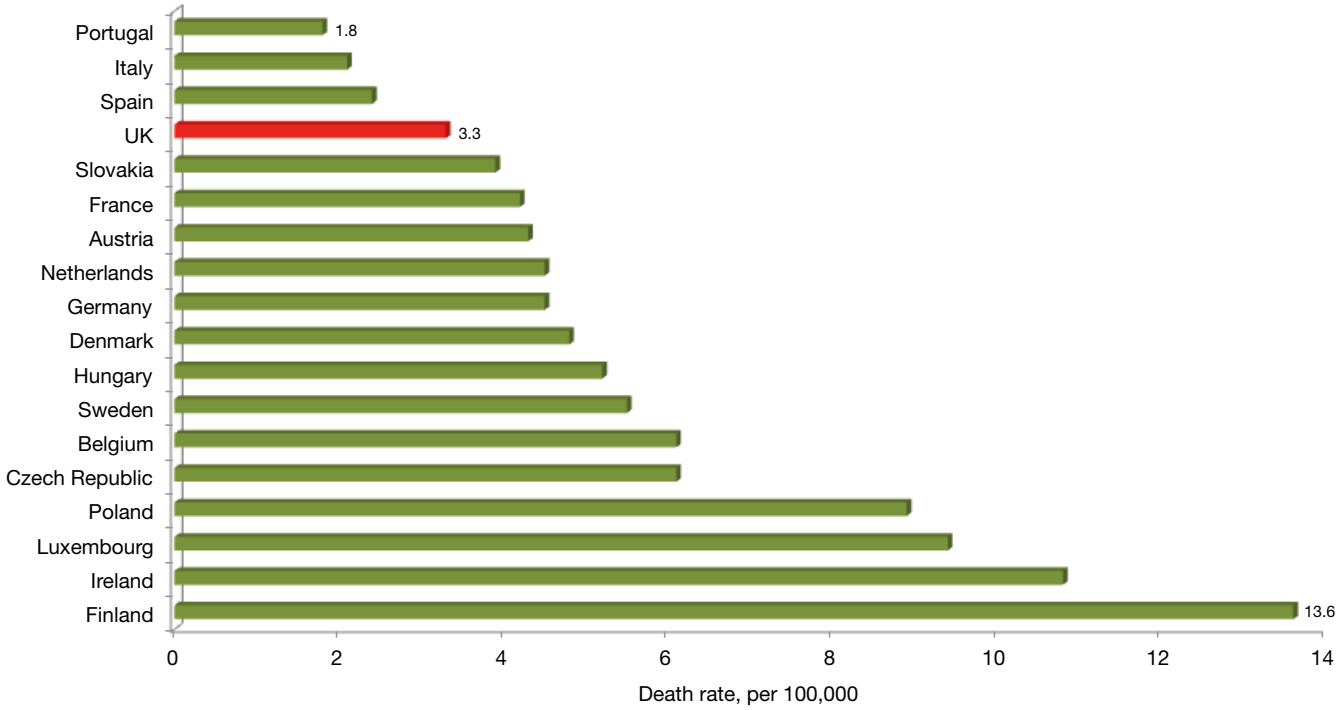
### Inequalities in adolescent mental health

Some vulnerable children and groups of children have an increased risk of mental health problems because of the accumulation of risk in their early experiences.

A systematic review of socioeconomic inequalities and mental health problems found that socioeconomically disadvantaged children and young people are two to three times more likely to develop mental health problems [124]. Entrenched lower socioeconomic position is strongly related to higher rates of mental health problems [124]. For example, some studies have found that overcrowded housing conditions, independent of household income, are associated with children's poor mental health [125]. Furthermore, mothers who suffer from depression have a greater risk of having a child with low birth weight, and low birth weight is itself a risk factor for depression in later life [40].

There is also some evidence that ethnicity is linked to mental health status. For example, ONS findings suggest that Indian children have a relatively low rate of mental disorder (3%, compared with 7–10% in other groups) [126]. However, findings on the prevalence of mental health disorders in children among minority ethnic groups are often contradictory and based on small-scale studies, so generalising results is challenging [127]. Refugee and asylum-seeking children [128], looked-after children [129], and gay, lesbian and bisexual young people [130-132] are also at increased risk of poor mental health.

*Figure 11*
*Rates of death by suicide and intentional self-harm, per 100,000, males and females, 10–19 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB [2]

# DEATHS AMONG YOUNG ADULTS, AGES 20–34

7

## Young adults ages 20–34

### KEY MESSAGES

**DEATHS AMONG YOUNG ADULTS, AGES 20–34**

Suicide and intentional self-harm (grouped together by Eurostat) is the leading cause of death for both men and women aged 20–34. The UK has the sixth lowest suicide and self-harm mortality rate (for this age group) compared with other European countries (EU19) (see Figure 13).

Although transport deaths are another leading specific cause of death by external causes, they cause more deaths among young men (around 11%) than young women (around 6%). Cancer is another leading cause of death for both young men and women. However, whereas brain cancer and cancer of the blood, bone marrow and lymph nodes continue to be the forms of cancer responsible for the most deaths among young men, cervical cancer and breast cancer emerge as different forms of cancer most likely to kill young women. Compared with other European countries (EU19), the UK has the fourth highest cervical cancer mortality rate for this age group (see Figure 14).

Social inequalities are found in the leading causes of death among young adults. The mechanisms suggested as underlying these social inequalities include social differences in:

- unemployment
- work quality
- perceived acculturation
- mental health and self-harm rates
- exposure to adverse experiences in childhood
- health risk behaviours including smoking, alcohol and drug misuse, and risky sexual behaviour
- use of preventive services
- shift work

## Leading causes of deaths among young adults

### Males

Deaths in males between the ages of 20–34 years comprised just over 4% of all male premature deaths in 2010. The total number of deaths in males aged 20–34 was 4,674.

The leading causes of death among men aged 20–34 are:

- injuries and poisoning from external causes (53%; 2,492 deaths). Suicide and intentional self-harm is the most common cause of death within this category (767 deaths), followed by road crashes (503 deaths)
- cancers (10%; 463 deaths) – the most common cancers being cancer of the blood, bone marrow and lymph nodes (lymph/haematopoietic tissue) (109 deaths), and brain cancer (69 deaths)
- diseases of the circulatory system (9%; 398 deaths), including heart muscle disease (cardiomyopathy) (57 deaths), heart attack (51 deaths) and coronary heart disease (48 deaths), which fall under the umbrella term cardiovascular disease (CVD).

### Females

Deaths in females between the ages of 20–34 years comprised around 2.7% of all female premature deaths in 2010. The total number of deaths in females aged 20–34 was 2,069.

The leading causes of death among women aged 20–34 are:

- injuries and poisoning from external causes (31%; 648 deaths). Suicide and intentional self-harm is the most common cause of death within this category (200 deaths), followed by road crashes (124 deaths)
- cancers (10%; 463 deaths) – the most common cancers among women aged 20–34 being cervical cancer (69 deaths), breast cancer (57 deaths) and cancer of the blood, bone marrow and lymph nodes (57 deaths)
- diseases of the circulatory system (9%; 398 deaths), the leading causes being heart muscle disease (cardiomyopathy) (27 deaths) and bleeding on the brain (subarachnoid haemorrhage) (27), which fall under the umbrella term cardiovascular disease (CVD)

## Social inequalities in the leading causes of death among young adults

### Suicide and intentional self-harm among adults

An overview of social inequalities in suicide and intentional self-harm was presented for young people aged 15–19 years earlier in this review. However, additional findings from research are presented here as suicide and self-harm is by far the leading cause of death for both young women and men aged 20–34 years, exceeding other disease or related cause-specific deaths.

The causes of young adult suicide are complex and multidimensional, involving a range of individual (proximal) and more distal factors (see Figure 12). Research has shown that many people who die by suicide have a mental illness, most commonly depression, or an alcohol problem. Vulnerability to mental health issues and suicide is also thought to be influenced by, among other factors: childhood abuse or neglect; drug or alcohol misuse; poor quality work; unemployment; relationships – including social isolation; and genetics or family history (see Figure 12) [133]. Suicide is thus largely preventable [134] and there is strong evidence that many mental health conditions originate in the early years but do not emerge until later in life [135]. Indeed, it is known from research studies that around half of adult mental disorders have started by adolescence [136].

Individual and distal factors, such as childhood abuse and childhood socioeconomic position, accumulate and combine with other factors in early adulthood such as job and financial losses, to have both a direct and indirect effect on health, behaviour and lifestyle. For example, some studies have shown that suicide attempts in later life are associated with both sexual and emotional abuse [137-139]. There is evidence too from European studies that social circumstances around the time of birth, including young maternal age, lower socioeconomic position and single motherhood are associated with an increased risk of suicide [140-144]. There is thus evidence in the literature of social inequalities in mental health, linked to gender, ethnicity and socioeconomic position.

#### Socioeconomic factors

People in the lowest social class living in the most disadvantaged areas of Scotland have up to a ten-fold greater risk of suicide than those in the highest social class in the most affluent areas [145]. The experience of multiple types of stressful life events – more often experienced by less advantaged social groups [146] – is a key driver of suicidal behaviour among those who have contemplated suicide [147].

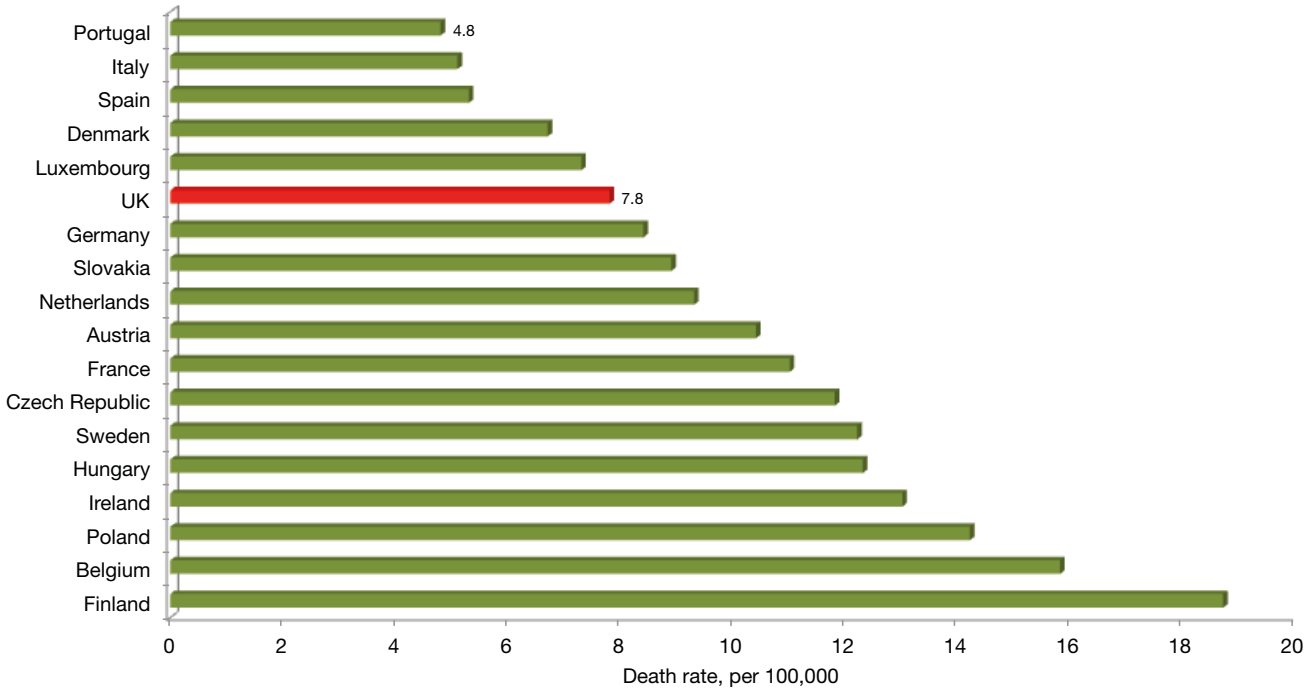
There is a well-established link between unemployment and suicide. Unemployment rates for young adults in the UK and Europe have risen sharply since the recession [148]. There is evidence linking the increase in suicide in England with the financial crisis that began in 2008 [298]. A systematic review found that long-term unemployment is also associated with an almost two-fold greater incidence of suicide (1.70, 95% confidence interval [CI] 1.22 to 2.18)[150].

***Figure 12***
*Risk factors (non-exhaustive) for suicide*

| Individual | Socio-cultural | Situational |
|---|---|---|
| Previous suicide attempt | Stigma associated with help-seeking behaviour | Job and financial losses |
| Mental disorder | Barrier to accessing health care, especially mental health and substance abuse treatment | Relational or social losses |
| Alcohol or drug abuse | Certain cultural and religious beliefs (for instance, the beleif that suicide is a noble resolution to a personal dilemma) | Easy access to lethal means |
| Hoplessness | Exposure to suicidal behaviours, including through the media, and influence of others who have died by suicide | Local clusters of suicide that have a contagious influence |
| Sense of isolation | | Stressful life events |
| Lack of social support | | |
| Aggressive tendencies | | |
| Impulsivity | | |
| History of trauma or abuse | | |
| Acute emotional distress | | |
| Major physical or chronic illnesses, including chronic pain | | |
| Family history of suicide | | |
| Neurobiological factors | | |

Source: WHO (2012) Public Health Action for the Prevention of Suicide [134]

*Figure 13*
*Rates of death by suicide and intentional self-harm, per 100,000, males and females, 20–34 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB

A recent population-based study of young adults in Australia found that involuntary job loss was associated with an almost two-fold increased risk of suicide and attempted suicide (2.12, 5% CI 1.24 to 3.61). However, the strength of this association was reduced when the results were adjusted for socioeconomic position and mental disorders (a 1.82 times increased risk – 1.82, 95% CI 0.98 to 3.37), indicating that these factors have a stronger influence on suicide than job loss. After adjustment for these individual and distal factors, diagnosis of a mental disorder was associated with a more than seven-fold increase in suicide and attempted suicide (7.87, 95% CI 5.16 to 12.01) and those in the least advantaged social groups had an almost four times greater risk for suicide and attempted suicide than the most advantaged groups [151].

Another recent Australian study found that socioeconomic status (income and education level) and mental disorders are risk factors for suicide, and have similar sized impacts (45.1% and 48.4% for males, and 58.1% and 52.3% for females, respectively) [152].

An episode of self-harm (intentional self-poisoning or self-injury) is the most important indicator of suicide risk [153]. For example, Hawton and colleagues reported that the risk of suicide in the first year following self-harm was 49 times greater than the general population risk of suicide in England and Wales [154]. Previous research has found that rates of self-harm are highest among those currently outside the labour market [155].

Insecure employment with poor wages and a lack of job protection disproportionately affects some minority ethnic groups and people from disadvantaged socioeconomic backgrounds, US research finds [156]. Additionally, a study based on the Korean Community Health Survey found that precarious work is associated with a 1.5 times higher risk of suicide attempts than more secure and better paid work (1.52, 95% CI 1.02 to 2.27) [157]. Additionally, a Swedish study found that unemployment and financial strain were associated with a two- to threefold elevated risk of suicide attempts for both males and females [158].

## Gender differences

In 2010, based on DMDB data, 16.4% of all young adult male deaths were attributed to suicide or self-harm, compared with 9.7% of all young female deaths. Young men are thus more likely than young women to end their own lives.

This is believed to be because of issues of masculinity. For example, loss of power, independence, efficiency, success and control, due to, for example, unemployment [159-162] or relationship breakdown, can result in depression, anxiety or feelings of being unable to cope [163]. Men are also more likely to use substances to cope with difficulties rather than turn to their friends or families for support and be open with their emotions [164]. Furthermore, a recent systematic review of the association between social relationships and depression found significant protective effects of perceived emotional and instrumental (tangible/physical) support, and having large, diverse social networks [165].

### Ethnicity and cultural factors

A Swedish study found that immigrating, particularly from outside Europe, is associated with increased suicide risk. First generation non-European female immigrants have a more than threefold elevated risk of suicide attempts compared with the general population (3.35, 95% CI 2.52 to 4.45) [158]. This is in comparison to an almost 1.5 times greater risk of suicide for European female immigrants (1.43, 95% CI 0.88 to 2.31), and a 1.37 times increased risk for non-EU first generation male immigrants (1.37, 95% CI 0.88 to 2.31) [158].

A US study also found that greater perceived acculturation (defined in the study as 'the degree to which ethnic-cultural minorities engage in the customs, tenets, principles and behaviours of their own culture versus the dominant'), is associated with a 1.06 to 1.07 increased risk of suicidal ideation (but not suicide attempts) [166].

## Cancers in young adults – cervical cancer

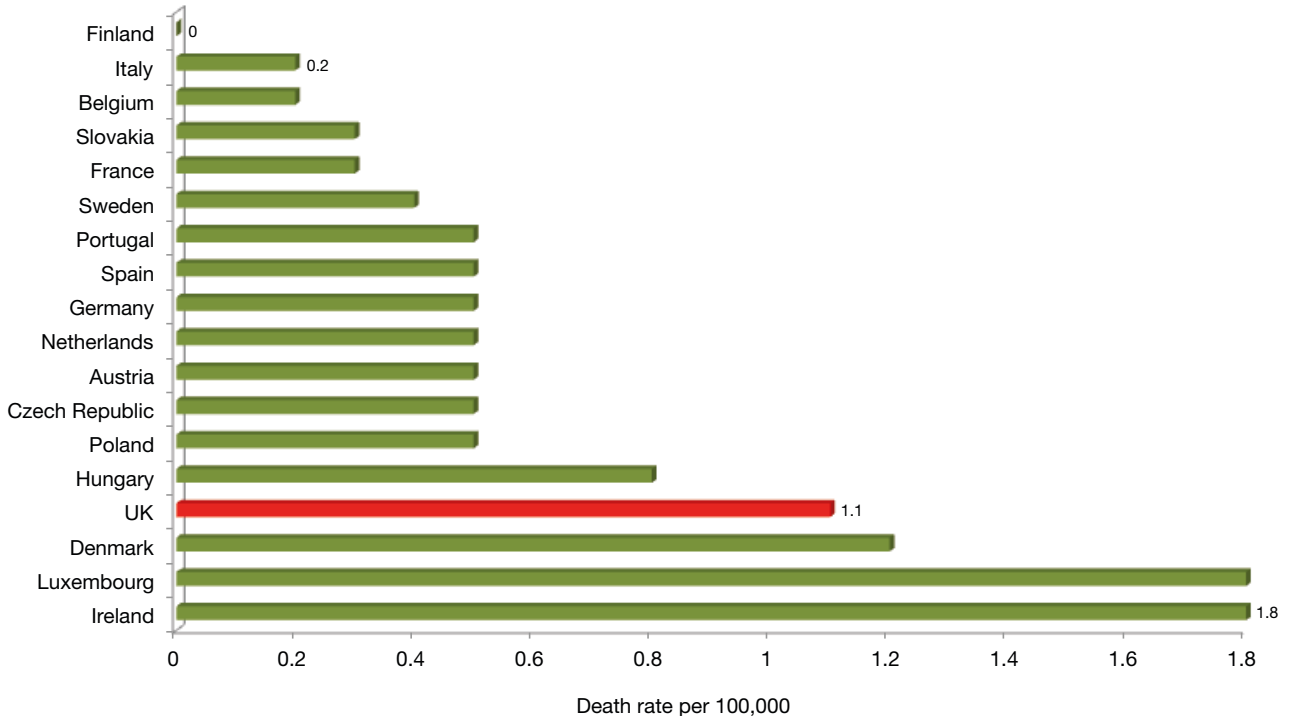
Virtually all cervical cancers in the UK are linked to Human Papillomavirus (HPV) infection – a necessary cause of cervical cancer [167]. HPV is most commonly transmitted through sexual contact and most people become infected with HPV after becoming sexually active. Although the majority of HPV infections do not cause symptoms or cancer, persistent infection with certain types of HPV may progress to cervical cancer years later if left untreated. Becoming sexually active at a young age, having multiple sexual partners and smoking are risk factors for HPV persistence and subsequent development of cervical cancer [168].

Smoking tobacco is classified by the International Agency for Research on Cancer (IARC) as a cause of cervical cancer [167]. Cervical squamous cell carcinoma risk is 1.5 times higher in current smokers than in people who have never smoked [169]. Smoking increases the progression of cancer in HPV-infected cells [169]. An estimated 7% of cervical cancers in the UK are thought to be linked to smoking [169].

There is known to be a higher incidence of cervical cancer in more disadvantaged areas of England. In the 30 most disadvantaged areas, 10.4 women per 100,000 are diagnosed with cervical cancer, compared with 7.8 per 100,000 in the 30 least disadvantaged areas [170]. Furthermore, the cervical cancer mortality rate ranges from 3.2 per 100,000 in the 30 most disadvantaged areas to 1.7 per 100,000 in the most affluent areas [170].

A number of mediating factors are thought to contribute towards inequalities in cervical cancer incidence later in life. For example, a history of exposure to adverse experiences in childhood, including exposure to violence

*Figure 14*
*Rates of death by cervical cancer, per 100,000, males and females, 20–34 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB

and maltreatment, which we have previously shown follows a social gradient, is associated with health risk behaviours including smoking, alcohol and drug use, and risky sexual behaviour. Furthermore, researchers exploring possible associations between individual and multiple risk behaviours and socioeconomic position in adolescence, using a UK-cohort study, reported a strong relationship with decreasing socioeconomic position (measured by maternal educational attainment, household income and parental social class), and early sexual behaviour and tobacco use [171].

All girls aged 12 or 13 in the UK are routinely offered the HPV vaccine at school, which protects against the strains of HPV most likely to cause cervical cancer. However, there are known to be inequalities in the uptake of HPV vaccination. UK-based research found that the social class and educational status of young women are the most important drivers of missing vaccinations in school [172].

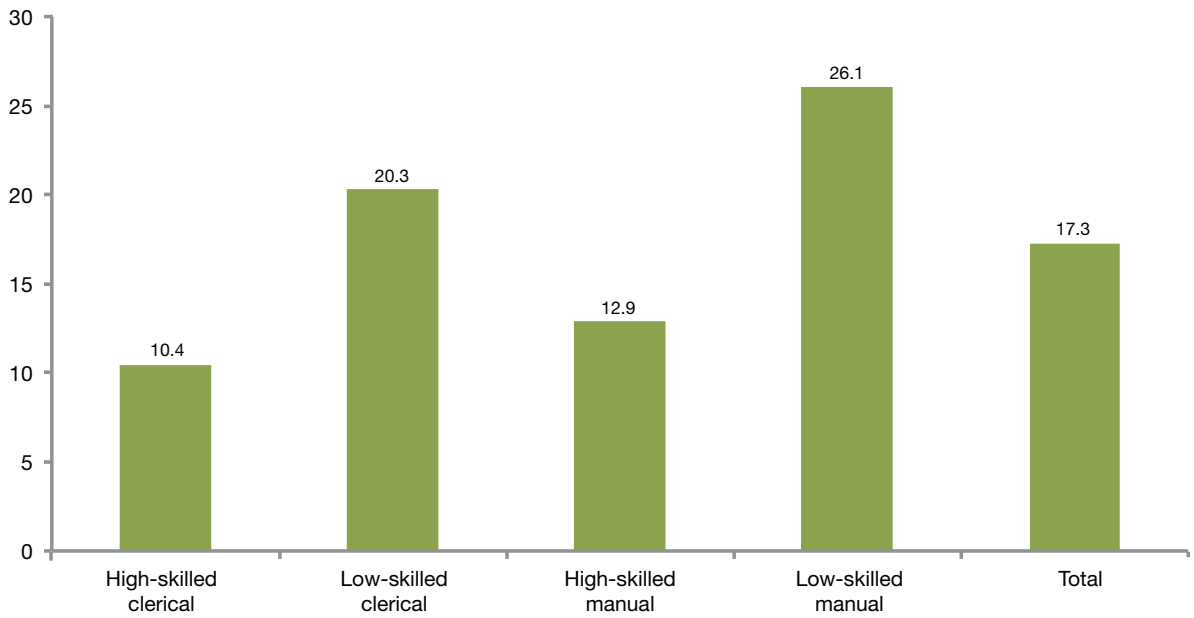
Overall, there are lower rates of cervical cancer screening uptake in large former industrial cities, including Liverpool, London, Manchester and Birmingham [170]. There is also evidence that some women are less likely to attend regular cervical screening, including women who have experienced sexual abuse, women who have a learning disability, women from certain BAME groups, younger women, and lesbian and bisexual women [173–177]. Low screening uptake may result in later presentation and the risk of more advanced cervical cancer and thus less effective treatment.

## Cancer in young adults – breast cancer

There are many factors potentially linked to an increased risk of breast cancer. However, this review focuses on inequalities in the risk factors for which there is sufficient evidence of being associated with increased risk of breast cancer, as well as known inequalities in breast cancer mortality.

A 2014 study in England by the National Cancer Intelligence Network found that between the years 2006 and 2010, the incidence of female breast cancer was highest in the most affluent areas (44,468, compared with 30,071 in the most disadvantaged areas) [178]. However, women from the most disadvantaged areas had a statistically-significant higher mortality rate – equivalent to an estimated 350 yearly excess deaths [178]. In other words, women from more disadvantaged areas are less likely to get diagnosed with breast cancer but are more likely to die from breast cancer.

***Figure 15***
*Percentage of shift workers by skill level (UK)*




Source: DMDB

The

National Cancer Intelligence Network reported that Asian and black women under 65 years have lower breast cancer survival rates than white women, at 89%, 85% and 91% respectively [179].

There appears to be no evidence to suggest that mortality rates differ according to sexual orientation, although this may be because there is a lack of routine recording of sexual orientation in health services [180].

What drives these social differences in breast cancer mortality rates? The following section looks at the evidence on social factors that are known to contribute to differences in breast cancer mortality, including alcohol consumption, smoking, shift work and screening.

### Alcohol consumption

Consumption of alcohol is listed by the IARC as a known risk factor for breast cancer [167]. A meta-analysis found that the excess risk associated with drinking alcohol was 22% (95% CI: 9–37%) [181]. Another study found that for every additional drink regularly consumed per day, an additional 11 women per 1,000 up to age 75 develop breast cancer [182].

A research study found that people in the most disadvantaged neighbourhoods are more likely to drink heavily or 'binge' drink (drinking eight or more units in a single session for men, six or more for women) than people in more affluent areas [183]. However, the latest statistics on alcohol consumption in England and Wales found that, for example, those from more advantaged backgrounds are more likely to drink heavily (in excess of 8 units for men and 6 units for women) than those from less advantaged backgrounds [184]. In the lowest income households, 10% of adults drank heavily on at least one day in the week before the study was conducted, compared with 22% in the highest income households [184].

There is, however, evidence that multiple unhealthy behaviours, including heavy drinking, smoking, eating an unhealthy diet and living a sedentary lifestyle, are more commonly associated with less advantaged social groups [185] [219].

### Smoking

Smoking is known to increase the risk of breast cancer [167]. Current and former smokers have a 12% and 9% respective increased risk of breast cancer than those who have never smoked[186]. The risk of breast cancer increases with the amount and duration of smoking, as well as smoking before giving birth [186-188].

As has been shown in previous sections, women from less advantaged backgrounds are more likely to smoke and continue to smoke during pregnancy than women from more advantaged backgrounds [189].

### Shift work

There is some evidence that shift work is associated with breast cancer risk, via lower melatonin levels and circulating oestrogen [167, 190, 191]. A meta-analysis of cohort studies found that women who have ever experienced disruption to the day–night cycle, i.e. through night shift work, have a 21% increased risk of breast cancer. An estimated 4–5% of female breast cancers in the UK are thought to be linked to night shift work. Although people of all ages, genders, socioeconomic position and ethnicity can work night shifts as part of their role, there is some evidence of bias. Internationally recruited nurses, for example, are more likely to work permanent night shifts compared with UK-qualified BAME or white nurses [192]. Additionally, as Figure 15 shows, shift work is most often associated with lower-skilled, and thus often lower paid, workers.

# DEATHS AMONG ADULTS, AGES 35–64

8

## Adults ages 35–64

### KEY MESSAGES

**DEATHS AMONG ADULTS, AGES 35–64**

Deaths as a result of disease and related causes, as opposed to external causes, are the leading causes of death among adult men and women although suicide and intentional self-harm remain a leading cause of death among adult men. Cancer is the leading cause of death for adults, responsible for one in two of all female deaths and just over a third of all male deaths. Between the ages of 35 and 64, compared with younger adults, coronary heart disease and heart attacks also claim a much larger number of lives. Chronic liver disease and cirrhosis, and alcoholic liver disease are the third largest cause-groups of deaths for adult men and women respectively.

Social inequalities are found in the leading causes of death among adults. The mechanisms suggested as underlying these social inequalities include social differences in:

- diet and lifestyle behaviours, including smoking rates, substance misuse, sedentary behaviours
- access to care and uptake of preventive services
- childhood cognitive development
- childhood obesity, associated with physical activity, excessive screen time and an unhealthy diet
- mental health problems, and physiological and psychological responses to a range of adverse circumstances, including poverty, debt, unemployment, poor working conditions, overcrowded housing conditions and lack of social support
- social isolation/loneliness

## Leading causes of deaths among adults, ages 35–64

### Males

Deaths in males between the ages of 35–64 years comprised just over 45% of all male premature deaths in 2010. This means that roughly the same proportion of men die before the age of 65 as those that die between the ages of 65 and 74. The total number of deaths in males aged 35–64 was 51,704.

The leading causes of death among men aged 35–64:

- cancer (35%; 17,842 deaths) – most common cancers resulting in death among adult men being cancer of the larynx, trachea, bronchus and lung (4,467)
- diseases of the circulatory system (cardiovascular diseases) (28%; 14,382 deaths), of which coronary heart disease (ischaemic heart disease) is the leading specific cause (9,120 deaths)
- injuries and poisoning from external causes (10%; 5,347 deaths), with the leading specific cause being suicide and intentional self-harm (1,927)
- diseases of the digestive system (10%; 5,272 deaths), with the most common cause being chronic liver disease and cirrhosis (3,400 deaths)

### Females

Deaths in females between the ages of 35 and 64 years comprised around 44% of all female premature deaths in 2010.The total number of deaths in females aged 35–64 was 34,106.

The leading causes of death among women aged 35–64:

- cancer (50%; 17,175 deaths) – the most common cancers resulting in death among adult women being breast cancer (3,872) and cancer of the larynx, trachea, bronchus and lung (3,515)
- diseases of the circulatory system (cardiovascular diseases) (16%; 5,476 deaths), of which coronary heart disease (ischaemic heart disease) is the leading specific cause (1,254 deaths), followed by heart attack (974 deaths)
- diseases of the digestive system (9%; 2,923 deaths), with the most common cause being alcoholic liver disease (1,405 deaths). Compared with other European countries (EU19), the UK has the fifth highest rate of female deaths by alcoholic liver disease (females, 35–64 years); almost seven times higher than the death rate in Italy (see Figure 17).

## Social inequalities in the leading causes of death among adults, ages 35–64

### Breast cancer

#### Screening and self-examination

Indicators of wealth have been found to be important determinants of breast cancer screening. UK-based research has found that women who live in their own homes (as opposed to rented properties) and in households with cars (as opposed to no cars) are significantly more likely to have a mammogram (compared with no car: one car, odds ratio 1.67, 95% confidence interval 1.06 to 2.62; two or more cars, odds ratio 2.65, 1.34 to 5.26; compared with rented housing: own with mortgage, odds ratio 2.12, 1.12 to 4.00; own outright, odds ratio 2.19, 1.39 to 3.43) [174]. Additionally, a UK survey by Cancer Research UK indicated that women from more disadvantaged areas are less likely to attend breast screening than the general population: 31% and 12% respectively [194]. These findings are supported by a range of UK and international studies [195-198].

Uptake of screening for breast cancer is also generally lower among people with learning disabilities, with studies estimating a range of 3–24% [199], compared with an overall screening uptake in England of 73.2% [200]. Screening uptake is also lower among BAME groups. For example, Breast Cancer Care found that 43% of BAME women never practised breast awareness compared with 11% in the general population [177] and a recent London study reported that, overall, white British women were more likely to attend their first (67%) and routine recall (78%) breast screening invitations than Indian (61% and 74% respectively), Bangladeshi (43% and 61% respectively), black Caribbean (63% and 74% respectively), and black African women (49% and 64% respectively) [201]. However, geographical variations in screening uptake for women from the same ethnic group have been reported, indicating that engagement strategies can reduce inequalities in breast cancer outcomes [201].

Language and literacy, as well as communication problems with GPs and other health professionals, emotional barriers, including fear, embarrassment and anticipated shame, and low perceived risk might contribute to explaining lower breast and other cancer screening uptake for some ethnic groups and people from less advantaged backgrounds [175, 194, 202]. Cost, access, health care provider discomfort, and physical and cognitive restraints are believed to be the main barriers to cancer screening for people with disabilities [203].

### Lung cancer

The incidence of lung cancer [204] and lung cancer mortality [205] is known to be higher among people from the most disadvantaged areas, which is strongly associated with higher smoking rates [12]. Smoking tobacco is estimated to account for 90% of lung cancer deaths [206-208]. Lung cancer is therefore largely preventable through smoking avoidance [209].

A recent US study published findings consistent with the fundamental cause theory, which posits that those with greater access to material and psychosocial resources, including knowledge, power, money and social connections, will disproportionately benefit from 'innovations' or knowledge that make a disease more preventable – and this is the case with lung cancer and the strong link to tobacco [209]. The researchers found that by the end of the study period (1968–2009), lung cancer mortality rates were greater among people living in less advantaged counties than more advantaged counties, while no significant change over time was seen in the association between pancreatic cancer and people's socioeconomic position [209].

A systematic review also found that patients with lung cancer living in more socioeconomically disadvantaged circumstances were less likely to be in receipt of lung cancer treatment, surgery and chemotherapy [210]. The study suggested that socioeconomic inequalities in treatment may be due to variations in access to care and uptake of services. However, further research is necessary to understand the factors underlying these differences [210].

There is also evidence that childhood lower mental ability (IQ) is associated with higher risks for a number of diseases later in life, including lung cancer. The research hypothesises that the association involves the effects of smoking, as well as other personal and social factors, although this warrants further investigation. Overall, the risk of mortality and morbidity later in life is 17% higher for each standard deviation disadvantage in childhood IQ [299].

### Diseases of the circulatory system (cardiovascular diseases)

Cardiovascular disease (CVD), diseases of the heart and circulation, including coronary heart disease and heart attacks, is responsible for a sizeable proportion – around one in four – of all adult deaths in the UK, although our analyses show that CVD kills more adult men than women (28% and 16%, respectively). However, there are clear social inequalities in CVD. Inequalities in CVD mortality and morbidity exist according to ethnicity and gender, and between geographical areas and socioeconomic groups. The literature identifies a number of lifestyle and behavioural risk factors for CVD, as presented below, shaped by the social, economic, cultural, legal and political context, which can help us understand these social inequalities. Figure 16 shows that the UK has the sixth highest rate of deaths by circulatory disease between ages 35-64 compared with other European countries (EU19).

Risk factors for CVD include:

- Smoking
- Poor diet
- Physical inactivity
- Harmful patterns of alcohol consumption
- Diabetes

- Blood and pulse pressure
- Obesity
- Social isolation and loneliness [300, 301].

### CVD mortality and socioeconomic factors

Increased mortality from CVD is associated with more disadvantaged socioeconomic position. For example, analyses have shown that socioeconomic inequalities in coronary heart disease (CHD) mortality widened between 2000 and 2007, despite overall CHD mortality in England declining by approximately 6% each year [214].

There is also evidence that adult atherosclerosis (a condition where arteries become clogged by fatty substances) has its roots in childhood obesity [215]. Childhood obesity prevalence is closely associated with socioeconomic circumstances – as deprivation rises, so does the prevalence of obesity [216]. Obesity prevalence in reception and year 6 is over twice as high among children from the most disadvantaged areas compared with those from the least disadvantaged areas [217]. Overall, much of the premature mortality seen in lower socioeconomic groups can be explained by diseases associated with obesity [302].

Furthermore, a Swedish study has found that CVD mortality is associated with both parental and own adult social class (manual versus non-manual classes), indicating that income and social class background have a significant impact on a child's future health and life chances [218].

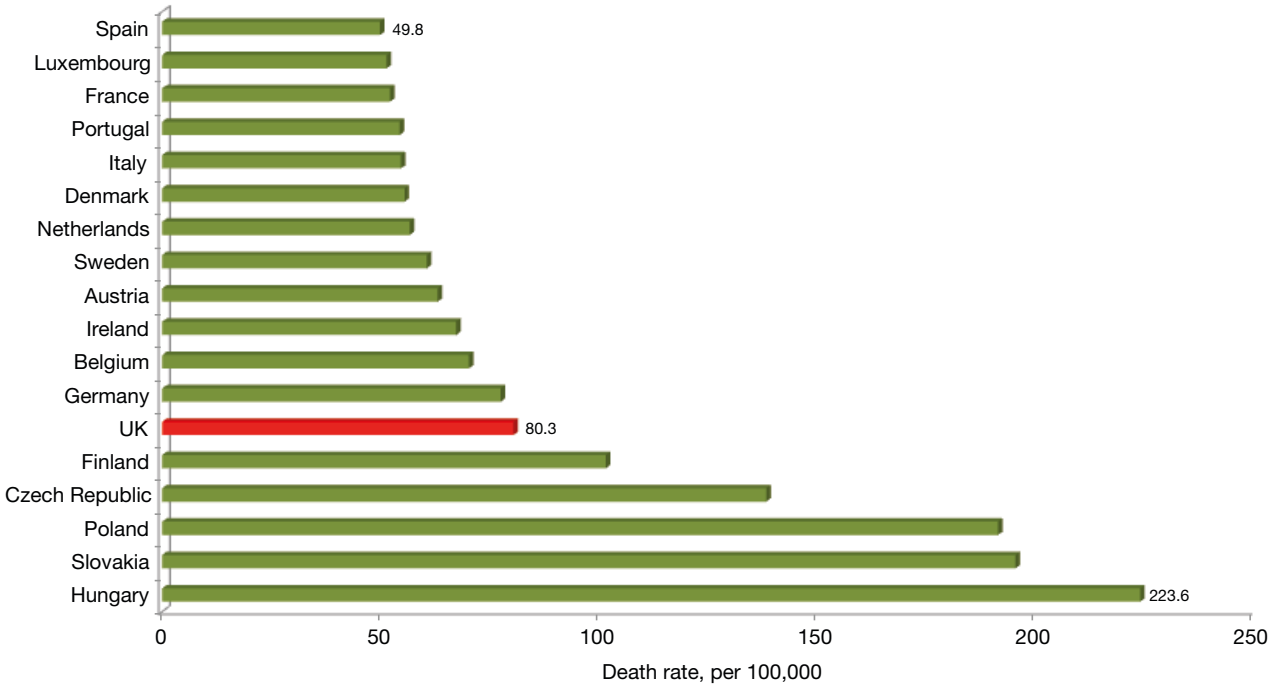
Lower adult socioeconomic position is directly associated with an increased risk of CVD, mediated by physiological and psychological responses to a range of adverse circumstances, including poverty, debt, unemployment, poor working conditions, overcrowded housing conditions and lack of social support [212]. For example, a meta-analysis of work-related stress and CVD found that job strain (measured by high demands and low control) was linked to increased risk of CVD attributable to a number of CVD risk factors[213]. Adults with job strain, compared to those without, were more likely to have diabetes (1.29, 95% CI: 1.11–1.51), to smoke (1.14; 1.08–1.20), to have a sedentary lifestyle (1.34; 1.26–1.41) and to be obese (1.12; 1.04–1.20).

Behavioural risk factors for CVD are also patterned by socioeconomic group. For example, people in the lowest educational groups are three times more likely than those in the highest educational groups to smoke, have an unhealthy diet, lead a sedentary lifestyle and have harmful patterns of alcohol consumption [219].

### CVD and ethnicity

A recent study suggested that children from Asian and black ethnic groups are more likely to have a low level of physical activity, excessive screen time and an unhealthy diet compared with white children (a threefold, and 3.5 times risk, respectively) [220]. These are the main risk factors for childhood obesity, which, as explained above, is linked to adult atherosclerosis [215].

*Figure 16*
*Death rate by diseases of the circulatory system, per 100,000, males and females, 35–64 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB

The risk of dying early from cardiovascular disease is twice as high among South Asian groups compared with the general population. Multiple studies of migrant South Asian populations have confirmed a three- to five-fold higher risk of cardiovascular death compared with other ethnic groups [221-223]. Although there is no conclusive explanation for this, the relatively higher cardiovascular rate is thought to be linked to diet, lifestyle and different ways of storing fat in the body [223].

## Liver disease and cirrhosis

Each year, an increasing number of people in the UK die as a result of liver disease and cirrhosis [224]. Consequently, the rate of increase of liver disease is substantially higher in the UK than other countries in Western Europe [225], where deaths from liver disease are decreasing [226]. The current increase in mortality from alcohol-related diseases mirrors the rise in alcohol consumption in the UK over the past 30 years [225], with over 24% of the population (33% of men, 16% of women) now consuming alcohol in a way that is potentially or actually harmful [227].

Social class, occupation and deprivation have been identified as factors linked to alcohol-related mortality in a number of studies [228-232]. Liver disease disproportionately affects the poorest in society [233], with people in the most disadvantaged areas 2.3 times more likely to die from liver disease than people living in the least disadvantaged areas [234]. For example, a report by the ONS showed that the occupational groups with the lowest alcohol-related mortality were managers, senior officials and professionals [230]. This is supported by a later analysis by the ONS, which found substantial socioeconomic variations in adult alcohol-related mortality, with women experiencing greater inequalities than men [233]. Women in the routine occupation classes were found to have a rate of alcohol-related mortality about six times greater than women in higher managerial and professional occupations, potentially owing to demographic changes in drinking patterns in recent years, with marked increases among women and young people [233]. Figure 18 shows geographical variation in mortality rates from liver disease in England, with the North East and North West having the worst mortality rates in England.

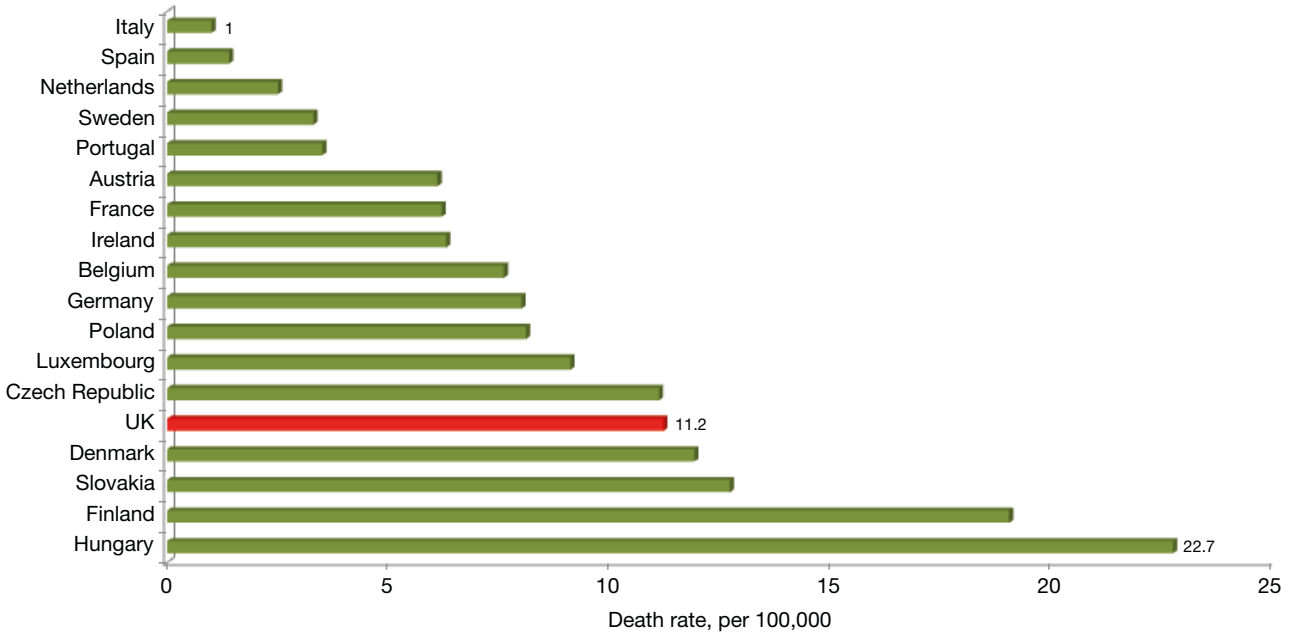
The All Party Parliamentary Health Group (APPHG) inquiry into improving outcomes in liver disease reported grave concerns about the "vastly different standards of care available to patients with liver disease depending on where they live" in the country [236]. Similarly, the NHS Atlas of Variation in Healthcare for People with Liver Disease shows a "postcode lottery of care" [237].

Alcohol misuse is one of the leading causes of liver disease and cirrhosis – drinking more than the government's current advice on sensible drinking increases a person's risk of liver disease [233] – but obesity, viral hepatitis and diabetes are also key risk factors. Social inequalities are evident for all of the main causes of liver disease and cirrhosis.

### Alcohol consumption

*Fair Society, Healthy Lives*, the Marmot review of health inequalities in England, reported that although alcohol consumption has an inverse social gradient – i.e. alcohol consumption increases with weekly household income – people with low socioeconomic status who do drink

***Figure 17***
*Death rate per 100,000, alcoholic liver disease, females, 35–64 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB

alcohol are more likely to have problematic drinking patterns and dependence [238-240]. Higher hospital admissions for alcohol-related conditions are also associated with increased levels of deprivation [12].

It has also been noted that there is often significant co-morbidity of alcoholism and mental health problems and/or psycho-social problems [236].

### Hepatitis C

Viral hepatitis is one of the principal contributors to liver disease and is a treatable infection yet only 3% of people with hepatitis C receive treatment each year [241]. Recent research has found that almost half of all people hospitalised with hepatitis C are from the poorest fifth of society [242]. The North West and London have disproportionately high numbers of people with hepatitis C [242].

### Obesity and non-alcoholic fatty liver disease

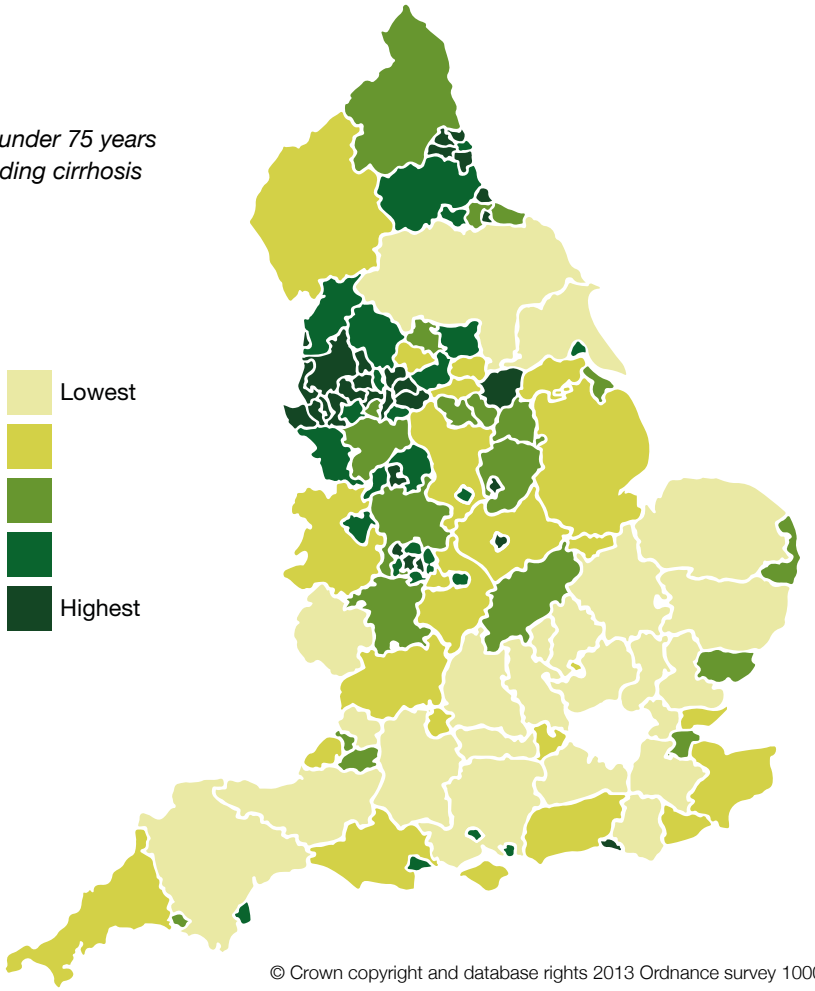
Obesity is an important risk factor for liver disease because it is linked to non-alcoholic fatty liver disease (NAFLD) – the accumulation of fat within the liver not caused by alcohol. NAFLD is thus usually seen in people who are overweight or obese. Around 24–25% of the adult population in England is thought to be obese [243] and most of these will have NAFLD (an estimated 1.4 million adults) [237]. Of this population, many (up to an estimated one in 20 of the UK population) will have ongoing inflammation and scarring that will lead to cirrhosis, and an estimated 5–10% of those that develop cirrhosis will go on to get liver cancer [225]. Furthermore, an estimated half a million children may already be at risk of liver disease and cirrhosis [244]. The rate of fatty liver disease is projected to increase with rates of obesity [235].

Obesity is associated with social and economic deprivation across all ages [12]. For example, the prevalence of obesity in the most disadvantaged 10% of areas in England is double that in the most affluent 10% [237].

### Diabetes and liver disease

People with type 2 diabetes are at the greatest risk of developing cirrhosis of the liver caused by NAFLD and people who are overweight or who live a sedentary lifestyle are at increased risk of developing diabetes. People of South Asian, African and African-Caribbean origin have a higher than average risk of developing Type 2 diabetes, as do less affluent individuals and populations [245]. For example, research suggests that breastfeeding is associated with a reduced incidence of type 2 diabetes in the mother [305], but as described above, breastfeeding follows a social gradient [281].

*Figure 18*
*Rate of mortality in people aged under 75 years due to chronic liver disease including cirrhosis per population by PCT*






Source: [235]

# DEATHS AMONG ADULTS, AGES 65–74

9

## Adults, ages 65–74

### KEY MESSAGES

**DEATHS AMONG ADULTS, AGES 65–74**

Cancer continues to be the leading cause of death among older adults aged 65–74, with lung cancer being the cancer that kills the highest number of older adults. Coronary heart disease also remains one of the leading causes of death, killing a greater proportion of older adults than adults aged 35–64: nearly nine times as many men, and just over three times as many women. Chronic lower respiratory diseases and pneumonia emerge as one of the leading causes of death among older men and women. The UK has the highest respiratory disease mortality rate across comparative European countries for this age group (see Figure 20).

Social inequalities are found in the leading causes of death among older adults. The mechanisms suggested as underlying these social inequalities include differences in:

- lifestyle behaviours, such as smoking, alcohol misuse and physical inactivity
- disease awareness
- cultural competence among health professionals
- housing conditions

## Leading causes of deaths among adults, ages 65–74

### Males

Deaths in males between the ages of 65 and 74 years comprised around 47.5% of all male premature deaths in 2010. The total number of deaths in males aged 65–74 was 54,052.

The leading causes of death among men aged 65–74 are:

- cancer (43%; 23,033 deaths) – the most common cancers resulting in death among older adult males being cancer of the larynx, trachea, bronchus and lung (6,437), followed by cancer of the colon, rectum and anus (2,423), and prostate cancer (2,113)
- diseases of the circulatory system (31%; 16,764 deaths), of which ischaemic heart disease (coronary heart disease) and cerebrovascular disease (conditions caused by problems that affect the blood supply to the brain, including stroke and vascular dementia), are the leading specific causes (9,949 and 2,884 deaths respectively)
- diseases of the respiratory system (11%; 6,086), including chronic lower respiratory diseases (CLRD) (3,301) and pneumonia (1,312)

### Females

Deaths in females between the ages of 65 and 74 years comprised just under 50% of all female premature deaths in 2010. The total number of deaths in females aged 65–74 was 38,205.

The leading causes of death among women aged 65–74 are:

- cancer (46%; 17,583 deaths) – the most common cancers resulting in death among older adult females being cancer of the larynx, trachea, bronchus and lung (4,507), and breast cancer (2,206)
- diseases of the circulatory system (24%; 9,005 deaths), of which coronary heart disease and cerebrovascular disease are the leading specific causes (4,084 and 2,326 deaths respectively)
- diseases of the respiratory system (12%; 4,735 deaths), including chronic lower respiratory diseases (CLRD) (2,937), and pneumonia (945)

## Social inequalities in the leading causes of death among adults, ages 65–74

### Cancer – prostate cancer

Overall, it is not yet clear what causes prostate cancer. The IARC does not list any factor known to have sufficient evidence for association with risk of prostate cancer. Yet there is evidence of inequalities in the incidence of and death rate from prostate cancer. The UK has a prostate cancer mortality rate of 82.1 (males, aged 65–74 years): the sixth highest rate compared with other European counties (EU19) (see figure 19).

#### Socioeconomic status

Research shows that area-level socioeconomic status is an important driver of disparities in prostate cancer mortality. Both black and white men living in areas of the US with the lowest average income have a respective 38% and 27% higher incidence of prostate cancer than those in the second poorest quintile [246].

#### Race/ethnicity

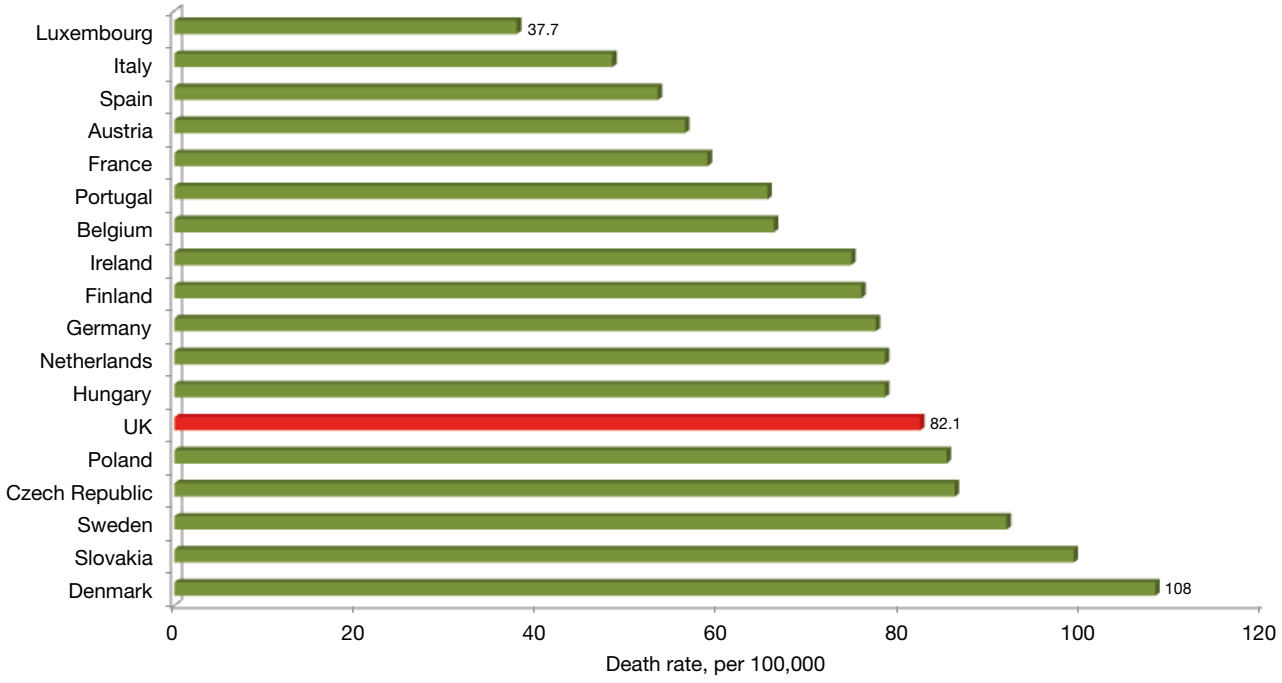
A US study found that prostate cancer incidence was significantly higher among black populations compared with white populations (20,745 per 100,000 versus 14,776 per 100,000), and that black males have an annual death rate from prostate cancer that is 2.4 times higher than for white males [246]. More frequent screening was associated with lower mortality rates, with more white than black men attending screening. For example, more than twice as many black as white men had not been tested during the three years prior to diagnosis[246]. However, the racial disparity gap largely disappeared once patients had been tested two or more times in the three years prior to diagnosis[246].

The (UK) National Cancer Intelligence Network supports this finding, reporting that black men face a 30% higher prostate cancer death rate compared with white men [247]. And in the UK, one in four black men will be diagnosed with prostate cancer in their lifetime; double the overall risk for men (one in eight) [248].

Overall, limited data on cancer outcomes and ethnicity makes it challenging to understand what drives inequalities in this area. However, lack of cancer awareness in black and other BAME communities, coupled with a lack of cultural awareness among health professionals are factors believed to contribute to ethnic disparities in prostate cancer outcomes [247]. For example, a survey conducted by BME Cancer Communities in Nottingham found that 36% of BAME people in the area were not familiar with the signs and symptoms of cancer and 47% did not know how to reduce their cancer risk. Behaviour is another contributor: smoking rates are high among BAME communities, particularly Bangladeshi, Caribbean and Chinese populations [249].

BAME communities often experience multiple disadvantages too. BAME communities tend to have higher rates of poverty, measured by income, worklessness, benefit use and deprivation by area [250], which can influence other determinants of health, including housing and neighbourhood conditions, education, stress levels and access to social networks.

*Figure 19*
*Death rate by prostate cancer, per 100,000, males, 65–74 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB

### Age

Macmillan and Prostate Cancer UK have highlighted how older men diagnosed with prostate cancer are more likely to receive poorer quality care and support than younger men: they are less likely to be told about treatment side effects and sometimes have fewer treatment options offered to them, compared with younger men [251, 252].

## Cancer – colon, rectum and anus

Low socioeconomic status is a known risk factor for colorectal cancer incidence [304, 305]. Differences in health behaviours, particularly in eating an unhealthy diet and physical inactivity, generally more common in more disadvantaged groups, are thought to contribute to socioeconomic differences [304, 306]. One US study found that unhealthy behaviour (physical inactivity, unhealthy diet and smoking) and high body mass index (BMI) (unhealthy weight) explained around 44% of the association of education with risk of colorectal cancer, and 36% of the association of neighbourhood socioeconomic position with risk of colorectal cancer {Doubeni, 2012 #320}. Diet is thought to be the largest contributor – explaining 21.6% of the association between education and risk of colorectal cancer, and 15.3% of the association between neighbourhood socioeconomic position and risk of colorectal cancer [307].

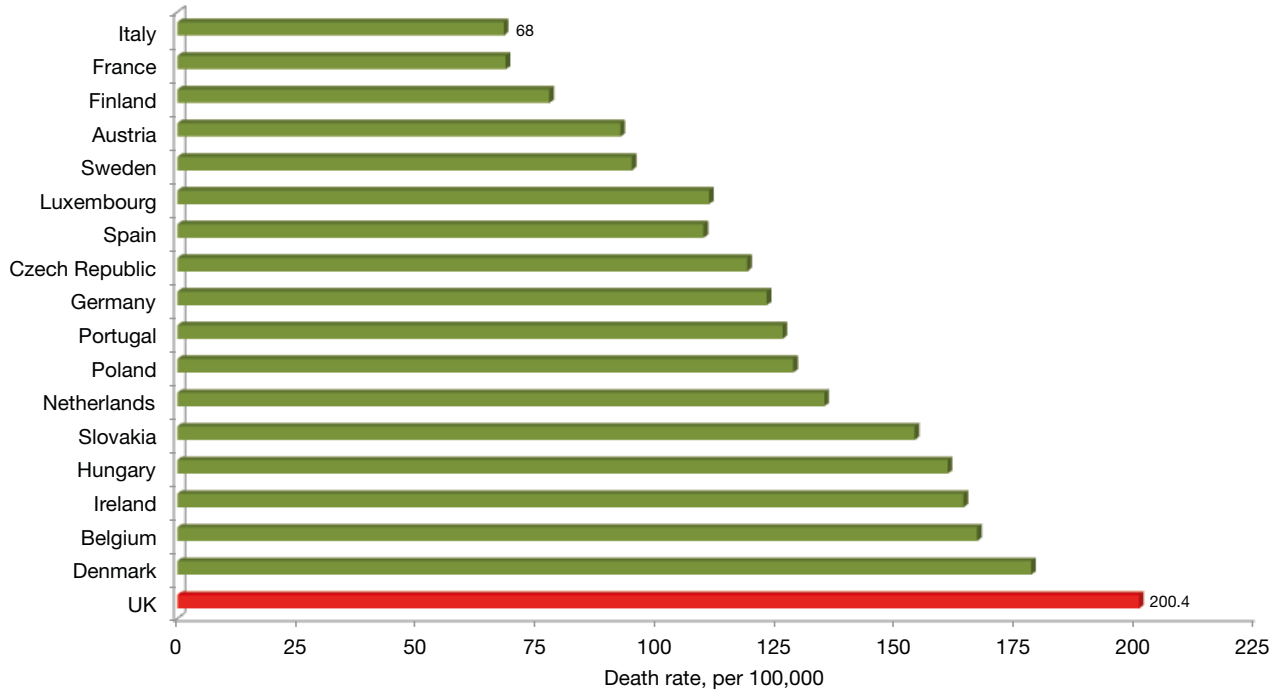
US populations from more disadvantaged backgrounds are also less likely to undergo screening for colorectal cancer and are thus more likely to be diagnosed at a later stage, compared with more advantaged populations [308]. They are also less likely to receive life-saving treatment than better-off people [308].

Inequalities have also been identified in risk of developing colorectal cancer and in rates of screening. Black population groups are known to have a higher incidence of colorectal cancer than white population groups, and although screening rates are generally low across the board, black population groups are also more likely to present to health services at a later stage, and subsequently have worse survival rates [308].

## Diseases of the circulatory system – coronary heart disease and cerebrovascular disease

There is some evidence that for women, exposure to childhood adversity increases the risk of developing coronary heart disease and cerebrovascular disease. One study found that the risk of cardiovascular disease was threefold among women who had been exposed concurrently to childhood financial difficulties, interpersonal conflicts and longstanding illness of a family member [309]. Only longstanding illness of a family member increased the risk among men. Further research, however, is needed to understand the mechanisms behind this association.

*Figure 20*
*Death rate per 100,000, diseases of the respiratory system, males and females, 65–74 years, EU19, latest ICD-10 codes (2009–2012)*




Source: DMDB

Several other longitudinal studies have shown a social gradient of coronary heart disease mortality in Europe. In England and Wales, Ireland and the Nordic countries, manual workers were shown to have a higher risk of mortality from coronary heart disease than non-manual workers [310]. However, in Switzerland and the Mediterranean countries, risk of mortality from this disease was similar across occupational classes [310]. Small socioeconomic differences in cerebrovascular disease mortality have also been shown in France and Spain – with manual workers at a slightly increased risk of mortality than non-manual workers [310]. These socioeconomic differences are thought to be explained by the adoption of healthier behaviours in the higher socioeconomic classes (to do with smoking and physical activity), and a decrease in healthy behaviours among people from less advantaged social backgrounds [311].

## Diseases of the respiratory system – chronic lower respiratory disease

US research has found that area-based socioeconomic level and race/ethnicity are independently associated with disease risk [253]. However, the association between socioeconomic status and respiratory outcomes in older adults is less consistent. For example, some studies have found that low socioeconomic position is independently associated with longer hospitalisation and hospital readmission for pneumonia [254], yet no association has been reported between socioeconomic status and pneumonia mortality [255, 256] or pneumonia outcomes [257].

There is, however, a strong relationship between cold temperatures and respiratory diseases [258]. Cold homes are believed to be one of the main causes of the increase in winter respiratory diseases [259]. A London-based study calculated ‘excess winter morbidity’ (EWM) based on emergency hospital episodes for respiratory diseases among older people and ranked this against a Fuel Poverty Index (FPI), which included measures of energy efficient housing, low income, householder age and under-occupation. The FPI was shown to be a predictor of EWM, suggesting a relationship between energy-inefficient housing and the rate of winter respiratory disease [260]. Older, low-income households are more likely to be affected by fuel poverty, and are thus more vulnerable to living in cold homes and are at a greater risk of developing winter respiratory diseases [260].

# CONCLUSION

The leading causes of death change across the life course – from low birth weight at the start, to suicide and self-harm during adolescence, to cardiovascular disease later in life. Mortality rates for some of the leading causes of early death are also higher in the UK compared with other European countries (EU19).

This evidence review shows marked social inequalities for the leading causes of early death across the life course. Common mechanisms behind socioeconomic variation in the leading causes of early death include differences in: access to resources (financial, social and natural); adversity; unemployment rates; housing quality; quality of work, the physical environment, social isolation, lifestyle behaviours, breastfeeding rates, disease awareness, use of health information, and; access to care, uptake of preventive services, quality and appropriateness of care, and adherence to treatment, among other factors.

Risk factors associated with premature mortality are also known to accumulate over time. An estimated half a million children may already be at risk of liver disease and cirrhosis owing to childhood obesity. Income and social class background are shown to have a significant impact on a child's future health and risk of early death by hindering or hastening a child's ability to climb the social ladder as they age (social mobility).

A sizeable proportion of the burden of disease and premature death is therefore estimated to be a result of social inequalities, which are amenable to policy and practice interventions. If the UK had the same death rate for all of the leading causes of death as the countries with the lowest rates, and if mortality rates for each of the leading causes of death across the life course matched rates for the highest socioeconomic groups, many lives from birth to age 75 years and up could be saved each year.

Gaps, however, remain in the literature. Further research is needed to improve understanding of the mechanisms behind social inequalities in the leading causes of early death, including cancers, CVD, suicide and road crashes, where evidence is limited. This will involve comparing international health care systems and health indicators linked to the common mechanisms underlying socioeconomic differences in mortality, such as smoking prevalence and alcohol consumption, as well as time trends in the social determinants of premature mortality. Evidence-based and cost-effective interventions to reduce social inequalities in the leading causes of premature mortality across the life course also need to be identified and then embedded in policy and practice.

Social inequalities in mortality are unjust. It is unacceptable that we can predict which children, young people and adults are more likely to have an early death from specific amenable non-communicable and external causes because of the conditions in which they are born, grow, live, work and age. Health care systems, with other sectors including education, welfare, social care, employment, transport, community and voluntary, and the built environment need to continue to work together to build on promising policies and practices, to prevent early death across the life course.

# APPENDIX A
## Mortality Data – Key available sources

1. **ONS 2012 infographic by sex and age groups (published December 2013) [261]**

   This shows total deaths registered in England and Wales in 2012. It uses the ONS standard list of leading causes based on a list developed by the World Health Organisation (WHO), which categorises causes using the ICD-10, and is modified for use in England and Wales.

   Available age groupings for males and females:1–4 years; 5–19 years; 20–34 years; 35–49 years; 50–64 years; 65–79 years; 80-plus years.

   The ONS infographic is part of Mortality Statistics: Deaths registered in England and Wales (Series DR), 2012 release [262].

   The 2012 infographic will be superseded by the 2013 infographic (forthcoming).

2. **ONS 2013 infographic by sex and age groups (forthcoming)**

   The ONS mortality cause list and age groupings will be the same as for the 2012 infographic. The 2013 infographic will be part of Mortality Statistics: Deaths registered in England and Wales (Series DR), 2013 release [265].

3. **European Detailed Mortality Database (DMDB) – 2010 statistics [267]**

   The DMDB was developed in 2007 to provide user-friendly access to detailed data on mortality. It categorises causes of mortality using ICD-9 or ICD-10, in five-year age groups.

   All of the data in the DMDB are uploaded from the raw detailed data files of the global WHO mortality database, which is maintained at WHO headquarters, but are limited to the 53 countries in the WHO European Region and to the data files that have been submitted to WHO using ICD coding.

   The DMDB allows for comparisons between various causes of death in one selected country, and between countries for one selected group of causes of death. The latest data available for the UK is from 2010.

4. **Euro-Peristat [268]**

   Euro-Peristat provides comparative data on neonatal mortality (babies born at 24 weeks or more of gestation). There is no composite UK data because constituent countries collect data in different ways.

5. **ONS child mortality statistics [269, 270]**

   Data allows review of infant mortality and low birth weight rates by social class.

6. **Child Death Reviews [271]**

   Age group: 0–18.

7. **The Compendium of Population Health Indicators – Health and Social Care Information Centre (HSCIC) [272]**

   This source provides data on life expectancy at age 75.

   Mortality from all causes – not grouped for ranking (age groups 1+; 1–4; 5–14; 15–34; 35–64; 65–74; 75+).

   Mortality by potentially avoidable or amenable causes.

   Maternal, infant and child mortality.

9. **Public Health England (PHE) Longer Lives website**

   Contains national rankings for the following causes of death:

   Overall premature deaths

   Cancer (lung, breast, colorectal)

   Heart disease and stroke

   Lung disease

   Liver disease

   Injury

10. **World Health Organisation World Mortality Database (WMD) [273]**

    This database allows for comparison between broad cause-groups of mortality, although these groups do not align with the European Detailed Mortality Database or ONS infographic data.

# APPENDIX B:
# Eurostat broad-causes and ICD-10 [274]

Cause-specific mortality indicators available in HFA-MDB

| No | Disease or external cause | ICD-9 BTL code | ICD-9 code | ICD-10 code | ex-USSR 175 list | ICD-10 Mortality Condensed list 1 | EUROSTAT list of 65 causes | Special BLT codes for NIS |
|---|---|---|---|---|---|---|---|---|
| 01 | Infectious and parasitic diseases | B01-B07 | 001-139 | A00-B99 | 1–44 | 1001 | 1 | CH01 |
| 02 | Intestinal infectious diseases | B01 | 001-009 | A00-A09 | 1-8 | 1002-1004 | | |
| 03 | Tuberculosis | B02, B077 | 010-018; 137 | A15-A19; B90 | 9-13, 43 | 1005-1006 (without B90) | 2 | |
| 04 | Meningococcal infection | B036 | 36 | A39 | 23 | 1011 | 3 | |
| 05 | AIDS (HIV-disease) (as recorded by routine mortality statistics system) | B184, B185 | For 093 codes are 042-044. For 094 code is 279.5 | B20-B24 | 206 | 1020 | 4 | |
| 06 | Viral hepatitis | B046 | 70 | B15-B19 | 30 | 1019 | 5 | |
| 07 | Neoplasms | B08-B17 | 140-239 | C00-D48 | 45-67 | 1026 | 6 | CH02 |
| 08 | Malignant neoplasms | B08-B14 | 140-208 | C00-C97 | 45-66 | 1027-1046 | 7 | S08 |
| 09 | Malignant neoplasm of lip/oral cavity/pharynx | B08 | 140-149 | C00-C14 | 45 | 1027 | 8 | |
| 10 | Malignant neoplasm of oesophagus | B090 | 150 | C15 | 46 | 1028 | 9 | |
| 11 | Malignant neoplasm of stomach | B091 | 151 | C16 | 47 | 1029 | 10 | |
| 12 | Malignant neoplasm of colon, rectum and anus | B093,B094 | 153-154 | C18 – C21 | 49-50 | 1030 | 11, 12 | |
| 13 | Malignant neoplasm liver and the intrahepatic bile ducts | B095 | 155 | C22 | | 1031 | 13 | |
| 14 | Malignant neoplasm of pancreas | B096 | 157 | C25 | | 1032 | 14 | |
| 15 | Malignant neoplasm of larynx, trachea, bronchus and lung | B100, B101 | 161-162 | C32-C34 | 52-53 | 1033- 1034 | 15 | |
| 16 | Malignant neoplasm of trachea, bronchus and lung | B101 | 162 | C33-C34 | 53 | 1034 | | |
| 17 | Malignant melanoma of skin | B111 | 172 | C43 | 56 | 1035 | 16 | |
| 18 | Malignant neoplasm of breast | B113 (female only, i.e. without 175) | 174-175 | C50 | 57 | 1036 | 17 | |
| 19 | Malignant neoplasm of cervix uteri | B120 | 180 | C53 | 58 | 1037 | 18 | |
| 20 | Malignant neoplasm of other parts of uterus | B122 | 179;182 | C54-55 | 59 | 1038 | 19 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 21 | Malignant neoplasm of ovary | B123 | 183 | C56 | | 1039 | 20 | |
| 22 | Malignant neoplasm of prostate | B124 | 185 | C61 | 61 | 1040 | 21 | |
| 23 | Malignant neoplasm of bladder | B126 | 188 | C67 | | 1041 | 23 | |
| 24 | Malignant neoplasm of lymph/haematopoietic tissue | B14 | 200-208 | C81-C96 | 65-66 | 1043-1045 (without C96) | 24 | |
| 25 | Diseases of the blood, blood forming organs and certain immunity disorders | B20 (without ICD10 codes D80-89) | 279-289 | D50-D89 | 71-72 (without ICD10 codes D80-89) | 1048 | 25 | |
| 26 | Endocrine, nutritional and metabolic diseases | B180- B183, B189, B19 | 240-278 | E00-E90 | 68-70 (may include AIDS) | 1051 (without E89-E90) | 26 | CH03 (may include AIDS – ICD9 code 279) |
| 27 | Diabetes mellitus | B181 | 250 | E10-E14 | 68 | 1052 | 27 | |
| 28 | Mental and behavioural disorders | B21 | 290-319 | F00-F99 | 73-77 | 1055 | 28 | |
| 29 | Psychoactive substance use | B215, B216 (without 291,305) | 291; 303-305 | F10-F19 | 73, 75, 76 | 1056 | 29-30 | |
| 30 | Alcohol abuse (including alcoholic psychosis) | B215, (without psychosis – 291) | 291;303 | F10 | 73, 75 | | 29 | |
| 31 | Drug dependence/ toxicomania | B216 (without 305) | 304-305 | F11-F16 F18-F19 | 76 (without 305) | | 30 | |
| 32 | Diseases of the nervous system and the sense organs | B22-B24 | 320-389 | G00-H95 | 78-83 | 1058, 1062, 1063 (without H94,H95) | 31 | CH06 |
| 33 | Meningitis | B220 | 320-322 | G00-G03 | 78 | 1059 | 32 | |
| 34 | Alzheimer's disease and other degenerative diseases of nervous system | B222 | 330, 331 | G30,G31 | | 1060 (only Alzheimer's disease - G30) | | |
| 35 | Diseases of the circulatory system | B25-B30 | 390-459 | I00-I99 | 84-102 | 1064 | 33 | |
| 36 | Ischaemic heart diseases | B27 | 410-414 | I20-I25 | 90-95 | 1067 | 34 | |
| 37 | Pulmonary heart disease and other heart diseases | B28 | 415-429 | I26-I51 | 97 | 1068 | different codes in E65 | |
| 38 | Cerebrovascular diseases | B29 | 430-438 | I60-I69 | 98,99 | 1069 | 36 | |
| 39 | Diseases of the respiratory system | B31, B32 | 460-519 | J00-J99 | 103-114 | 1072 (without J99) | 37 | CH08 |
| 40 | Influenza | B322 | 487 | J10-J11 | 104 | 1073 | 38 | |
| 41 | Pneumonia | B321 | 480-486 | J12-J18 | 105-107 | 1074 | 39 | |
| 42 | Other acute respiratory infections | 310-312, 320 | 460-466 | J00-J06, J20-J22 | 103 | 1075 (without J00-J06) | | |
| 43 | Chronic lower respiratory diseases | B323-B325 | 490-494;496 | J40-J47 | 108-110 | 1076 | 40 | |
| 44 | Asthma | | 493 | J45-J46 | 109 | | 41 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 45 | Diseases of the digestive system | B33, B34 | 520-579 | K00-K93 | 115-127 | 1078 | 42 | CH09 |
| 46 | Ulcer of stomach and duodenum | B341 | 531-533 | K25-K27 | 115, 116 | 1079 | 43 (includes also K28) | |
| 47 | Chronic liver disease and cirrhosis | B347 | 571 | K70;K73-K74 | 122, 123 | | 44 | |
| 48 | Diseases of the skin and subcutaneous tissue | B42 | 680-709 | L00-L99 | 142 | 1082 (without L99) | 45 | |
| 49 | Diseases of the musculoskeletal system/connective tissue | B43 | 710-739 | M00-M99 | 143, 144 | 1083 | 46 | |
| 50 | Diseases of the genitourinary system | B35-B37 | 580-629 | N00-N99 | 128-134 | 1084 (without N99) | 48 | CH10 |
| 51 | Complications of pregnancy and childbirth and puerperium | B38-B41 | 630-676 | O00-O99 | 135-141 | 1087 | 50 | CH11 |
| 52 | Certain conditions originating in the perinatal period | B45 | 760-779 | P00-P96 | 151-157 | 1092 | 51 | |
| 53 | Congenital malformations and chromosomal abnormalities | B44 | 740-759 | Q00-Q99 | 145-150 | 1093 | 52 | |
| 54 | Symptoms/signs/ abnormal findings/ill-defined causes | B46 | 780-799 | R00-R99 | 158-159 | 1094 | 55 | |
| 55 | Sudden and unattended death, cause unknown | | 798 | R95-R98 | | | | |
| 56 | External causes of injury and poisoning | B47-B56 | 800-999 | V01-Y89 | 160-175 | 1095 | 58 | CH17 |
| 57 | Accidents | B47-B53 | 800-929 | V01-X59 | 160-172 | | 59 | S47 |
| 58 | Transport accidents | B47 | 800-848 | V01-V99 | 160-162 | 1096 | 60 | |
| 59 | Motor vehicle traffic accidents | B471 | 810-819 | V02-V04, V09, V12-V14, V19-V79, V82-V87, V89 | 160,161 | | | |
| 60 | Accidental falls | B50 | 880-888 | W00-W19 | 166 | 1097 | 61 | |
| 61 | Accidental drowning and submersion | B521 | 910 | W65-W74 | 168 | 1098 | | |
| 62 | Exposure to smoke, fire and flames | B51 | 890-899 | X00-X09 | 167 | 1099 | | |
| 63 | Accidental poisoning | B48 | 850-869 | X40-X49 | 163, 164 | 1100 | 62 | |
| 64 | Accidental poisoning by alcohol | | 860 | X45 | 163 | | | |
| 65 | Suicide and intentional self-harm | B54 | 950-959 | X60-X84 | 173 | 1101 | 63 | |
| 66 | Homicide/assault | B55 | 960-969 | X85-Y09 | 174 (includes legal interventions E970-978) | 1102 | 64 | |
| 67 | Events of undetermined intent | B560 | 980-989 | Y10-Y34 | 175 | | 65 | |

# APPENDIX C
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