

Hypertension: the public health burden

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This section of the toolkit looks at:

- what hypertension is
- how prevalent it is
- who is most susceptible to it and why
- what effects it can have on health
- how much it costs the nation, and
- what are the main risk factors for hypertension.

What is blood pressure?

Blood pressure is the force of blood pushing through the arteries and is necessary for maintaining our circulation. With every heartbeat, the heart pumps blood through the arteries to all parts of the body.

The blood pressure rises and falls throughout each heartbeat cycle. The highest pressure in each cycle, known as the *systolic* blood pressure (SBP), occurs when the heart contracts to pump the blood. This is felt as the pulse. The lowest pressure, known as the *diastolic* blood pressure (DBP), occurs when the heart relaxes between beats and refills. Blood pressure is therefore expressed as two numbers – for example '140/90mmHg' – where 140 is the systolic pressure and 90 is the diastolic pressure. The units are millimetres of mercury (mmHg) because blood pressure has traditionally been measured using a column of mercury.

Blood pressure also varies throughout the day. It rises when a person is tense, anxious or angry, or if they physically exert themselves, and it falls when they relax, sit, lie down or go to sleep. For this reason, blood pressure is usually measured with the person sitting calmly and comfortably in a relaxed environment. This is sometimes referred to as the *resting blood pressure*. (For details on how blood pressure should be accurately measured, please refer to relevant clinical guidelines.)

Why is high blood pressure a problem?

If the resting blood pressure is persistently high, it not only puts strain on the heart but also damages the walls of the arteries, large and small, making them stiffer and more prone to clogging and haemorrhage. This causes problems in the organs they supply and leads to a number of major disorders and diseases. In general, the higher the blood pressure, the greater the risks to health.

What are the effects on health?

High blood pressure is usually symptomless and often not regarded as a disease in its own right. However, it is a major risk factor in a number of potentially fatal conditions and is also a precursor to several non-fatal but debilitating disorders.

The main potential consequences include:

- coronary heart disease (angina, heart attack)
- stroke (thrombotic and haemorrhagic)
- heart failure (heart strain – especially left ventricular)
- chronic kidney disease (including established renal failure)
- aortic aneurysm (dilated aorta with risk of massive internal haemorrhage)
- retinal disease (visual impairment), and
- peripheral vascular disease (clogged blood supply to the limbs).

In terms of the numbers of people affected, the most important group of consequences is the cardiovascular diseases (coronary heart disease, stroke, heart failure, aortic aneurysm and peripheral vascular disease).

How high is too high?

Surprisingly, there is no clear-cut answer to this. The risks associated with high blood pressure increase in parallel with a rising level of blood pressure. This increase in risk is gradual and continuous – there is no sudden step-up in risk with rising blood pressure. So drawing a line between what is 'normal' (in the sense of 'no risk' or 'low risk') and what is 'too high' is a matter for debate. Nevertheless, it is useful to have an agreed threshold (or a number of thresholds) in order to help decide between different courses of action (see *So, what is 'hypertension'?* on page 13).

Furthermore, average blood pressure levels in developed countries such as the UK are not 'normal', in the sense of 'no risk' or 'low risk' outlined above. A large-scale international study has shown that significantly increased risks of cardiovascular disease begin to appear at a level as low as 115/75mmHg.¹ This is far lower than the average adult blood pressure in the UK. For example, in England the average is 131/74mmHg for men and 126/73mmHg for women,² and there are similar average levels in Scotland, Wales and Northern Ireland – which may in part explain why the UK has relatively high rates of cardiovascular disease.

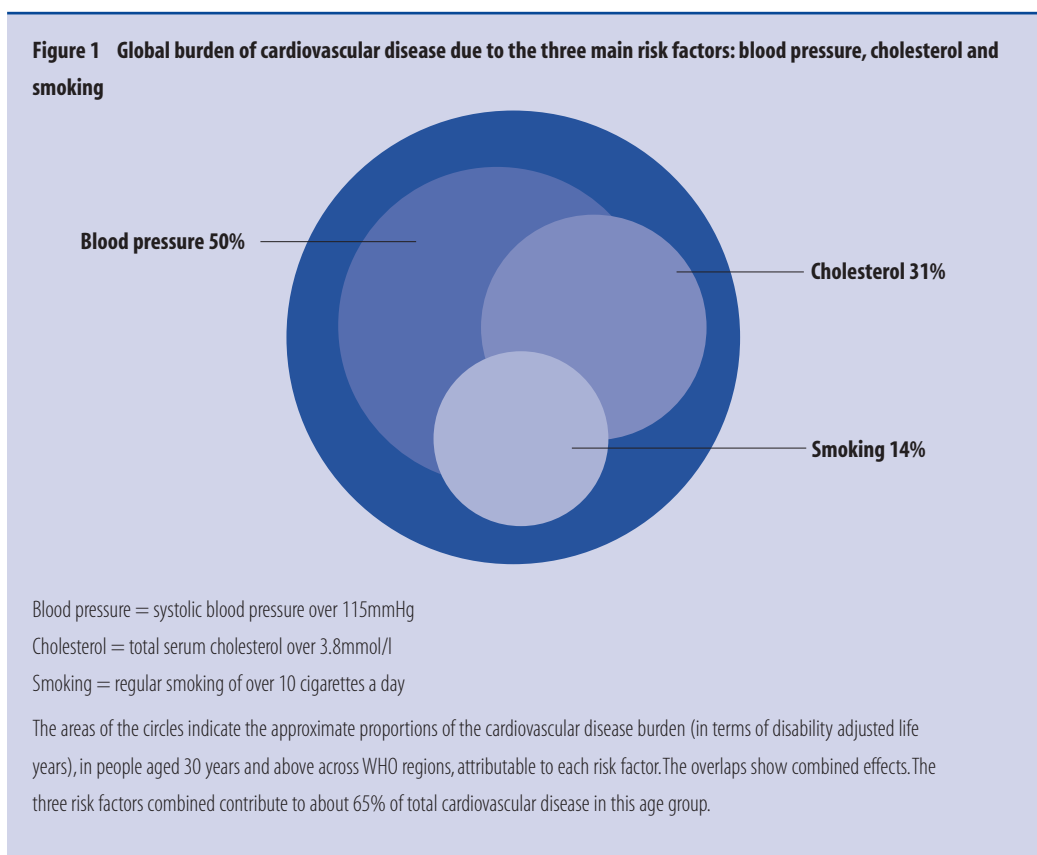
Because of the very large numbers of people involved, those with blood pressures above 115/75mmHg contribute considerably to the overall burden of blood pressure-related disease. According to the World Health Organization (WHO), the global disease burden attributable to a systolic blood pressure of 115mmHg or above is:³

- 20% of all deaths in men and 24% of all deaths in women
- 62% of strokes and 49% of coronary heart disease, and
- 11% of disability adjusted life years (DALYs).

High blood pressure is one of several risk factors for cardiovascular disease. Others include high blood cholesterol, diabetes and smoking. Combinations of these risk factors are additive. The combination of high blood pressure and diabetes is especially dangerous, doubling the risk of cardiovascular disease.⁴

Worldwide, approximately 50% of the burden of cardiovascular disease in people aged 30 years and over can be attributed to a systolic blood pressure of 115mmHg or above, 31% to high

cholesterol, and 14% to smoking (see Figure 1). These effects overlap to some extent, so that the three risk factors combined contribute to about 65% of total cardiovascular disease in this age group.³



Source: Adapted from *World Health Report: Reducing Risks, Promoting Healthy Life*. World Health Organization, 2002³

So, what is 'hypertension'?

'Hypertension' is a persistently raised blood pressure above a designated threshold. Given that the risks increase steadily with increasing blood pressure, the main purpose in having a designated level for diagnosing 'hypertension' is to indicate a threshold for a particular course of action such as whether or not to intervene medically.

Because any such threshold is arbitrary, the designated level has varied according to the recommendations of the many expert panels set up to consider the issue. In the UK, the most authoritative panels are the British Hypertension Society (BHS)⁵ and, in England and Wales, the National Institute for Clinical Excellence⁶ (NICE – now the National Institute for Health and Clinical Excellence). The Scottish Intercollegiate Guidelines Network (SIGN)⁷ has produced guidance which refers to the BHS guidelines.

This toolkit uses the definition of hypertension recommended in the current clinical guidelines of NICE⁶, BHS⁵ and SIGN⁷ – a persistent raised blood pressure of 140/90mmHg or above.

NB The thresholds for hypertension in people with Type 1 or Type 2 diabetes are slightly lower (see www.diabetes.org.uk).

Types of hypertension

Essential (or primary) hypertension

This accounts for 95% of cases of hypertension in adults in the UK. No specific underlying cause is found and it is thought to result from a genetic predisposition underlying the cumulative effects of various lifestyle factors (eg high salt intake, low levels of physical activity and increasing obesity) over many years. (See *Modifiable risk factors* on page 17.)

Around one-third of people with essential hypertension have raised systolic blood pressure only. This is known as **isolated systolic hypertension** (ISH) and is more common in older people.

The rise in systolic blood pressure with age is observed in all developed societies. Until fairly recently it was thought to be part of the normal ageing process. However, studies on economically underdeveloped societies have demonstrated that blood pressure naturally remains constant throughout life at around 110/70 mmHg.³ This suggests that the rise in systolic blood pressure with age in countries such as the UK is most likely related to lifestyle.

Secondary hypertension

This is hypertension caused by an underlying disease or as a side-effect of medication and may account for up to 5% of hypertension cases.⁶ The most common underlying disease is chronic kidney disease – but others include endocrine (hormonal) diseases, brain conditions and structural abnormalities in the cardiovascular system. Medications that can cause hypertension include some of those used to treat stomach ulcers, arthritis and depression.

Malignant (accelerated) hypertension

About 1% of people who have essential hypertension, and a higher proportion of those with secondary hypertension, develop a very high or rapidly rising blood pressure which threatens end-organ damage and requires urgent or emergency treatment.

Gestational hypertension

This occurs during pregnancy and usually returns to normal after childbirth. Women who have had gestational hypertension have a greater risk of developing hypertension later in life.⁸

‘White-coat hypertension’

‘White-coat hypertension’ is the term used for blood pressure which is high when the person sees the doctor or nurse, but is ‘normal’ at other times. It is a recognised entity separate from established essential hypertension. It appears to carry increased cardiovascular risk but at a lower level than that of essential hypertension.⁹

How many people have hypertension?

In England, 32% of men and 30% of women aged 16 years or over have hypertension (persistent raised blood pressure of 140/90mmHg or above) or are being treated for high blood pressure.² This means that, in terms of the average GP’s list of 2,000 patients, about 500 have hypertension.¹⁰ The equivalent figures for Scotland are 33% of men and 28% of women respectively.¹¹ There are no exactly comparable data available for Wales and Northern Ireland. However, in Wales 15% of adults (over 18 years) reported being treated for high blood pressure,¹² and in Northern Ireland 19% of men and 27% of women reported having been diagnosed with high blood pressure.¹³

What are the costs of hypertension?

In addition to the suffering caused to patients, carers and their families by the consequences of hypertension, there is also a considerable cost burden to the NHS, social care and the wider economy. The apportionment of costs to direct healthcare, social and informal care, and lost productivity varies from disease to disease and is methodologically complex. Calculating the proportion attributable to hypertension is even more difficult.

With regard to the two main cardiovascular consequences of hypertension – coronary heart disease and stroke – the British Heart Foundation Health Promotion Research Group has calculated the economic burden for the UK at 1999 prices.¹⁴ The total costs (direct healthcare, informal care and lost productivity) are equivalent to about £7.06 billion for coronary heart disease and £5.77 billion for stroke.

Taking into account the WHO estimates of the contribution raised blood pressure (115/75mmHg or above) makes to coronary heart disease (49%) and stroke (62%) as quoted on page 12, the total cost burden of raised blood pressure for these two diseases alone amounts to over £7 billion at 1999 prices, to say nothing of the additional costs incurred by other health consequences such as heart failure and renal disease.

Who is most at risk of hypertension?

With regard to essential (primary) hypertension, there are a number of predisposing ‘risk factors’ (see Table 1). Some of these are *unmodifiable* risk factors which are inbuilt and cannot be altered. The remaining risk factors can be modified through changes in various lifestyle habits from pre-conception onwards. The causes of other types of hypertension are mentioned above.

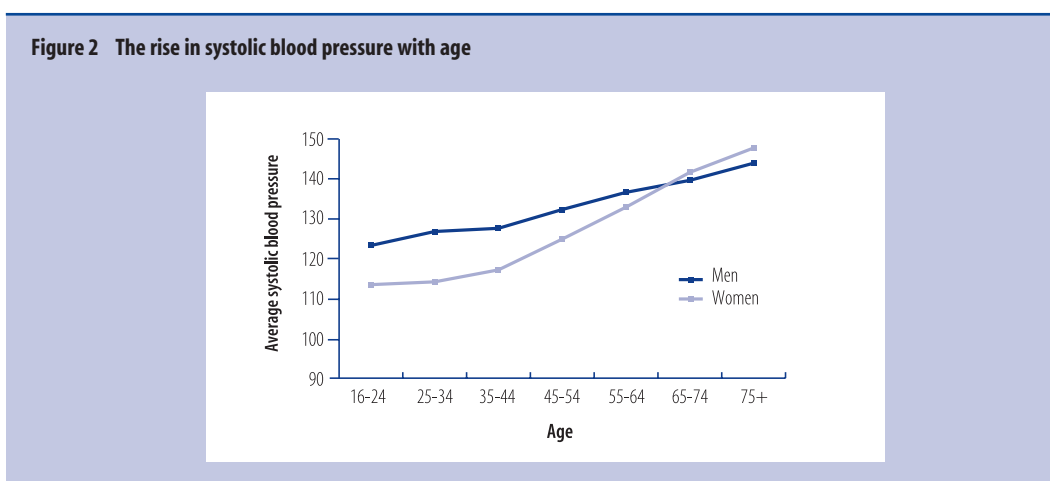
Table 1 Risk factors for developing hypertension	
Unmodifiable risk factors	Modifiable risk factors
Age and gender	Excess dietary salt
Ethnicity	Low dietary potassium
Family history	Overweight and obesity
	Physical inactivity
	Excess alcohol
	Smoking
	Cold homes
	Socioeconomic status
	Psychosocial stressors
	Diabetes
	Low birthweight
	Being formula-fed as a baby

These risk factors are explained in more detail on pages 16-21.

Unmodifiable risk factors

Age and gender

In the UK, as in other developed nations, blood pressure (particularly systolic) tends to rise with age. For example, in England, the increase in average systolic pressure between ages 16-24 years and 75 years and above is about 20mmHg (see Figure 2).



Source: Health Survey for England 2003²

The strong association in the UK between increasing age and increasing systolic blood pressure is thought to reflect the length of time that people are exposed to modifiable lifestyle risk factors such as those outlined in Table 1 on page 15.

Gender influences blood pressure differently according to age. For any given age up to about 65 years, women tend to have a lower systolic blood pressure than men. After 65 years of age, women tend to have a higher systolic blood pressure.² The cause of this difference is unknown. Diastolic pressures are about the same in both sexes for any given age.

In terms of prevalence, in England the proportion of the population with hypertension increases from 6% of men and 2% of women aged 16-24 years, to 64% in men and 64% of women aged 65-74 years.² Prevalence in Scotland also increases with age, from 10% in men and 4% in women aged 16-24 years, to 74% in men and 76% in women aged 65-74 years.¹⁵ The pattern in Wales and Northern Ireland shows a similar trend.

Ethnicity

There are differences in the prevalence of hypertension in different ethnic groups (see Table 2).

Table 2 Hypertension in ethnic groups in England	
Hypertension is MORE COMMON among:	Hypertension is LESS COMMON among:
Black Caribbean men and women	Bangladeshi men and women
Black African men and women	Chinese men
Chinese women	Irish women
Irish men	Pakistani men
Indian men and women	
Pakistani women	

Source: Health Survey for England. The Health of Ethnic Minority Groups '99¹⁶

At least some of the differences in prevalence of hypertension between ethnic groups are thought to be related to inherited differences in the way the body reacts to salt (salt-sensitivity),¹⁷ and differences in various hormones that control blood pressure (vasoactive neuropeptides) in the blood. Hypertension is also linked to diabetes which is more prevalent in certain ethnic groups such as South Asian, black African and black Caribbean communities.

Family history

Research on twins suggests that up to 40% of variability in blood pressure may be explained by genetic factors.¹⁸ However, studies in developing countries^{19,20} and in various ethnic groups²¹ suggest that genetic predisposition is relatively weak compared with the powerful influences of lifestyle and environment.

Modifiable risk factors

Excess dietary salt

Excess dietary salt (the active component of which is sodium) is the most important modifiable risk factor for hypertension. The Scientific Advisory Committee on Nutrition (SACN) concluded that: “the evidence strongly suggests an association between salt intakes and elevated blood pressure.”²²

In the UK the average adult eats around 9g of salt per day – up to three times the amount our bodies need.²³ About 65%-75% of the salt we eat comes from processed food, such as bread, breakfast cereals, soups, sauces, ready meals and biscuits.²² Other common sources of sodium in the diet include baking powder, effervescent tablets and monosodium glutamate (a flavour enhancer).²⁴

Epidemiological studies suggest the optimal level for health might be as low as 3g of salt a day – one third of the current UK intake.²⁵ However, achieving such a level is difficult and, as a population target, the daily salt intake for adults recommended by SACN is 6g (equivalent to 2.4g sodium) per day. For children, SACN recommends a range of target levels for different age groups of children (see Tool H9 on page 87).

Low dietary potassium

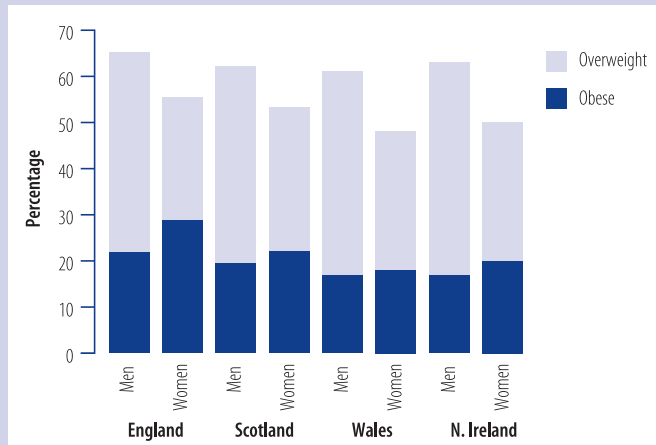
Low levels of potassium in the diet are associated with raised systolic and diastolic blood pressure. Fruit and vegetables are a good source of potassium. People in the UK on average eat only half the recommended level of at least five portions of fruit and vegetables a day.²³

Overweight and obesity

There is a strong and direct relationship between excess weight and hypertension.²⁶ Obesity multiplies the risk of developing hypertension about fourfold in men and threefold in women.²⁷

In the UK, about two-thirds of men and over half of women are either overweight (with a Body Mass Index [BMI] of 25-29.9kg/m²) or obese (with a BMI of 30kg/m² or above). (See Figure 3.) In England, the proportions categorised as obese are about one in five men and one in four women.² England also has a higher percentage of obese adults than other parts of the UK (see Figure 3). Obesity also tends to be more prevalent in manual/routine socioeconomic groups.

Figure 3 Percentages of overweight and obese adults aged 16 years and over in the UK

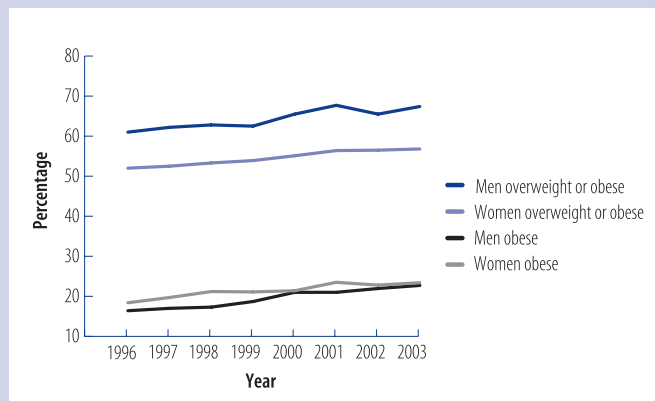


Sources: England: Health Survey for England 2003²; Scotland: Scottish Health Survey 1998¹⁵; Wales: Welsh Health Survey 2003/04²⁸; Northern Ireland: Health and Lifestyle Report 1997²⁹

Trends in overweight and obesity

Across the UK, the prevalence of overweight and obesity has increased markedly over the past decade. Figure 4 shows the trend in adults in England. Obesity in children has increased even more markedly.²

Figure 4 The rising prevalence of overweight and obesity in adults, England, 1996-2003



Source: Health Survey for England 2003²

In Wales, overweight and obesity increased from 53% of men in 1996 to 60% in 2003-04, and slightly decreased in women from 51% in 1996 to 48% in 2003-04.^{28, 30}

Figures for Scotland and Northern Ireland are not directly comparable to those for England and Wales as available data refer to different time periods. However, both countries show similar trends. In Scotland, in both men and women, the prevalence of obesity in adults aged 16-64 years increased from 16% to 20% in men and from 17% to 25% among women between 1995 and 1998.^{31, 15} In Northern Ireland, prevalence of obesity increased from 8% to 17% among men and from 16% to 20% among women between 1990 and 1997.^{32, 29}

Patterns of obesity differ between ethnic groups. Levels of obesity are much lower in Pakistani, Indian, Chinese and Bangladeshi men, and higher in black Caribbean and Pakistani women. However, in ethnic groups with low general obesity, there are often relatively high levels of central obesity (excess fat around the trunk, particularly the abdomen). Central obesity is linked to an increased risk of Type 2 diabetes and heart disease.¹⁶

Physical inactivity

People who do not take enough aerobic exercise (such as brisk walking, running, cycling, swimming or dancing) are more likely to have or to develop hypertension. Large cross-sectional and longitudinal studies have shown a direct positive correlation between habitual aerobic physical inactivity and hypertension.³³ For example, in a study following up male college alumni over many years, those who were habitually active were up to 30% less likely to have hypertension than their inactive colleagues.³⁴

Only 37% of men and 24% of women in England meet the recommended level of physical activity of a total of at least 30 minutes of at least moderate intensity activity a day on five or more days a week.² There is evidence that general activity levels are currently declining as lifestyles change. For example, between 1975-76 and 1999-2001 total miles travelled per year on foot or by bicycle fell by 26% and 24% respectively³⁵ (although these figures exclude walking and cycling for leisure). However, there has been an increase in the proportion of people who choose to be active in their leisure time.³⁶

In Scotland, 59% of men and 72% of women are not meeting the physical activity guidelines.³⁷ In Wales, 14% of adults take no exercise.²⁸ In Northern Ireland, 70% of men and 74% of women are not meeting the physical activity guidelines, and those in lower socioeconomic groups are the least likely to exercise.¹³

Excess alcohol

While a low-to-moderate habitual consumption of alcohol is associated with a lower risk of cardiovascular disease, heavy alcohol use is a well-established risk factor for hypertension and stroke. For example, a large study of almost 6,000 Scottish men aged 35-64 followed up for 21 years found that there was a strong correlation between alcohol consumption and mortality from stroke: drinkers of more than 35 units of alcohol a week doubled their risk of mortality compared with non-drinkers.³⁸

In Great Britain (England, Scotland and Wales combined) the proportion of men (aged 16 years plus) drinking more than the benchmark limit for weekly consumption (21 units for men) fell from 28% in 1998 to 27% in 2002, while in women the proportion drinking more than the benchmark for women (14 units) rose from 15% to 17%.³⁹ In Northern Ireland, 23% of men and 10% of women drink over the recommended weekly limits.²⁹

Blood pressure rises when large amounts of alcohol are consumed, in some cases to dangerous levels – particularly when ‘binge-drinking’.⁴⁰ In Great Britain there has been a marked increase in binge-drinking among young women. Between 1998 and 2002 the proportion of women aged 16-24 years who had drunk more than the ‘female binge benchmark’ of six units of alcohol on at least one day in the previous week rose from 24% to 28%. In contrast, the proportion of men aged 16-24 years drinking more than the ‘male binge benchmark’ of eight units on at least one day in the previous week fell from 39% to 35% over the same period.³⁹

Smoking

Although blood pressure rises briefly while people are smoking, any independent long-term effect on blood pressure is small.⁴¹ However, the risk of cardiovascular disease for any particular level of blood pressure is higher in smokers and strategies for hypertension should include helping people to stop smoking.

Cold homes

There are over 60,000 cold-related deaths throughout the year in the UK, and over half of these are from cardiovascular disease.⁴² In older people, blood pressure rises after two hours' exposure to temperatures of 12°C and below, and this effect may contribute to these excess deaths. In the UK around two and a quarter million people, many of them older people, are living in cold homes that they cannot afford to heat.⁴³

Socioeconomic status

Differences in the prevalence of hypertension in England have been analysed in the Health Survey for England 2003 using the new socioeconomic classification (NS-SEC). The prevalence of hypertension is highest in the lower supervisory and technical group in both men and women, and the differences between this group and the managerial and professional group are statistically significant in both sexes.²

In Scotland there is a similar pattern, with the prevalence of hypertension in women rising from 16.7% in social class I to 33.6% in social class V.¹⁵ No comparable data are available for Wales or Northern Ireland.

The social class (or manual vs non-manual) pattern differs according to ethnicity. For example, among Bangladeshi men in England there is a marked gradient with 11.7% of non-manual men compared with 26.2% of manual men having hypertension, while this difference is reversed among Bangladeshi women.¹⁶

Psychosocial stressors

In the short term, blood pressure is increased at times of 'stress'. It rises with anxiety, anger or mental effort as part of the physiological adrenalin-driven 'fight or flight' response, but decreases again once the anxiety has gone. One example of this is the 'white-coat hypertension' described on page 14.

Blood pressure may also persistently increase over a longer period in response to a wide range of stressful situations, including stress at work.⁴⁴ For example, the Whitehall II civil servants longitudinal study found that systolic and diastolic blood pressure were greater in participants reporting low job control compared with those reporting high job control, independent of sex, employment grade, body mass index, age, smoking status and physical activity.⁴⁵

Diabetes

Hypertension is more prevalent in people with Type 1 and Type 2 diabetes than in the non-diabetic population, whether or not they are overweight. With the much less common Type 1 diabetes, hypertension is mostly a consequence of kidney damage.⁴⁶ With Type 2 diabetes, the causative factor is thought to be insulin resistance or 'metabolic syndrome', but the mechanism is not fully understood.⁴⁷

In England, surveys have found the prevalence of hypertension to be as high as 70% of adults with Type 2 diabetes – with about 50% having blood pressure of 160/95mmHg or higher.⁴⁸ People who have both hypertension and Type 2 diabetes have double the risk of a cardiovascular event.⁴ The UKPDS 36 study found that the risk of diabetic complications for patients with Type 2 diabetes

was strongly associated with blood pressure.⁴⁹ Controlling blood pressure in people with diabetes who have co-existing hypertension reduces their risk of developing both end-organ damage (such as chronic kidney disease and visual impairment) and cardiovascular disease.⁵⁰

There are estimated to be around 1.8 million people with diabetes in the UK, about 85% of whom have Type 2 diabetes. As many as one million of these are undiagnosed.⁵¹

Type 2 diabetes is up to six times more common in people of South Asian origin and up to three times more common among people of black African or black Caribbean origin compared with the general population.¹⁶

The development of Type 2 diabetes, as with hypertension, is related to low physical activity levels and to overweight and obesity. Those with a BMI greater than 30 increase their risk of developing Type 2 diabetes by up to 10 times.⁵²

Low birthweight

There appears to be a direct relationship between adult hypertension and low birthweight and poor growth and development in the first year of life.⁵³ Fast catch-up growth (where small babies grow quickly in the first months of life) may also contribute to later hypertension.^{54,55} However, the contribution of low birthweight and catch-up growth to hypertension is relatively low in comparison with lifestyle influences in later life.

Being formula-fed as a baby

Babies who are exclusively formula-fed tend to have higher systolic blood pressures than breast-fed babies and this difference extends into adult life.^{56,57} The reasons for this are not known but some formula feeds can have a higher salt content than breast milk.

Summary of risk factor trends

A summary of the recent trends in adult lifestyle risk factors for hypertension is shown in Table 3.

	Timescale	Men	Women
Salt Average adult daily intake ²³	1986/87-2001/02	UP by 9%, from 10.1g to 11g	UP by 5%, from 7.7g to 8.1g
Fruit and vegetables Purchases of fresh fruit per person per week ⁵⁸ Purchases of fresh vegetables per person per week ⁵⁸	1995-2002/03	UP by 15% in both sexes from 6.9kg to 7.9kg by 2.3% in both sexes from 7.2kg to 7.4kg	
Overweight and obesity Prevalence of BMI of 25kg/m ² or above ²	1994-2003	UP from 58% to 65%	UP from 49% to 56%
Physical activity Percentage achieving recommended levels ²	1997-2003	UP from 32% to 37%	UP from 21% to 24%
Alcohol Percentage drinking more than weekly benchmark levels ³⁹	1998-2002	DOWN from 28% to 27%	UP from 15% to 17%
Diabetes Prevalence of Type 2 diabetes ²	1994-2003	UP from 2.9% to 4.8%	UP from 1.9% to 3.6%

In the next section – *Reducing the burden: tackling hypertension* – we consider some of the general principles involved in reducing the burden of hypertension.

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