# STATURE IN SCOTLAND OVER THE CENTURIES

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## INTRODUCTION

Throughout history, there have been conflicting views regarding the stature of Scots. The Classical world viewed Celts as tall, red-haired warriors who went naked into battle covered in blue tattoos.[1] Later images portray Picts as dwarves living in earth houses:

> . . . It seems strange that the aborigines should return to their dark, rude, and underground dwellings, when, as in this instance, they were almost in sight of the comparative luxury of a Roman settlement. . . [2]

Hyperbole abounded after the Wars of Independence, with William Wallace, wielding an enormous claymore, towering over his foes.[3] In later decades there was every reason for Scots to have a stunted growth as they suffered from recurrent episodes of plague and famine.[4] Popular evidence of a low stature during this period are small suits of armour (worn by sons of the nobility on ceremonial occasions), short four poster beds (cut at a later period to fit into rooms) and low door lintels (used as a defence). However, Highlanders, reviled after Culloden, were lauded as latter-day Fingals (Fingal, legend has it, was a giant who lived in Scotland) as they drove back the French at Waterloo and smashed the Russians in the thin red line at Alma.[5] However, this idealised picture has to be balanced against the Clearances and the misery and ill-health of expanding industrial centres. Reality struck home when a high proportion of Scottish volunteers for the Boer War had to be rejected because of stunted growth and malnutrition.[6]

Most of these images have a sociopolitical subtext and are, at best, grossly misleading. Over the last half century archaeologists and anthropologists, instead of casting skeletons aside in their quest for treasure, have been finding the treasure in the skeletons, and have done much to enhance information on the health and demography of past populations.

## INVESTIGATION

Several problems frustrate investigation of stature in prehistoric and historic groups:

- remains may have been cremated or destroyed by excarnation;
- acid soil is a potent cause of bone destruction in many parts of Scotland;
- funeral rites involving serial burials or excarnation may have jumbled bones;
- an imbalance of age, gender or social class often exists at a particular funerary site with multiple interments;
- over-enthusiastic antiquaries wrecked burial sites, bagging cairns in the same way as they shot pheasants; and
- farmers and quarrymen used cairns and bones as sources of stones and fertiliser.

## CALCULATION OF HEIGHT AND GENDER

Since skeletons rarely are complete, height is calculated from a formula related to the length of the long bones;[7] less reliable formulae for other bones are also available. Determination of gender is even more difficult unless several bones from the skeleton are available.[8] A wide pubic angle and wide sciatic notch at the back of the pelvis are features used to determine whether skeletons are female.

## MESOLITHIC PERIOD (8500–4000 BC)

Humans were well established in Scotland by 8500 BC.[9] They lived as hunter-gatherers, following a carefully planned route each year to maximise the range of flora and fauna available to them throughout the seasons. Sources of nutrition included red deer, wild cattle, wild boar, fish, seashells, roots, fungi, seeds, leaves, shoots, nuts and berries.[10] There are a number of large shell middens on raised beaches in Lothian (Figure 1). Oysters, which were utilised, are not a particularly rich source of nutrition but are more resistant to dissolution than most foodstuffs, hence the survival of their remains.

Although no human remains have been uncovered in Scotland for this period, remains-rich sites in Portugal suggest that the mean height of Mesolithic males was 160 cm, a figure 10 cm lower than that of males in present-day Portugal.[11] Whether there was a similar pattern in Scotland is difficult to ascertain.

## NEOLITHIC PERIOD (4000–2500 BC)

In northern and western Scotland, early farmers built standing stones and stone circles (Figure 2) and interred their dead in passages or chambered tombs.[12] Analysis of human bones from these sites has been frustrating, since many of the bones have been removed from them and the remaining bones are from several individuals mixed together. An exception to such poor material was a tomb at Isbister, Orkney, where it was possible to separate out the bones of 43 males and females out of 342 individuals.[13] The mean height of males was 170 cm (ranging from 160 cm to 178 cm), whilst that of females

**FIGURE 1**
**Site of Mesolithic shell midden on raised beach at Mumrills, near Falkirk. The sea level was about 12 m higher 10,000 years ago.**

**FIGURE 2**
**Neolithic standing stones at Lunin Links, Fife.**

was 162 cm (ranging from 147 cm to 164 cm), figures that are comparable to those of Scots in the early twentieth century.

**BRONZE AGE (2500–750 BC)**

During the Bronze Age, the dead were either cremated or buried in a crouched position in short cists,[14] which were unmarked or covered with a cairn (Figure 3). There is a particularly useful report on skeletons retrieved from 70 short cists in Scotland over many years.[15] Of course, it should be recognised that they may have been a very select group in the population, i.e. those who may have been better off. In males the mean height was 171 cm (ranging from 157 cm to 178 cm), and in women 160 cm (ranging from 156 cm to 166 cm), figures comparable with those of Scots from the mid twentieth century.

**IRON AGE AND ROMANO-BRITISH PERIOD (750 BC–AD 400)**

During the Iron Age, when people initially lived in forts, only a minority of individuals received a conventional burial (Figure 4). The ashes of many were emptied into rivers or ponds.[16] Some groups, like the Parsees and Native American tribes, disposed of their dead by excarnation. There is even evidence that body parts were sometimes buried under houses or the entrances of forts to ensure good fortune.

**FIGURE 3**
**Bronze Age cairn at North Muir, West Linton.**

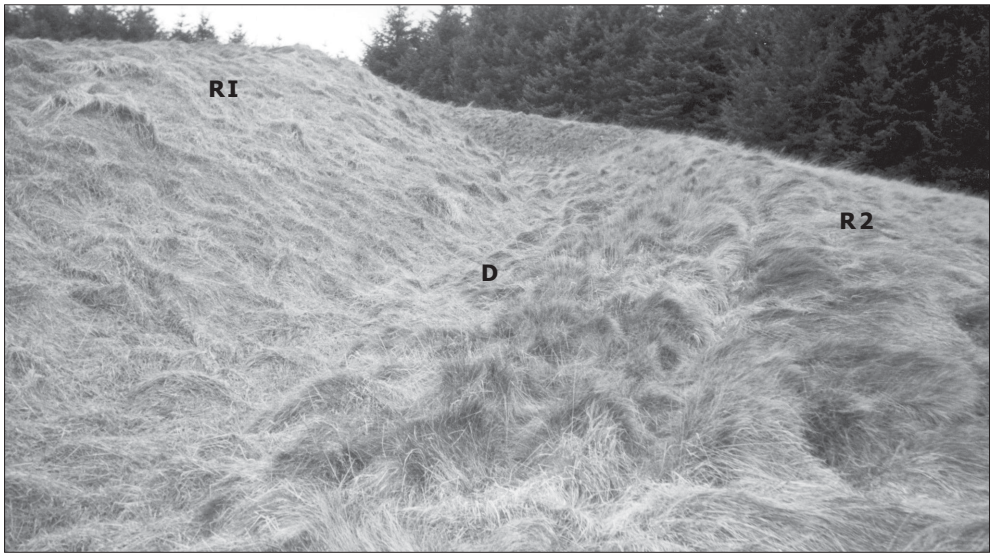


**FIGURE 4**
**Inner rampart (R1), ditch (D) and outer rampart (R2) of Iron Age settlement at Harehope Knowe, Tweeddale.**

An opportunity to study an Iron Age group arose when a large cist containing the bones of several adults and children was discovered near Dunbar, East Lothian.[17] The mean height of eight adult males was 169 cm (ranging from 164 cm to 175 cm), while the heights of two adult females were 162 cm and 154 cm, respectively. The males had heights comparable with those of men from early twentieth-century Scotland, while those of the females, while low, were within the normal limits for the same twentieth-century period.

In East Lothian, a group of bodies was buried in two long cists, several round pits and a large stone-lined cist.[18] Their bones had radio-carbon dates between AD 10 and AD 340. The heights of four females ranged between 155 cm and 162 cm, while that of one male was 183 cm. While the females were of average modern stature, the male was exceptionally tall.

**EARLY MEDIEVAL PERIOD (AD 400–1000)**

This period is characterised by a large number of long cist burials and cemeteries concentrated in Lothian and Fife. Several cemeteries have been excavated, but the acid soil has left little trace of bones.[19–22] One exception is a cemetery at Dunbar with both long cist burials and inhumations.[23] The earlier burials there were dated from between the fifth and eighth centuries. Five males from cist burials had a mean height of 170 cm (ranging from 165 cm to 175 cm), while three females had a mean height of 157 cm (ranging from 152 cm to 163 cm). Both males and females were of moderate height.

**FIGURE 5**
**Polygonal choir of Ladykirk, an early sixteenth-century church 12 km northeast of Coldstream.**

A sixth- and seventh-century cemetery was also identified at Whithorn Abbey.[24] There were 118 burials, but only five were suitable for anthropometry. These gave a mean height for four males of 176 cm (ranging from 170 cm to 179 cm); the remains of one female suggested a height of 168 cm. Although they were of above average height, they were found in a communal graveyard, making it unlikely that they came from a privileged background.

A number of Norse graves have been excavated recently. One from Knip on the Isle of Lewis contained the remains of two males and a female. The heights of the males were 162 cm and 167 cm, respectively, and that of the female was 160 cm.[25] Their low heights could be due to them being settlers, although the height of a Viking warrior found with his axe and shield at Reay, Caithness, was unremarkable.[26] At Scar, an adult male in a boat burial was much taller at 180 cm.[27] A further grave on the Isle of Lewis was that of a female with rich grave goods; despite the presence of these she had a height of only 160 cm.[28] The general lesson may be that the sample of Viking burials available is far too small to draw any demographic conclusions.

**LATE MIDDLE AGES (AD 1000–1600)**

Late Medieval monastic cemeteries are particularly rich in material, and since the local populace was buried in them they provide relatively unbiased samples (Figure 5). Whithorn had a cemetery with 1,605 skeletons for the period 1300–1450.[24] The mean stature of 103 males was 170 cm (ranging from 158 cm to 183 cm), and that for 117 females was 156 cm (ranging from 139 cm to 169 cm). As in earlier periods, the heights are comparable with those from the early part of the twentieth century.

The cemeteries from three Carmelite priories have also been investigated:[29]

- in Aberdeen, the mean height of 27 males was 168 cm (ranging from one very small individual at 153 cm to 179 cm); the mean value for ten females was 160 cm (ranging from 147 cm to 169 cm);
- in Linlithgow, the mean height for 20 males was 170 cm (ranging from 159 cm to 177 cm); the mean height of 24 females was low at 156 cm (ranging from 147 cm to 163 cm); the disparity in the height of females at the two centres suggests that those in Aberdeen may have been undernourished;
- in Perth, the only individual who could be assessed was a male with an estimated height of 170 cm.

Skeletons also were exhumed from a Medieval cemetery in Dundee.[30] Fifteen males had a mean height of 172 cm (ranging from 159 cm to 185 cm), and the average height of the 16 women was 157 cm (ranging from 145 cm to 169 cm). Like many other Late Medieval groups, the figures were comparable with those of Scots from the first half of the twentieth century.

It is likely that, as in all other periods, social class, with its corresponding better nutrition, had an effect on height. In England, the first four King Edwards and Henry VIII had heights in excess of 185 cm. The skeleton of Robert the Bruce measured 182 cm, while Mary Queen of Scots was over 180 cm in height. An element of selection may exist in that perhaps only individuals with an exceptional height may have been mentioned.

**SEVENTEENTH AND EIGHTEENTH CENTURIES**

Little scientific information exists about the stature of

**FIGURE 6**

**Military hospital in Edinburgh Castle; this was opened as a hospital in 1897. It previously had been used as an Ordinance depot in the eighteenth century. During the latter part of the nineteenth century there was a marked improvement in the healthcare of soldiers.**

Scots during this period. Most individuals were buried in churchyards that are still in use, and therefore their remains have not been exhumed. This is unfortunate from a data collection point of view, since there were many episodes of famine during this period, and the resulting measurements of people buried at this time would have provided interesting data.[31] The worst famine started in 1695 and lasted for four years. Many died of hunger, and in at least one parish there was a five-fold increase in mortality. People dropped dead in the streets, the milk of nursing mothers dried up, respectable householders had to beg for food and individuals dragged themselves and their relatives to graveyards to ensure a Christian burial. The socio-economic conditions prevalent during this period probably had an effect on the stature of a large cohort of infants and children.

By the mid eighteenth century, most farmers and dependants lived well above subsistence and, with the efforts of landlord 'improvers', there was a dramatic increase in animal and vegetable output, which in turn led to a better level of nutrition in the population.

**NINETEENTH CENTURY**

The most accessible sources for the heights of men in the nineteenth century are army records kept at various army hospitals (Figure 6). One such record gives details of British recruits to the East India Company Army between 1815 and 1860.[32] Wellington's labelling of his soldiers as 'the scum of the earth' was a deliberate exaggeration. Between 27% and 49% of recruits to the East India Company Army had been labourers, the remainder having worked as weavers, tailors, builders, farm workers, traders, metal workers, miners and 'literate workers'. The one important cause of bias is that the Company imposed a minimum standard of height. The authors of the report devised a mathematical factor to correct for this, however.[32]

On this basis, the mean height of Scottish males between 1814 and 1819 was 172 cm, falling to 170 cm between 1839 and 1841, rising to 173 cm between 1847 and 1850 and falling to 167 cm between 1858 and 1860. The last figure may have been particularly low due to increased recruitment from industrial areas, where people were less well nourished, and the effects of famine and the Western Highland potato blight in the 1830s and 1840s. Despite these variations, the mean height of Scots was up to 0·5cm more than that of their Irish counterparts and 2·7 cm more than that of their English ones.

Another study reviewed the heights of males in Great Britain in 1870.[33] This was biased in that most subjects were rural workers, criminals, mental patients or military recruits. This gave the mean height for Scottish males as 171 cm compared with 169 cm for the English.

In 1883, the Anthropometric Commission of the British Society for the Advancement in Science conducted a similar survey, reporting that the mean height of Scottish males was 175 cm compared with 171 cm for the English.[34] There is no information on the selection of subjects, so this sample may have been just as biased as the earlier one.

**TWENTIETH CENTURY**

Most data for this period have been collected from samples that came from the whole of Great Britain. In the Army, mean heights remained static at 169 cm in 1910 and 168 cm in 1917/18, with a progressive increase to 171

cm in 1939, 172 cm in 1951, 173 cm in 1961 and 174 cm in 1971.[35]

The pattern was repeated in civilian life;[36] the heights of 27,515 males in industrial work in 1930 was compared with those of 10,863 steel workers at Port Talbot in 1965. The mean height of those aged 20–24 years was 170 cm in 1930, rising to 174 cm in 1965. Over the same period the mean height of those aged 60–64 years rose from 167 cm to 169 cm.

Material from the second half of the twentieth century was collected from individuals aged between 45 and 64 years in Renfrew.[37] Out of a total of 15,411, the mean heights of males aged 45–49 years and 60–64 years were 171 cm and 168 cm, respectively, and of females in the same age groups 159 cm and 156 cm, respectively.

**DISCUSSION**

Major limitations exist in the scant material available for investigating the heights of individuals from Mesolithic through to early Medieval times. No skeletons remain from the Mesolithic period in Scotland, and it would be a mistake to rely on data gathered from overseas in order to extrapolate data for Scotland. Some Neolithic and Bronze Age burials have been analysed, but since most burial sites were destroyed, or skeletons dissolved, the remaining samples must by inference be heavily biased. The strange practices in Iron Age burials mean that the little material available must be highly suspect in terms of selectivity. Many early Medieval cemeteries have been identified, but an adverse environment means that most bony remains have been dissolved. Material from late Middle Age monastic settlements is more reliable in that more people were buried in them, more skeletons have survived and (apart from the aristocracy) individuals from all walks of life were buried in the same place.

Although the heights from Neolithic burials in Orkney are comparable with those of the early twentieth century, the sample was from a small area and thus such data may not apply to Scotland in general. Bones from Bronze Age cists provide a more representative, although small, sample, and indicate heights similar to those of the early twentieth century. The small number of burials available from the Iron Age and Romano-British period confounds reliable interpretation. Although the males buried at Dunbar and elsewhere in East Lothian were of 'above average' height, the unusual nature of their graves suggests that they were a specially selected group.

The small number of surviving skeletons from the fifth to eleventh centuries once more raises the issue as to how representative they were of the general population. As in other periods, there were sites – such as the Anglican chapel at Whithorn and the Viking boat burial in Orkney – where the height of males may have been influenced by their aristocratic and better nourished status.

The heights of males and females in Late Medieval cemeteries were also similar to those of the early twentieth century. In most monastic cemeteries the majority of interments came from the general population, so there should have been no particular bias.

There is a frustrating gap in data for the seventeenth and eighteenth centuries in Scotland. It is difficult to believe that the recurrent famines of the late seventeenth century did not have some effect on the height of the early eighteenth century general populace. A useful study from England reviewed 987 interments in a church crypt between 1750 and 1850. This gave mean heights of 168 cm for men and 155 cm for women, figures similar to those of the early twentieth century for men but marginally low for women.[38]

In the nineteenth century, details on the heights of Army recruits produce useful information on whether or not there were changes in height over this period. Review of occupational details prior to enlistment suggests that the recruits were reasonably representative of the working and middle classes. An obvious deficiency is that there were no women in the sample. It appears that the heights in the East India Company Army remained steady until 1850. The subsequent reduction in height might have been due to adverse conditions in the industrial parts of the country. An alternative explanation is that there could have been a change in recruitment patterns. The greater initial height of Scots could be the reflection of a high proportion recruited from rural areas.[39] This advantage was lost with an increase in the proportion recruited from towns.

In the second half of the twentieth century, there has been a progressive increase in the heights of both males and females. However, it is of some concern that this has been accompanied by a disproportionate increase in the body mass index.[36] In some areas of deprivation, such as the industrial west of Scotland, there has been less evidence of a change in stature.

It is surprising that, over several thousand years of warfare, infection and famine, the stature of the people of Scotland has remained much the same over the centuries to the present day. There can be no doubt that poor nutrition can influence growth. In Kenya, it was recorded that a low maternal height and a reduced increase in weight during pregnancy delayed a child's first five years of growth.[40] Even in the US, the amount of dietary energy and protein affects the peak growth velocity of adolescents.[41] Chronic ill health also affects growth, particularly where this is combined with poor nutrition.[42]

Height is also influenced by genetic determinants. The increased height of individuals with rich grave goods, and of Medieval royalty, is unlikely to have been due to

diet alone. In a Finnish study on a cohort of twins, there was a high heritability for height in both males and females.[43] The relative effects of genetics, nutrition and poor health have not been untangled.

**CONCLUSION**

Despite the horrific conditions under which our predecessors lived and worked, their stature appears to have been much the same as that of Scots at the beginning of the twentieth century. It may be argued that this observation is due to inadequate and heavily biased data; if so, however, it is unlikely that there would have been such a consistent pattern from the Neolithic period onwards. Being distinguished and wealthy seems to go with a high stature, but it remains to be seen whether this is due to genetic inheritance or a good diet. One of the most astonishing features of the late twentieth century has been the rapid increase in the height of young people. Many mildly staturally challenged individuals like myself sometimes feel that we have woken up in Gulliver's Brobdingnag. Lest we develop too much of an inferiority complex, let us remember that Alexander the Great created his great Hellenic Empire by the age of 30 – with a mere stature of 152 cm![44]

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