Skeletons in the cupboard: what a human bone specialist can tell from your bones

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After excavation, human bone is generally handed to a specialist for a detailed skeletal report. The archaeologist should have some idea of the information he requires from this analysis, and should also be aware of the limitations of the material.

The normal approach of the specialist is to give a basic report on age, sex, general physical characteristics, genetic traits and pathology. It is possible to carry out increasingly sophisticated scientific tests on bone (e.g. for dietary analysis, DNA, age estimation, dating), but these are not normally carried out unless specifically required by the archaeologist, and then only by research specialists.

The work of the specialist

To begin with, measurements of the bones are taken whenever possible. This involves recording the lengths of long bones, sometimes the diameters or circumferences of certain parts of these, and a number of measurements of the skull and jaw. The actual measurements taken vary according to the specialist concerned, but the method of taking them is standardized as far as possible. A number of indices are calculated to allow groupings to be made, particularly in the case of skulls. The main purpose of these measurements and indices is to ease comparison within and between populations.

Age at death in children is usually estimated from the stage of eruption or formation of the teeth, the lengths of the long bones, or epiphyseal fusion (the ends of long bones fuse to the shafts at different times). If one or more of these methods is possible, the age of a child can usually be estimated to within one or two years.

Adult age at death is not so easy to estimate, and becomes increasingly difficult past the age of c.30 years. Once the teeth are fully erupted, age can be estimated from standard tooth wear charts, although the rate of wear is dependent on the type of food as well as the age. Most charts allow for an estimate of age within ten year periods. Another method is to use the changes which occur at the pubic symphsis (the joint at the front of the pelvis). This is generally ridged in the young adult, and becomes progressively smoother with age (other changes are also taken into consideration). However, this part of the skeleton is rarely preserved in ancient skeletons, and the method is very difficult to use accurately when it is. The stage of fusion of the cranial sutures was used in the past, but this method is no longer thought to be accurate. The general appearance of the bones may suggest a basic age category, particularly if arthritic changes or other signs of aging are present. Evidence from recent work on the documented skeletons from Spitalfields in London, suggests that many of the skeletal ageing techniques commonly used by human bone specialists produce inaccurate results. It seems that we may be underestimating the age at death of adults by some decades, the greatest problem concerning the older members of a skeletal population. Often the best the specialist can do is to suggest that an individual was young, middle-aged or old, since to provide more detailed estimates would be misleading.

Sex can only be estimated in the adult skeleton. It may be possible to suggest the sex of a "teenager", but this should always be regarded as a tentative assessment. The most sexually diagnostic bones in the human skeleton are those which make up the pelvis. A typical female pelvis is low and bowl-shaped with a wide sciatic notch and sub-pubic angle. A male pelvis should be narrow and tall with a narrow sciatic notch and sub-pubic angle. The skull is also a useful indicator of sex, the male skull having a generally more robust appearance than the female, with large brow ridges and muscle attachments. In practice, of course, the differences are not so clear cut. Large bones with heavy muscle markings are

likely to be male, but in past societies women were just as likely as men to be involved in heavy muscle-building work. Nothing should be taken for granted, and as many sex indicators as possible have to be used.

Stature is estimated using a series of regression equations. Those most generally used were calculated from recent American war dead and may not be applicable to ancient populations. They are, however, the best we have at present. They can only be used if at least one intact long bone is present, from which the maximum or total length is taken. Leg bones are preferable, since arm bones do not contribute to height, but the latter can be used if no leg bones are available. Given a choice of bones, the equation with the lowest standard deviation is used. Taking an average of three or four different bones is not recommended, due to the extra error this involves.

Non-metric traits are traits which are recorded on a present or absent basis because they are generally too small to measure. A number of these have been found to be congenital in origin and can be used to suggest family relationships in large cemeteries. The retention of the metopic suture (which divides the front of the skull and is usually fused by the age of 6) into adulthood is a particularly good example, having been found in adjacent skeletons in a number of cemeteries.

Palaeopathology is perhaps the most interesting branch of the specialist's work. It is also the most specialised and difficult to learn. Many palaeopathologists are (or have been) qualified medical doctors, but even with their training one bone disease in a dry bone can look very much like another. It may be possible to give some idea of the type of disease involved and a suggestion of its cause, but it is generally impossible to give an indication of the cause of death. Rarely, the skeleton may show signs of an unhealed injury or surgical intervention, but it is always possible that the individual died from a heart attack or a separate soft tissue injury.

The most common diseases to be seen in the human skeleton are tooth decay and periodontal disease, closely followed by osteoarthritis. Chronic infections may reach the bone, the most easily diagnosable being leprosy, syphilis and tuberculosis. Physical trauma is quite common, particularly in the form of torn muscle attachments and fractures. Other diseases include inflammation of the sinuses (sinusitis), various cancerous growths or erosions, congenital malformations and anaemia. The many diseases which are assumed to be common in the past, such as measles, influenza, cholera and typhoid, do not affect the bone (usually because they kill so quickly). It is likely that these and other similar illnesses caused the death of many of the younger individuals we find.

The Results

Once all the biological evidence has been collected, it has to be interpreted taking into account the limitations imposed on the data by the methods used. The most useful information for the archaeologist is the demographical profile of the site. This will provide information on the minimum number of individuals, the infant mortality, sex ratios (which unfortunately cannot include the children), and life expectancy. If the length of use of the site is known, it may even be possible to estimate the size of the population from which the cemetery is drawn, although this is not normal practice.