Belinda Speed and Kundisai Dembetembe tell *QUEST* how important the hand is in forensic investigations.

**What do your bones say about you?**
Do you ever wonder what your skeleton could say about you 100 years from now? That is the job of the forensic anthropologist. Through careful observation and measurement it is possible to reconstruct your life story, whether it is from a whole skeleton or from a simple X-ray. From bones, we can tell sex, age, healed and recent fractures and sometimes also areas of infection on the bone. Even habits such as smoking or activities like weight-lifting leave evidence on the skeleton. Despite all these fascinating research areas, our specific research focus has been on using the skeleton for age estimation of South Africans.

**Why do we need to know the age of an individual?**
It is easy to tell someone’s age when you have their birth certificate or identity document available. But what happens when there is no documentation? One option would be to measure the person’s weight and height and match the results to a growth chart. The growth chart plots your weight and height against a known standard and these measurements correspond to your age. Unfortunately, this is more useful in infants and young children, and is difficult to apply to teenagers and young adults because weight tends to fluctuate.

For teenagers and young adults, the question is not whether they are growing more but whether they are developing ‘normally’. To do this we use standards relating to the development of the skeleton and we use what we know about bone development to estimate age more carefully.

**Why is this important?**
Estimating age helps to narrow down the search categories of missing persons and even confirm identity of missing persons. It is also used if the unknown person has committed a crime and the judge must decide whether to prosecute them as an adult or a juvenile. Such cases sometimes involve the trials of child soldiers. A recent application of this type of age estimation is to catch ‘age-cheats’. These are sportsmen/women who pretend to be younger than they are in order to compete in regional, national or even international events. In many cases it is in the athlete’s best interest to claim to be younger than they really are as that means that they can compete for longer. In other words, they are employed for a longer period before they have to retire.

**How do we estimate age?**
The easiest method involves taking an X-ray image of the hand and wrist. This X-ray image or radiograph shows the degree of development of the bones in the wrist, palm and fingers. There are 30 different areas in the hand and wrist that can be used by the anthropologist to estimate age (as shown in the picture). Each of them develops at a different time and age, from the time you are born, until about 18 years of age.

We compare this radiograph to standard radiographs from children of known ages. We look at the standard which is the closest match in terms of bone size and the level of fusion between the ends of certain bones and their respective shafts.

One such set of standard radiographs used for estimating age is the Greulich and Pyle ‘Radiographic Atlas of Skeletal Development of the Hand and Wrist’. The standard provides an estimate of age, based on the development of certain bones, for cases where the age of an individual is unknown.

**What does the research say about skeletal maturation in South Africans?**
Recently it has been found that, during their growing years, South Africans develop at a different rate to other populations. More specifically, we differ from North Americans – the sample group on which the Greulich and Pyle standards are based.

Children under the age of 14 years have such varied development (some develop much faster or slower than others), that the Greulich and Pyle standard does not estimate age correctly. The Greulich and Pyle standard tends to underestimate age for older South Africans (over the age of 14 years), meaning that the standard will show age to be 14 years when the individual is actually 16 years old chronologically. Because of this discrepancy it is essential for us to create new standards that are more applicable to the South African population so that age estimates are accurate. The hand and
what these bones tell us

wrist region is still useful to estimate age, but the method which is currently being used is not.

Belinda Speed has honours in Biological Anthropology from UCT and an MSC in Applied Anatomy. Her masters research showed that the age estimation method used since the 1950s is not applicable to South African children.

Kundisal Dembete has an MSC in Anatomy from UCT. Her research focused on testing applications of the Greulich and Pyle Atlas methods for estimating skeletal age in a population of

Above left: A child having an X-ray taken of her hand. Image: www.medicinenet.com
Above: Radiograph (b) shows boy X, who suffered a broken finger. We estimated his age by comparing his radiograph (b) to two radiographs from the Greulich and Pyle age estimation standards shown in (a) and (c). From that we concluded that he must be 19 years old as shown in (c). His chronological age was actually 16 years and 4 months, in which case we would expect his hand to look more like 13 years old in radiograph (a). Boy X's bones look older than his birth certificate says he is. Image: Belinda Speed and Kundisal Dembete

African ancestry. She currently works as a forensic anthropologist, specialising in human rights cases.