Research on the Prehistoric Population Age Structure in the Middle and Lower Reaches of the Yellow River Valley

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Key words: Yellow River valley; population age structure; development of social complexity

The age structure of populations comprises an important component of the general character of populations and can reflect social development. On the basis of archaeologically excavated burial data which have been systematically sorted through, the age structure of prehistoric populations from the Middle and Lower reaches of the Yellow River valley can be examined preliminarily. In order to facilitate this research, we consider a static model of population wherein the yearly birth rate matches the death rate. Accordingly, over a period of time the population does not change. In this way the population data from burials directly reflects the population structure of the living society. Furthermore, in order for the results of analysis to be statistically meaningful, we choose cemeteries from which the identifiable individuals number more that 20. Moreover, on the basis of systematically combing through the human osteology data from cemeteries, we divide up the age data for populations into the following groups: Children (0–14 years of age), Young (15–25), Prime (26–35), Middle Age (36–50), and Elderly (above 50). Adults are considered those above 15 years of age. (All of the data discussed herein come from published tables in excavation reports).

Statistics from the Data on Prehistoric Population Age Structure

1. Peiligang period population age structure

There are three cemeteries in the Middle and Lower reaches of the Yellow River valley from the Peiligang period for which cemetery data have been published: Jiahu, Shigu, and Baijiacun. In Figures 1, 2 and 3 we can see the Peiligang period aggregate population age structure for individuals of different sexes. The average age of individuals during the Peiligang period is 33.1 years for all individuals, 39.7 for males and 33.0 for females. One phenomenon that should be made clear at this point is that in prehistory, the treatment accorded to individu-

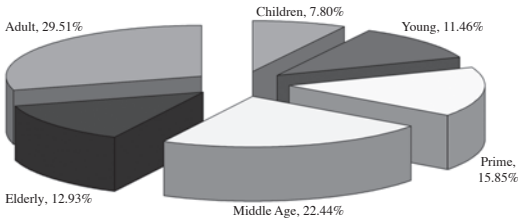

Figure 1. The burial population age structure in the Peiligang period

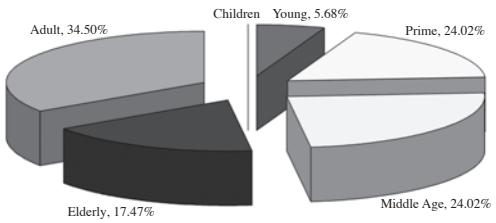

Figure 2. The male burial population age structure in the Peiligang period

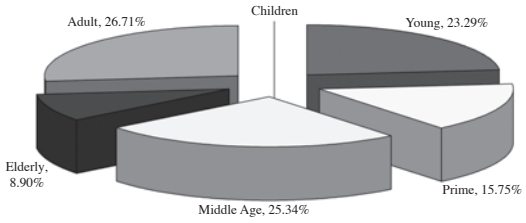

Figure 3. The female burial population age structure in the Peiligang period

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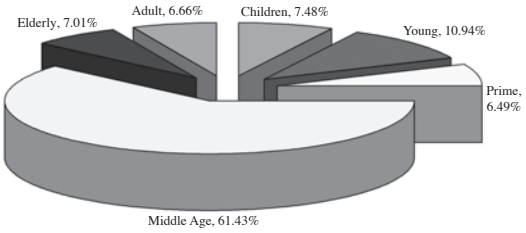

Figure 4. The burial population age structure in the Yangshao period

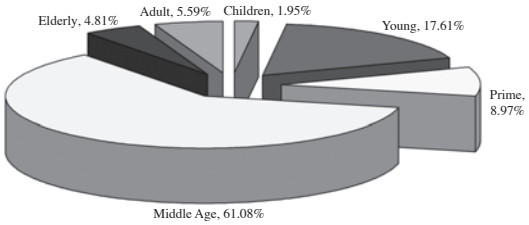

Figure 5. The male burial population age structure in the Yangshao period

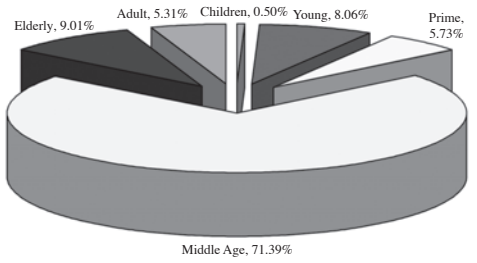

Figure 6. The female burial population age structure in the Yangshao period

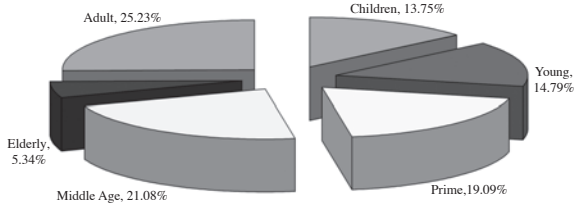

Figure 7. The burial population age structure in the Dawenkou period

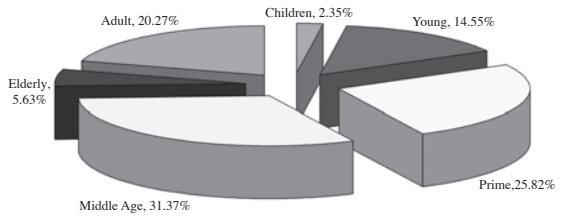

Figure 8. The male burial population age structure in the Dawenkou period

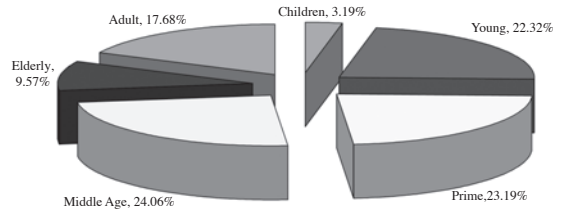

Figure 9. The female burial population age structure in the Dawenkou period

als of different ages is not necessarily the same. Infants in particular are often buried separately from adults. In the Middle and Lower reaches of the Yellow River valley, most excavated prehistoric cemeteries were created for adults, and it is quite possible that the majority of child burials have not been found. We can see clearly from the statistical data that the percentage of child burials is quite low. In order to make the results of analysis closer to the actual prehistoric situation, it is important to compensate for the paucity of children. According to previous research, in prehistoric populations children typically comprise about 40% of the death populations. If we use this estimate to determine the number of children and then reexamine the resulting Peiligang population data we produce an average population age of 24.2 years. Males average 25.0 years and females 22.1 years. The death rate of Peiligang individuals can be determined according to the formula, b (or m)=$1/e^0$‰, where e is the average age in the population. In this case, the resulting data (1/24.2 = 41.4‰) indicates that the death rate for the Peiligang period is 41.4%. Divided by sex, the death rate for males is b (or m) = $1/e^0$‰ = 1/24.99 = 40.01‰ and for females it's b (or m): $1/e^0$‰ = 1/22.09 = 45.27‰.

2. Yangshao population age structure

For the Yangshao period, specimens from 13 burial grounds have undergone systematic identification. These include: Yuanjunmiao, Beishouling, Jiangzhai, Longgangsi, Hengzhen, Hejiawan, Fulinbao, Shijia, Lüjiaya, Xiawanggang, Wangwan, Dahecun, and Hongshanmiao M1. Figures 4, 5 and 6 show the aggregate population age structure for the Yangshao period based on data from these sites as well as the age structure for each sex. The average age at death for the Yangshao population is 34.1 years, with males averaging 38.7 and females 34.2 years. If we add an appropriate proportion of children to the overall population, the average age at death is reduced to 20.0 years and the male and female averages are 27.1 and 25.3 years respectively. Accordingly, the Yangshao period death rate is calculated as b (or m) = $1/e^0$‰ = 1/25.03 = 39.95‰. For males the death rate is b (or m) = $1/e^0$‰ = 1/27.09 = 36.91‰, and for females it is b (or m) = $1/e^0$‰ = 1/25.29 = 39.54‰.

As for the Dawenkou -culture, a total of 13 cemeteries have produced systematic osteological data that are appropriate for the approach discussed here.

These 13 localities are: Dawenkou, Dadunzi, Liulin, Jianxin, Fujia, Wucun, Chengzi, Wangyin, Yuchisi, Yedian, Sanlihe, Xixiahou, and Huating. Figures 7, 8, and 9 show the the population age structure for the Dawenkou period in aggregate and for each sex. The average age at death for the Dawenkou population is 27.5 years. The average age for males is 33.9 and for females the average is 32.3. If we once again adjust for the under-representation of children, the overall average age at death drops to 23.0 years, and the male and female averages drop to 23.5 and 22.9 years respectively. The death rate for Dawenkou populations is calculated as b (or m) = $1/e^0_0$ = 1/22.99 = 43.5‰ in aggregate, b (or m) = $1/e^0_0$ = 1/23.5 = 42.55‰ for males, and b (or m) = $1/e^0_0$ = 1/22.89 = 43.69‰ for females.

3. Our analysis of Longshan period population age structure relies on systematically collected data on human remains collected from five sites: Wangwan, Dahecun, Sanlihe, Yinjiacheng, and Chengzi. Figures 10, 11, and 12 show the population age structure for the total Longshan population and for the population broken down by sex. The average age at death in these Longshan communities was 32.4 years, with males averaging 35.4 years and females 32.3. Adjusting the population structure for the missing children we get an age at death for the aggregate population of 21.6, and averages of 23.4 and 24.3 for males and females respectively. The resulting Longshan death rate is b (or m) = $1/e^0_0$ = 1/21.59 = 46.32‰ for the total population, b (or m) = $1/e^0_0$ = 1/23.99 = 41.68‰ for males and b (or m) = $1/e^0_0$ = 1/24.27 = 41.2‰ for females.

4. The last period that we will consider is the Erlitou era, which is more or less contemporaneous with the Xia period known from historical documents. Sites from this period are far fewer in number than the Longshan era and accordingly cemeteries from this period are also less common. Only the data from the site of Xinzhou Youyao satisfy the statistical requirements for use in this discussion. Figures 13, 14 and 15 show the aggregate population age structure and the structure of males and females for the collection of burials at Youyao. The average age at death at Youyao is 28.5 years, and the average ages for males and females are 33.7 and 25.9 respectively. Adjusting these data to account for the under-representation of children, the aggregate age is reduced to 21.9, and the males and females ages are reduced to 22.6 and

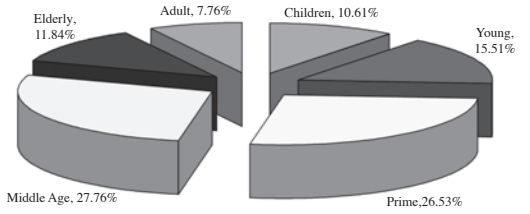

Figure 10. The burial population age structure in the Longshan period

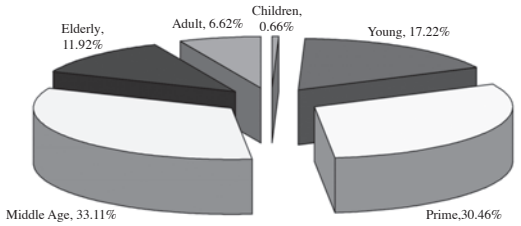

Figure 11. The male burial population age structure in the Longshan period

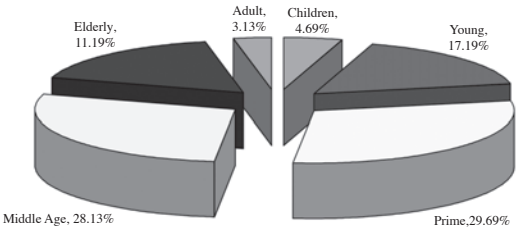

Figure 12. The female burial population age structure in the Longshan period

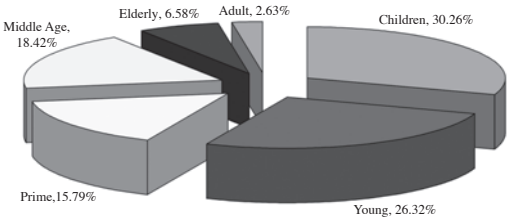

Figure 13. The burial population age structure in the Erlitou period

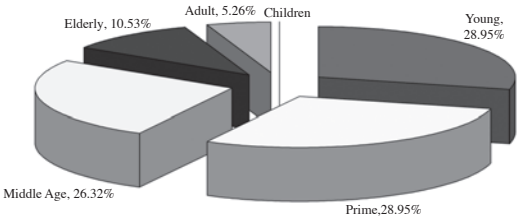

Figure 14. The male burial population age structure in the Erlitou period

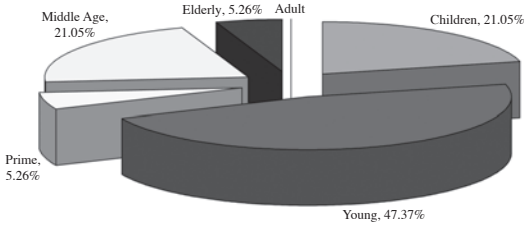

Figure 15. The female burial population age structure in the Erlitou period

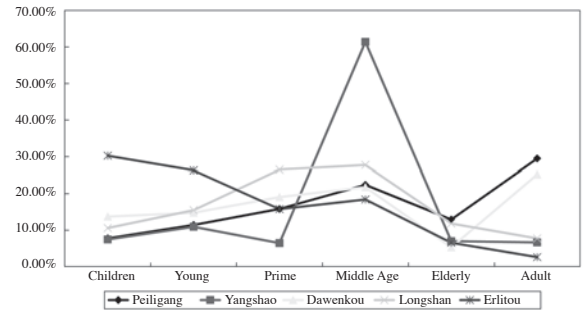

Figure 16. The compare pattern in the population age structure in the prehistoric period in the Middle and Lower Yellow River valleys

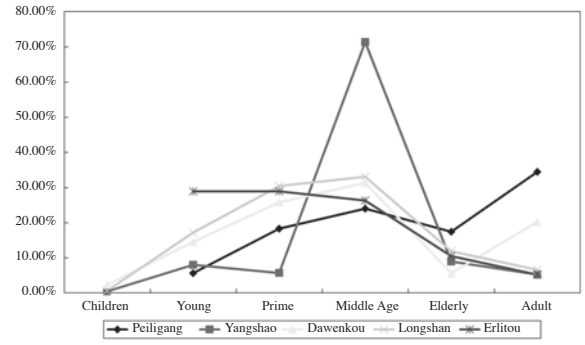

Figure 17. The compare pattern in the male population age structure in the prehistoric period in the Middle and Lower Yellow River valleys

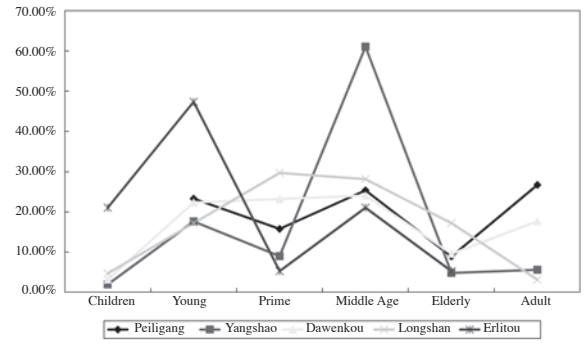

Figure 18. The compare pattern in the female population age structure in the prehistoric period in the Middle and Lower Yellow River valleys

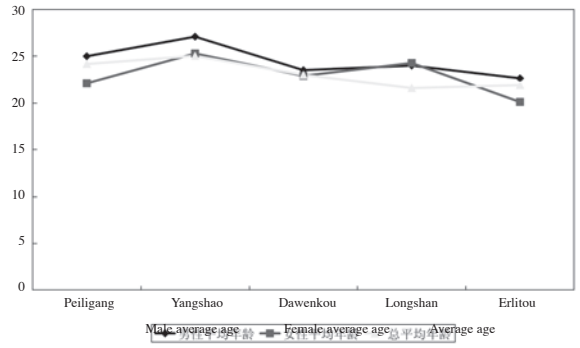

Figure 19. The compare pattern in the population average age structure in the prehistoric period in the Middle and Lower Yellow River valleys

20.1 respectively. These data result in death rates for Youyao of b (or m) = $1/e^0_0$ = 1/21.91 = 45.64‰ for the complete population, b (or m) = $1/e^0_0$ = 1/22.63 = 44.19‰ for males, and b (or m) = $1/e^0_0$ = 1/20.1 = 49.75‰ for females.

The Basic Characteristics of Prehistoric Population Age Structure

In the previous section we discussed the population age structure for the Middle and Lower reaches of the Yellow River valley according to chronological period. In Figure 16 we see clearly the high degree of change in the death rate of the prehistoric population of this region when we do not include the child death rate in calculations. When we do not include the child death rate, the proportion of dead made up by children is the highest in the overall population age structure while the patterns of other age groups do not change. So it is the case that the analysis of population age structure in the Yellow River valley not only illustrates chronological change, it also shows characteristics of the different times. At this point, an important question that remains to be answered is whether the one cemetery from the Erlitou period is representative of patterns from that time, and whether other data can be discovered that can verify the patterns from that site.

In order to compare clearly the patterns in the population age structure for different sexes for each time period, we can observe the data in Figures 17 and 18. In these figures we see clear differences between males and females in each period. Based on the data on population age structure in the Middle and Lower Yellow River valley, we can see that in some ways the situation in different time periods is rather similar. For example, in all cases the proportion of children is high while the proportion of elderly is low. In other ways there are chronological differences such as the rise in proportion of youth and prime age individuals over time.

Usually studies of the age structure of populations are based on an evaluation of the average age in the population. This is because the average age is a useful method for determining the age situation in a population. Based on an analysis of the average age of the population in different time periods in the Middle and Lower Yellow River valley, we can see that the Longshan period average age is the lowest, and the average age during the Yangshao period is highest, after which the average decreases. The trends in average age for the different sexes is similar to the tendency of the population as a whole, but the average age for

females is lower than that for males. This situation can be observed clearly on Figure 19 where we see that the curve depicting the change over time in the average age of females lies between that of males and the line for the overall population.

Discussing Issues That Prehistoric Population Age Structures Reflect

Not only is there a change over time in the overall population age structure in the region of the Middle and Lower Yellow River valley, there are also changes in the age structure of each sex. These patterns of change influenced the reproduction rate of prehistoric populations and to a degree established the sex ratio within the population. We conducted analysis of the unequal sex ratio of prehistoric populations in the Middle and Lower reaches of the Yellow River valley. Based on this analysis we see that the population age structure, particularly the female age structure, has an important effect on the unequal sex ratio. We can say that the high death rate among female children and youth directly brought about the unequal prehistoric sex ratio. This unequal sex ratio, namely the predominance of males in the population, determined the nature of marriage in the associated societies. It was not possible, given the sex ratio, for marriage patterns to be monogamous, and even less possible that one man would take many wives. Instead, in order to mitigate the potential social crisis that would result from this population structure, it is probable that the society instituted the phenomenon of one wife with many husbands. The above describes one influence that population age structure has on a society's marriage patterns, something that will vary depending on the social situation.

That the population age structure of the prehistoric communities in the Middle and Lower reaches of the Yellow River valley could influence marriage patterns demonstrates how it could influence the stability and development of society in general. Likewise, the population age structure could also influence changes in the development process. This type of influence was concentrated on changes in the age at death of individuals in the prehistoric population. Surveying the direction of change in the age category with the highest death rate within the prehistoric populations of this region, we see that the age category tends to decrease over time. This trend exactly parallels the development of complex society. Prehistoric society developed through the Longshan and Erlitou periods and concomitantly the substance of social complexity also developed. Many scholars consider this period the time when society entered the stage of "civilization." Social stratification emerged at this time and the degree of private ownership caused an increased in conflict aimed at the forceful seizure of wealth. The most direct effect of such conflict was on the increased death rate, particularly among those youth and prime age individuals who took part in the conflict. Up to the present, our analysis of the population age structure for the Middle and Lower reaches of the Yellow River valley proves this point. Although we cannot state this completely firmly, it seems that when all is said and done, changes in the population age structure in the region were predicated upon conflict, and these changes were consistent with the development of complex society.

According to the above data we can achieve a preliminary understanding of the relationship between prehistoric age structure and social complexity. However, this relationship remains rather crude and broad. In order to understand the internal developments within society, clarify processes of social change, and elucidate the interrelationships between population and social structure, we still need to improve our methods for researching population structure and age structure of prehistoric groups.

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