Demographic Structure of the Human Skeletal Remains from the Ikenohata-Shichikencho Site, Tokyo

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Abstract The purposes of this study are to estimate the age and sex of the human skeletal remains from the Ikenohata-shichikencho site; to reconstruct the demographic features of the Edo people; and to discuss whether the materials represent the demographic structure of the Edo people. This study analyzes the right pelvic bones of 394 individuals from the Ikenohata-shichikencho site, which are adult individuals of 15 years of age or above. The sex of 391 adult individuals was determined, resulting in 235 men and 156 women. In the age-at-death distribution of 371 individuals above the age of 60. The sexual difference in the finding that females have a significantly younger death distribution than males could reflect the general living population of the Edo people. However, death tends to be concentrated in young individuals and thus the proportion of elderly individuals is very low. The reconstructed age-at-death distribution may include the methodological fault that leads to the systematic underestimation of age in elderly adults. If so, this denies the possibility that the age-at-death distribution of the Ikenohata-shichikencho sample represents the reality of the living population.

Key words: Auricular surface, Age at death, Sex, Edo, Japan

Introduction

The early modern Edo period is a segment of Japanese history during which the Tokugawa Shogunate governed the country from 1603 to 1867. In the Edo period, the social structure was stratified with "samurai" or warriors at the top, then farmers, technical laborers, and finally merchants at the bottom. Below the merchants, there were the lowest classes of the low: i.e., "eta hinin" or butchers and non-humans. The feudal capital, Edo (now Tokyo), became a major city with the population of approximately one million. Archaeological sites of Edo yielded thousands of human skeletal remains. Most preceding studies of Edo skeletons have focused on the phylogenetic and paleopathological perspectives (e.g., Suzuki, 1969, 1985; Suzuki, 1978; Nagaoka, 2003), but there are also a few paleodemographic studies (e.g., Kobayashi, 1967). Kobayashi

(1967) examined 166 skeletons mainly from Buddhist temples of Fukagawa, Tokyo, and showed a 10-year shorter lifespan of the inhabitants of Edo than historical census records (*shumon-aratamecho*) (Kobayashi, 1956; Kito, 2000) or a National census in the 19th and 20th centuries (Ministry of Health, Labour and Welfare, n.d.). There is a question as to whether the materials utilized in previous studies represent the demographic structure of the Edo people or not.

A paleodemographic study using new specimens will provide more information to reconstruct the life history pattern of the Edo Japanese. Recently, the Ikenohata-shichikencho site located in Tokyo have yielded about six hundreds of human skeletal remains. The purposes of this study are three: first, to estimate the age and sex of the skeletons from the Ikenohata-shichikencho site; second, to reconstruct the demographic features of the Edo people; and, finally, to discuss



Fig. 1. Map of Japan showing the location of the Ikenohata-shichikencho site.

whether the Ikenohata-shichikencho sample represents the demographic structure of the Edo people. Furthermore, this study presents basic data on the age and sex estimation of each individual, which forms the basis for future studies on the osteology of the Edo Japanese.

Materials

The materials used in this study are composed of human skeletal remains from the Ikenohatashichikencho site (Figure 1). The Ikenohatashichikencho site is located in Taito-ku, Tokyo, Japan. The excavation was undertaken between 1993 and 1995, and yielded about six hundreds of graves which belong to the period from the late 17th to the 19th centuries. The graves represented samurai and townsmen, known from the fact that the burials contained ceramic coffins (kamekan) and wooden coffins (mokkan) that were used for samurai and commoners, respectively (Omata, 1997). They are kept at the Department of Anthropology, National Museum of Nature and Science, Tokyo.

This study analyzes the right pelvic bones of 394 individuals, adults aged 15 years or above. If the right side could not be observed, the left side of the same individual was substituted. In this study, the term "adult" includes individuals aged 15-19. Subadult skeletons aged 14 years or under were excluded based on the dental development (Ubelaker, 1989) and the degree of ossification and epiphyseal union of the pelvis (Brothwell, 1981). The exclusion of such skeletons circumvents the unavoidable problems of infant underrepresentation in skeletal populations. Kobayashi (1967: 110) stated, "Skeletons of infants and children in the collection were too scanty in general to reveal any appropriate level of pre-adult mortality. Age data from pre-adult skeletons whose ages were estimated at under 15 years were, therefore, excluded."

The Edo data used for comparison are a skeletal population (Kobayashi, 1967) and historical census records (*shumon-aratamecho*) (Kobayashi, 1956). The historical census record refines the



Fig. 2. Age stage 1 of the auricular surface of the ilium (No. 4/599 Futaue/B1).



Fig. 3. Age stage 3 of the auricular surface of the ilium (No. 70/808/B1).



Fig. 4. Age stage 6 of the auricular surface of the ilium (No. 89/919/C8).



Fig. 5. Age stage 8 of the auricular surface of the ilium (No. 15/343/B3).

understanding of the life history of the Edo people in a way that the author cannot reconstruct from skeletal evidence alone.

Methods

Uniformitarian hypothesis

The estimation of age and sex is based on the uniformitarian hypothesis according to which the biological processes related to aging and sexual dimorphism were the same in the past as in the present (Weiss, 1973; Howell, 1976; Hoppa, 2002; Chamberlain, 2006).

Age-at-death estimation

The materials used in the age-at-death estimation consist of the iliac auricular surfaces of adult individuals aged 15 years or above. Because of the excellent preservation of the auricular surfaces (Waldron, 1987; Stojanowski *et al.*, 2002), demographic analysis based thereupon yields reliable results. This study, therefore, excluded individuals whose auricular surfaces could not be observed because of poor preservation, abnormality, or pathological changes. In particular, this study estimated the age at death only for individuals with more than 50% of the auricular surfaces intact.

Age estimation based on the auricular surfaces was performed using the technique of Lovejoy et al. (1985), who established eight modal age stages according to the chronological metamorphosis of transverse organization, density, apical change, retroauricular area, and porosity (Figures 2-5). Sexual differences were not observed in auricular surface age estimation (Lovejoy et al., 1985; Murray and Murray, 1991). The method of Lovejoy et al. (1985) relies on published age group data based on the auricular surface examination: the age groups 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-59, and 60+ correspond to the eight modal stages. The age groups employed in this analysis are five that were made by combining the original eight age groups: -30, 30-39, 40-49, 50-59, and 60+. Here, the age group of -30 includes individuals aged 15–19 that Lovejoy et al. (1985) do not include in the

original age groups.

The method of Lovejoy *et al.* (1985) is subject to intra- and inter-observer scoring error (Saunders *et al.*, 1992). Therefore, the author made observations of auricular surfaces twice during a period of three months. The skeletal individuals recorded with discrepancies between the two observations were observed once again. Color photographs were taken of all auricular surfaces and were used for checking observation consistency. To avoid inter-observer error, only the author recorded age markers.

Sex determination

Sex determination of individuals was carried out based on macroscopic assessment of pelvic features: ventral arc, subpubic concavity, and medial aspect of the ischiopubic ramus (Phenice, 1969); greater sciatic notch, preauricular sulcus, composite arch, inferior pelvis, and ischiopubic proportion (Bruzek, 2002).

Statistic analysis

Statistical analysis was performed using statistical package R 1.1.1 (Ihaka and Gentleman, 1996).

Results

Table 1 shows the number of adults for each of Lovejoy's eight stages of the auricular surface. The distribution among the eight indicator stages of 371 individuals is, in order, 84, 54, 79, 71, 46, 17, 12, and 8 (Table 1). The sex of 391 adult individuals was determined: 235 men and 156 women (Table 1). In the age-at-death distribution of individuals aged 15 years or above there is a peak around the age groups of -30 and 30-39, and only 8 individuals are above the age of 60 (Figure 6; Table 1). A comparison of the proportion of dead individuals between males and females suggests that the death of females was concentrated in the age group of -30; on the other hand, the death of males was concentrated in the age group of 30-39 (Figure 7; Table 2). Females show a significantly younger death distribution than males (Mann-Whitney U-test, P < 0.01).

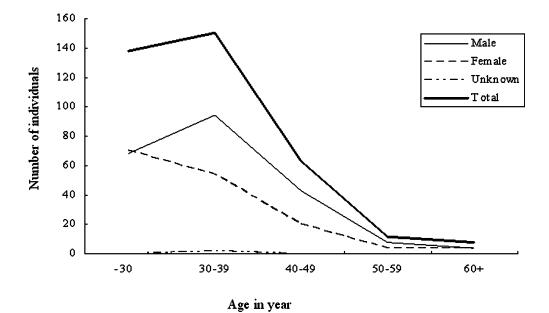


Fig. 6. Number of individuals in each age group of the Ikenohata-shichikencho site.

Table 1. Number of individuals associated with each of the eight auricular surface stages¹.

Stage	Male	Female	Unknown	Total
1	41	43	0	84
2	27	27	0	54
3	49	29	1	79
4	45	25	1	71
5	31	15	0	46
6	12	5	0	17
7	8	4	0	12
8	4	4	0	8
Unknown	18	4	1	23
Total	235	156	3	394

¹Lovejoy et al. (1985)

Discussion

Sex ratio

A sex ratio of 235 males to 156 females means that for every adult female there were 1.5 adult males. According to Eshed *et al.* (2004), the overrepresentation of males can be explained as follows. First, the factors related to taphonomy and burial practices distort the sex ratio of a skeletal population. Second, the overrepresentation of males represents the real living population, and sex-selective infanticide and other cultural practices yield an excess of males over females. As for the Ikenohata-shichikencho sample, the latter explanation is plausible, because sex-selective infanticide of female children was prevalent during the Edo period (Hanley, 1997), and Edo attracted people from the peripheral rural areas (Kito, 2000). The immigration of males could strengthen the biased sex ratio.

Reconstruction of adult age-at-death distribution from human skeletal remains

Sexual difference of the age-at-death distribution According to the study of historical census records, it has been demonstrated that females had a shorter lifespan than males, and that the mortality of females was centered on the ages of 20–40, which corresponds to the reproductive period (Kito, 2000). This study indicated that the mortality of females was centered on the age group of -30, and that females had a significantly younger death distribution than males (Figures 6 and 7). The sexual difference of the age at death distribution of the Ikenohata-shichikencho sample could reflect the real demographic profile of the early modern Japanese, and the higher mortality of females could be explained by the risk of reproduction.



Fig. 7. Comparison of percentage of dead individuals in each sex for Ikenohata-shichikencho.

Table 2. Age distribution of individuals aged 15 years and above from the Ikenohata-shichiken-cho site.

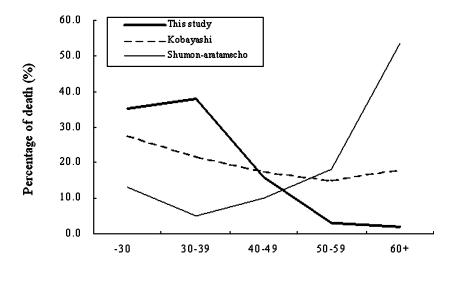
Number of individuals							
Age in year	Male	Female	Unknown	Total			
-30	68	70	0	138			
30-39	94	54	2	150			
40-49	43	20	0	63			
50-59	8	4	0	12			
60 +	4	4	0	8			
Unknown	18	4	1	23			
Total	235	156	3	394			
	Perc	entage exp	pression				
Age in year	Male	Female	Unknown	Total			
-30	28.9	44.9	0.0	35.0			
30-39	40.0	34.6	66.7	38.1			
40-49	18.3	12.8	0.0	16.0			
50-59	3.4	2.6	0.0	3.0			
60 +	1.7	2.6	0.0	2.0			
Unknown	7.7	2.6	33.3	5.8			
Total	100.0	100.0	100.0	100.0			

Methodological problems Figure 8 and Table 3 compare the age distributions for the data of the Ikenohata-shichikencho sample, Kobayashi's skeletal population (Kobayashi, 1967), and *shumon-aratamecho*, i.e., historical census record

(Kobayashi, 1956). The age distribution of the Ikenohata-shichikencho sample shows a significantly younger distribution of deaths than Kobayashi's skeletal population (Mann-Whitney U-test, P<0.001) and *shumon-aratamecho* (Mann-Whitney U-test, P<0.001). The Ikenohata-shichikencho sample yields a peak of individuals around the age groups of -30 and 30–39, and there are few individuals above the age of 60. Kobayashi's skeletal population shows an age distribution with a low proportion of individuals over 60 years. However, *shumon-aratamecho* has a peak for individuals in the age group of 60+.

Does the age-at-death distribution of the Ikenohata-shichikencho sample represent the real living population of the Edo period?

In preceding studies of paleodemography, adult age-at-death distributions obtained from skeletal samples are often different from the distributions recorded in historically documented populations (e.g., Howell, 1982; Chamberlain, 2006; Storey, 2007). Deaths tend to be concentrated in young individuals and thus the proportion of elderly individuals is very low (e.g., Kobayashi, 1967; Lovejoy *et al.*, 1977; Nagaoka *et al.*, 2006). According to Howell (1982: 263), "the unusual and implausible features of the



Age in year

Fig. 8. Comparison of percentage of dead individuals in each age group from among the data of Ikenohatashichikencho with Kobayashi's skeletal population (Kobayashi, 1967), and the historical census record (*shu-mon-aratamecho*) (Kobayashi, 1956).

	Number of individuals						
Age in year	This study	Kobayashi (Kobayashi, 1967)	Shumon-aratamecho (Kobayashi, 1956)				
-30	138	46	16				
30-39	150	36	6				
40-49	63	29	12				
50-59	12	25	22				
60+	8	30	65				
Unknown	23	0	0				
Total	394	166	121				
		Percentage expression					
Age in year	This study	Kobayashi (Kobayashi, 1967)	Shumon-aratamecho (Kobayashi, 1956)				
-30	35.0	27.7	13.2				
30–39	38.1	21.7	5.0				
40-49	16.0	17.5	9.9				
50-59	3.0	15.1	18.2				
60+	2.0	18.1	53.7				
Unknown	5.8	0.0	0.0				
Total	100.0	100.0	100.0				

Table 3. Comparison of age distributions of individuals aged 15 years and above for the Edo populations.

skeletal population structure can be interpreted as direct evidence of severe living conditions, or alternatively, as a caution that the skeletal population structure may include sources of error or bias."

To be sure, the possibility that the age-at-death distribution of the Ikenohata-shichikencho sample reflects the reality cannot completely be rejected, but the validity of age estimation techniques has been questioned (Bocquet-Appel and Masset, 1982, 1985, 1996; Buikstra and Konigsberg, 1985; Horowitz et al., 1988; Mensforth, 1990; Konigsberg and Frankenberg, 1992; Buckberry and Chamberlain, 2002). First, the method of Lovejoy et al. itself has a basic problem, according to Buckberry and Chamberlain (2002: 232), who have stated, "The separate features of the auricular surface described by Lovejoy et al. (1985), such as porosity, surface texture, and marginal changes, appear to develop independently of each other. The age of onset for each stage of different features of the auricular surface appears to vary, and as a consequence the 5-year age categories of Lovejoy et al. (1985) tend to overlap." Second, and more importantly, the underestimation of ages of older adults has been criticized in the last three decades (Bocquet-Appel and Masset, 1982, 1985, 1996; Buikstra and Konigsberg, 1985; Horowitz et al., 1988; Mensforth, 1990; Konigsberg and Frankenberg, 1992). A reconstructed age-at-death distribution may include the methodological fault that leads to the systematic underestimation of age in elderly adults.

If the above criticisms of the paleodemographic methodologies are correct, they and the present comparison with the historical census record deny the possibility that the Ikenohata-shichikencho sample represents the reality of the living population, and also suggests that Kobayashi's (1967) skeletal age distribution with a low proportion of individuals over 60 years has a methodological fault.

As stated above, the inaccuracy of the adult age estimation of human skeletal remains has been a persistent problem in paleodemography. However, the paleodemographic studies are not necessarily pessimistic. This is because recent advancements in paleodemography have improved the age estimation of skeletal remains. Buckberry and Chamberlain (2002), who criticized the methodology of Lovejoy et al., proposed a revised quantitative system of 5-19 composite scores according to five morphological traits of the auricular surface: transverse organization, surface texture, microporosity, macroporosity, and apical change. More importantly, Buckberry and Chamberlain (2002) employed the Bayesian theorem using uniform priors to provide posterior probabilities, by age and auricular surface stage, which allow us to approximate the actual age distribution of adults from an archaeological sample. The Bayesian theorem "allows the calculation of the probability of age conditional on the stage of the age indicator, and the probability of a skeleton being a particular age at death, given the stage of the indicator" (Storey, 2007: 41). Nagaoka et al. (n.d.) examined the iliac auricular surfaces of the Jomon people using the revised method of Buckberry and Chamberlain (2002), and indicated an important finding: the revised method improves the accuracy of age estimation for elderly individuals, and affords new perspectives to reconstruct the life history pattern of a past archaeological population. In the future, additional studies using the revised method are needed to reconstruct the demographic profile of the Ikenohata-shichikencho sample.

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Specimen	Side	Sex	Age stage of the auricular surface of the ilium ¹	Estimated age based on the auricular surface of the ilium	Preservation of the auricular surface of the ilium	Other traits of the pelvic bones
1/178/B1	Right	Male	_	-	Poorly preserved	
2/274/B2	Right	Female	4	30-39		
2/368/B1	Right	Male	5	40-49		
2/418/B5	Right	Male	5	40-49		
3/372/B1	Right	Female	2	-30	D l	Enisternal and an effet all a const
3/372/B1	Right	Male	_	_	Poorly preserved	Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
3/380/B2	Right	Male	4	30-39		and the isemai tuberosity are not fused.
4/431/B2	Right	Male	2	-30		
4/599 Futaue/B1a	Right	Female?	1	-30		Epiphyseal unions of the iliac crest
5/201/D2	D: 1.	F 1		20		and the ischial tuberosit are not fused.
5/381/B3 5/524/B1	Right Right	Female Male	1	-30 -30		
5/562/B1	Right	Male	5	-50 40-49		
6/162/B2	Right	Male	5	40-49		
6/599/B1	Right	Male	2	-30		
7/172/B2	Right	Male	2	-30		
7/173/B2	Right	Male	3	30-39		
8/175/B2	Right	Male	1	-30		
8/213/B2	Right	Male	1	-30		
9/342/B2	Right	Female	4	30-39		
9/361/B2	Right	Female	4	30-39		
9/373/B2	Right	Male Male	4	30-39		
10/378/B2 10/503/B2	Right Right	Female?	4 5	30–39 40–49		
11/498/B2	Right	Male	4	30-39		
11/516/B2	Right	Male	3	30-39		
11/547/B2	Right	Female	1	-30		Epiphyseal unions of the iliac crest
						and the ischial tuberosity are not fused.
12/563/B2	Right	Male	1	-30		
13/243/B3	Right	Male	5	40-49		
13/246/B3	Right	Male	1	-30		Epiphyseal unions of the iliac crest
13/601/B2	Right	Female	4	30-39		and the ischial tuberosity are not fused.
14/245/B3	Right	Male	5	40-49		
14/245 Soto/B3	Right	Male	8	60+		Presence of bony bridge in the sacroiliac
	8					joint.
14/256/B3	Right	Male	3	30-39		
14/435/B3	Right	Male	4	30-39		
15/260/B3	Right	Male	1	-30	The side side is	
15/343/B3	Left	Male	8	60+	The right side is poorly preserved. The left side is substituted.	
16/415/B4	Right	Female	3	30-39		
16/489/B3	Right	Male	1	-30		
16/565/B3	Right	Female?	2	-30		
17/478/B4 17/479/B4	Right Right	Male Female	3 5	30–39 40–49		
17/506/B4	Right	Male	3	30-39		
17/506/B4	Right	Male	3	30-39		
18/459/B4	Right	Female	1	-30		
18/577/B4	Right	Male	3	30-39		
18/592/B4	Left	Male	5	40-49	The right side is poorly preserved. The left side is substituted.	
19/583/B4	Right	Male	5	40-49		
19/614/bd	Right	Male	3	30-39		
19/726/B4	Right	Female	3	30-39		
20/416/B5	Right	Male	3	30-39		
21/625/B6	Right	Female	4	30-39		
21/720/B2 21/851/B4	Right Right	Female Female	5 3	40-49 30-39		
	Right	Male	3	30-39		
	Right	Female	3	30-39		
22/364/C1a	Kigin		3	30-39		
	Right	Male	5			
22/364/C1a 22/369/C1 23/366/C1 23/384/C1	Right Right	Female	3	30-39		
22/364/C1a 22/369/C1 23/366/C1 23/384/C1 24/455/C1	Right Right Right	Female Male	3 1	-30		
22/364/C1a 22/369/C1 23/366/C1 23/384/C1 24/455/C1 24/495/C1	Right Right Right Right	Female Male Female	3 1 3	-30 30-39		
22/364/C1a 22/369/C1 23/366/C1 23/384/C1 24/455/C1 24/495/C1 24/495/C1	Right Right Right Right Right	Female Male Female Female	3 1 3 1	-30 30-39 -30		
22/364/C1a 22/369/C1 23/366/C1 23/384/C1 24/455/C1 24/495/C1 24/499/C1 25/150/C2a	Right Right Right Right Right Right	Female Male Female Female Female	3 1 3 1 4	-30 30-39 -30 30-39		
22/364/C1a 22/369/C1 23/366/C1 23/384/C1 24/455/C1 24/495/C1 24/495/C1	Right Right Right Right Right	Female Male Female Female	3 1 3 1	-30 30-39 -30		

Appendix 1: Estimation of age and sex of each individual from the Ikenohata-shichikencho site

Appendix 1:	(Continued)
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Specimen	Side	Sex	Age stage of the auricular surface of the ilium ¹	Estimated age based on the auricular surface of the ilium	Preservation of the auricular surface of the ilium	Other traits of the pelvic bones
26/566/C1	Left	Female	3	30–39	The right side is poorly preserved. The left side is substituted.	
27/142/C2	Right	Male	4	30-39		
27/147/C2	Right	Female	5	40-49		
28/148/C2	Left	Male	5	40-49	The right side is poorly preserved. The left side is substituted.	
28/155/C2	Right	Male	-	-	Poorly preserved	Presence of bony bridge in the sacroiliad joint.
28/159/C2	Right	Female	4	30-39		Jonni
9/157/C2	Right	Female	2	-30		
9/338/C2	Right	Male	5	40-49		
0/388 Futaue/C2	Right	Male	2	-30		
0/388/C2	Right	Male	1	-30		
0/399/C2	Right	Female	1	-30		
1/390/C2	Right	Male	4	30-39		
1/395/C2	Right	Male	4	30-39		
2/214/C2	Right	Female?	5	40-49		
2/432/C2	Right	Male	_	-	Poorly preserved	
2/461/C2	Right	Female?	4	30-39		
3/398/C2	Right	Female	4	30-39		
3/404/C2	Right	Male	2	-30		
4/392/C2	Right	Male	3	30-39		
4/467/C2	Right	Male	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
4/484/C2	Right	Male	4	30-39		
5/485/C2	Right	Male	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
5/493/C2	Right	Male	4	30-39		
5/494/C2	Right	Female	3	30-39		
561/B1	Right	Male	2	-30		
5/22/C3	Right	Male	3	30-39		
5/23/C3 5/23/C3	Right Right	Male Female	2		Poorly preserved	Epiphyseal union of the iliac crest is no
7/352/C3	Right	Male	3	30-39		fused.
7/424/C3	Right	Unknown	3	30-39		
8/471/C3	Right	Female	3	30-39		
8/472/C3	Right	Female	4	30-39		
8/474/C3	Right	Male	4	30-39		
9/324/C3	Right	Male	3	30-39		
9/325/C3	Right	Female	1	-30		Epiphyseal union of the iliac crest is no fused.
0/209/D3	Right	Male	5	40-49		
D/326/C3	Right	Female	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
0/327/C3	Right	Male	4	30-39		
0/331/C3	Right	Male	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
1/356/C4	Right	Male	6	40-49		
2/411 Futaue/C4	Right	Male	4	30-39		
2/457/C4 2/457 Futa/C4	Right Right	Female Female	1 3	-30 30-39		Epiphyseal unions of the iliac crest and
3/615/C4	Right	Male	3	30-39		the ischial tuberosity are not fused.
4/400/C3	Right	Female	1	-30		
4/719/C4	Right	Male	1	-30		
5/420/C5	Right	Male	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
5/594/C5	Right	Female	4	30-39		
6/137/D2	Right	Female	5	40-49		
6/262/D3 7/134/D2	Right Right	Female Female	3	30–39	Poorly preserved	Epiphyseal union of the ischial tuberosi
7/344/D2	Right	Female	1	-30		is not fused.
8/335/D1	Right	Female	8	-30 60+		
8/609/B6	Right	Male	3	30-39		
8/616/B6	Right	Male	8	60+		
9/Ikkatsu/B2	Right	Male	5	40-49		
0/569/B7	Right	Male	3	30-39		
and the second sec						Entrelation of the literation of the literation of the
1/522Naihokei	Right	Female	1	-30		Epiphyseal unions of the iliac crest and

Appendix 1: (0	Continued)
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Specimen	Side	Sex	Age stage of the auricular surface of the ilium ¹	Estimated age based on the auricular surface of the ilium	Preservation of the auricular surface of the ilium	Other traits of the pelvic bones
51/522 Nai	Right	Female	2	-30		
Ikkatsu/B7 Part 2 51/522 Nai	Dight	Famala	2	20		
Ikkatsu/B7 Part 2	Right	Female	2	-30		
51/522/B7	Right	Male	1	-30		
52/570/B7	Right	Male	-	-		Presence of bony bridge in the sacroilia
	8					joint.
52/604/B7	Right	Female	8	60+		
52/605/B7	Right	Female	1	-30		
53/639/B7	Right	Female	1	-30		Epiphyseal union of the iliac crest is not
53/640/B7	Right	Male	1	-30		crest is not fused. Epiphyseal unions of the iliac crest and
33/040/D/	Kigin	Iviale	1	-30		the ischial tuberosity are not fused.
54/641/B7	Right	Male	1	-30		Epiphyseal unions of the iliac crest and
	8		-			the ischial tuberosity are not fused.
54/705/B7	Right	Male	1	-30		Epiphyseal unions of the iliac crest,
	-					the Y-shaped cartilage, and the ischial
						tuberosity are not fused.
54/769/B7	Right	Female	3	30-39		
55/665/B7	Right	Female	1	-30		
55/767/B7 55/931/B7	Right Right	Female Male	3	30-39 -30		
56/809/B7	Right	Female	2	-30 -30		Epiphyseal unions of the iliac crest,
50/007/27	reight	Tennare	2	50		the Y-shaped cartilage, and the ischial tuberosity are not fused.
56/810/B7	Right	Male	7	50-59		2
57/261/C7	Right	Female	3	30-39		
57/916/B7	Right	Female	2	-30		
57/946/B7	Right	Female	3	30-39		
58/529/C7	Right	Male	4	30-39		
58/531/C7 59/571/C7	Right Right	Male Male	8	60+ 40-49		
59/633/C7	Right	Female	0	40-49		Epiphyseal unions of the iliac crest,
59/055/07	Right	remaie				the Y-shaped cartilage, and the ischial tuberosity are not fused.
59/635/C7	Right	Male	1	-30		
60/646/C7	Left	Female	4	30–39	The right side is poorly preserved. The left side is substituted.	
60/688/C7	Right	Female	1	-30		
60/875/C7	Right	Male?	1	-30		
60/882/C7	Right	Female	8	60+		
61/312/B8	Right	Female	1	30-		
61/854/C7	Right	Female	7 3	50-59		Painhard Indian (the life and is and
62/309/B8	Right	Male	3	30-39		Epiphyseal union of the iliac crest is not fused.
63/313/B8	Right	Female	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
63/315/B8	Right	Female	4	30-39		2
63/316/B8	Right	Male	7	50-59		
63/318/B8	Right	Male	3	30-39		
64/317/B8	Right	Female	3	30–39 30–39		
64/536/B8 64/537/B8	Right Right	Female Male	3 5	30-39 40-49		
65/653/B8	Right	Female	3	30-39		
65/654/B8	Right	Male	5	40-49		
66/654 Nantou	Right	Male	_	_		Presence of bony bridge in the sacroiliad
Ikkatsu/B8	-					joint.
66/757/B8	Right	Female	4	30–39		
67/721/B8 Part 2	Right	Male	- 2	20 20	Poorly preserved	
67/737/B8 68/722/B8	Right Right	Male Male	3 7	30–39 50–59		
68/738/B8	Right	Male	7	50-59 50-59		
68/738/B8	Right	Male	_	-	Poorly preserved	
68/739/B8	Right	Male	_	_	Poorly preserved	
69/779/B8	Left	Male	6	40-49	The right side is poorly preserved. The left side is substituted.	
69/780/B8	Right	Male	2	-30	substituted.	
69/876/B8	Right	Male	4	30-39		
70/808/B8	Right	Female	3	30-39		
70/808/B8	Right	Male	3	30-39		
70/808/B8	Right	Female	5	40-49		

Appendix 1:	(Continued)	
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Specimen	Side	Sex	Age stage of the auricular surface of the ilium ¹	Estimated age based on the auricular surface of the ilium	Preservation of the auricular surface of the ilium	Other traits of the pelvic bones
70/826/B8	Right	Female	6	40-49		
70/862 Futaue/B8	Right	Male	4	30-39		
70/862 Futaue/B8	Right	Female	5	40-49		
		Female	1			
71/821/B8	Right			-30		
71/856/B8	Right	Male	2	-30		
72/828/B8	Right	Male	4	30-39		
72/911/B8	Right	Male	7	50-59		
73/871/B8	Right	Female	6	40-49		
74/122/C8	Right	Female	4	30-39		
74/909/B8	Right	Female	6	40-49		
75/274/C8	Right	Male	7	50-59		
75/275/C8	Right	Female	3	30-39		
76/279/C8	Right	Female	4	30-39		
76/281/C8	Right	Male	3	30-39		
76/282/C8	Right	Female	2	-30		
76/305/C8	Right	Female	2	-30		
77/286 Kaso/C8	Right	Male?	5	40-49		
78/290/C8 Part 1	Right	Male	2	-30		
78/651/C8	Right	Female	5	40-49		
79/298/C8	Right	Male	6	40-49		
79/302/C8	Right	Male	1	-30		
79/302/C8	Right	Male	2	-30 -30		
	Right	Male?	5	_30 40_49		
80/540/C8		Male? Male	5			
80/632/C8	Right			-30		
80/671/C8	Right	Male	4	30-39		
82/689/C8	Right	Female	4	30-39		
82/696/C8	Right	Male	5	40-49		
82/700/C8 83/716/C8 Part 1	Right Right	Female Male	- 2	-30	Poorly preserved	Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused. Epiphyseal unions of the iliac crest and
83/716/C8 Part 1	Right	Male	_	_50	Poorly preserved	the ischial tuberosity are not fused. Presence of bony bridge in the sacroiliac
83/716/C8 Part 2	Right	Female	8	60+	rooniy proserved	joint.
	Right	Male	6	40-49		
84/717/C8						
84/733/C8	Right	Male	2	-30		
85/735/C8 Part 1	Right	Male	2	-30		
85/735/C8 Part 1	Right	Male?	5	40-49		
85/735/C8 Part 1	Right	Male	6	40-49		
86/773/C8	Right	Female	1	-30		
86/829/C8	Right	Female	2	-30		
86/840/C8	Right	Female?	4	30-39		
86/840/C8	Right	Female	4	30-39		
86/860/C8	Right	Female	7	50-59		
87/736/C8 Part 2	Right	Male	7	50-59		
87/886/C8	Right	Female	1	-30		
87/913/C8	Right	Female	7	50-59		
88/869/C9	Right	Female	1	-30		
88/878 Futaue/C8	Right	Unknown	-	_	Poorly preserved	
88/878/C8	Right	Female	1	-30	• •	Epiphyseal union of the iliac crest is not
	Ũ					fused.
88/885/C8	Right	Male	5	40-49		
89/919/C8	Right	Male	6	40-49		
89/920/C8	Right	Male	4	30-39		
90/7/D8	Right	Female	6	40-49		
90/8 Higashi/D8	Right	Male	2	-30		
90/8 Nishi/D8	D' 1.	Female	2	-30		
91/120/D8	Right	Female	2	-30 -30		
91/6 Futaue/D8		Male	4	30-39		
	Right					
91/6/D8	Right	Male	6	40-49		
92/131/D8	Right	Male	2	-30	Develop	
92/247/D8 Part 1	Right	Male?	-	-	Poorly preserved	
93/169/D8	Right	Male	2	-30		
93/169/D8	Right	Male?	3	30–39		Epiphyseal unions of the iliac crest, the Y-shaped cartilage, and the ischial tuberosity are not fused.
93/188/D8	Right	Female	1	-30		
94/205/D8	Right	Female	1	-30		
94/226/D8	Right	Male	1	-30		
94/227/D8	Right	Female	3	30-39		
95/223/D8	Right	Male	4	30-39		
	Right	Male	2	-30		
95/835/D8						
96/228 Futaue/D8	Right	Female	3	30-39		
		Female Male Female	3 2 1	-30 -30		

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Appendix 1:	(Continued)

Specimen	Side	Sex	Age stage of the auricular surface of the ilium ¹	Estimated age based on the auricular surface of the ilium	Preservation of the auricular surface of the ilium	Other traits of the pelvic bones
97/629/D8	Right	Male	5	40-49		
97/644/D8	Right	Male	6	40-49		
97/644/D8	Right	Male	2	-30		
98/650/D8	Right	Female	1	-30		
98/693/D8	Right	Female	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
98/713/D8	Right Right	Male Male?	3	30–39 –30		
99/792/D8 99/831/D8	Right	Male	4	30-39		
100/742/D8	Right	Male	-	-		Presence of bony bridge in the sacroilia
100/834/D8	Right	Male	4	30–39		joint.
100/864/D8 Part 1	Right	Male	1	-30		
101/837/D8	Right	Female	3	30-39		
101/865/D8	Right	Female	5	40-49		
101/894/D8	Right	Male	3 1	30-39		
102/836/D8	Right	Male Male	3	-30 30-39		
102/922/D8 103/896/D8	Right Right	Male	3 4	30-39		
103/924/D8	Right	Male	+		Poorly preserved	
104/129/E8	Right	Female	4	30-39	- Joily proserved	
104/170/E8	Right	Female	3	30-39		
105/219/E8	Right	Male	1	-30		
106/208/E8	Right	Male	2	-30		
106/218/E8	Right	Male	1	-30		
107/217/E8	Right	Male	4	30-39		
107/221/E8	Right	Male	1	-30		
108/204/E8	Right	Male	2	-30		
108/204/E8	Right	Female	2	-30		
108/263/E8	Right	Male	_	_	Poorly preserved	
108/751/E8	Right	Male	1	-30		
109/18/E8	Right	Male	1	-30		
110/306/B9 110/9/B9	Right Right	Female Male	2 3	-30 30-39		
111/544/B9	Right	Male	2	-30		
111/822/B9	Right	Female	1	-30		
111/867/B9	Right	Female	2	-30		
111/873/B9	Right	Female	1	-30		
112/701 Futaue/B9	Right	Female?	2	-30		
112/701/B9	Right	Female	2	-30		
112/760/B9	Right	Male	1	-30		
113/288/B9	Right	Male	5	40-49		
113/766/B9	Right	Male	4	30-39		
114/294/C9	Right	Male	5	40-49		
114/669/C9	Right	Female	3	30-39		
115/451/C9	Right	Female	2	-30		
115/451/C9	Right	Male	1	-30		Processo of home buildes in the second
115/451/C9	Right	Male	-	-		Presence of bony bridge in the sacroilia- joint.
116/591 Futaue/C9	Right	Female	1	-30		
116/591/C9	Right	Male	3	30-39		
116/776/C9	Right	Male	4	30-39		
118/637/C9 Part 1	Right	Male	2 3	-30		
118/637/C9 Part 2 119/759/C9	Right Right	Male Male	3 5	30–39 40–49		
119/759/C9 119/937/C9 Part 1	Right	Male	5 4	40–49 30–39		
120/234/D9	Right	Male	4	30-39		
120/234/D9 120/937 Futaue/C9	Right	Male	2	-30		
120/937 Futaue/C9	Right	Female	2	-30		
120/937 Futaue/C9	Right	Female	5	40-49		
121/670/D9	Right	Female	5	40-49		
121/753/D9	Right	Male	1	-30		
121/753/D9	Right	Male	3	30-39		
121/753/D9	Right	Female	2	-30		
122/634 Hokusei Ikkatsu/D9	Right	Male	4	30–39		
123/695/D9	Right	Female	3	30-39		
124/764 Futaue/D9	Right	Female	1	-30		
124/764/D9 125/672 Eutono/D0	Right	Male	3	30-39		
125/672 Futaue/D9 125/724/D9	Right	Male	4 2	30-39		
125/724/D9 126/621 Shuhen	Right Right	Male	2	-30 -30		
Ikkatsu/D9	Right	Male	1	-50		
126/839/D9	Right	Male	4	30-39		
			-	20 27		

Appendix	1:	(Continued)
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Specimen	Side	Sex	Age stage of the auricular surface of the ilium ¹	Estimated age based on the auricular surface of the ilium	Preservation of the auricular surface of the ilium	Other traits of the pelvic bones
127/832/D8	Right	Female	7	50-59		
28/235/E9	Right	Female	2	-30		
128/236/E9	Right	Male	4	30-39		
129/754, 763/E9	Right	Female	4	30-39		
129/754, 763/E9	Right	Female	3	30-39		
129/944/E9	Right	Male	4	30-39		
130/237/E9	Right	Male	4	30-39		
31/Ikkatsu/B7 Part 2	Right	Male	3	30-39		
31/Ikkatsu/B7 Part 2	Right	Male	5	40-49		
132/Ikkatsu/B8 Part	Right	Male	3	30-39		
132/Ikkatsu/B8 Part 1	Right	Female	-	-	Poorly preserved	
32/Ikkatsu/B8 Part 1	Right	Male?	4	30-39		
32/Ikkatsu/B8 Part 2	Right	Male	-	-	Poorly preserved	
33/Ikkatsu/C8 Part 2	Right	Male	4	30-39		
33/Ikkatsu 2/C8 Part 1	Right	Male	5	40-49		
33/Ikkatsu 2/C8 Part 1	Right	Male	4	30-39		
33/Ikkatsu 2/C8 Part 1	Right	Male	3	30-39		
33/Ikkatsu 2/C8 Part 1	Right	Male	3	30-39		
34/Ikkatsu/D8	Right	Female	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
34/Ikkatsu/D8	Right	Male	3	30-39		
135/Ikkatsu/s	Right	Female	6	40-49		
136/Ikkatsu/D9 Part 1	Right	Female	2	-30		
136/Ikkatsu/D9 Part 1	Right	Male	3	30-39		
136/Ikkatsu/D9 Part 2	Right	Male	3	30-39		
138/518a/C1	Right	Male	3	30-39		
138/518/C1	Right	Female	1	-30		Epiphyseal union of the iliac crest is no
139/258a/B3	Right	Male	5	40-49		fused.
Fachiai 1 Part 2	Right	Female	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
Fachiai 2 Part 1	Right	Female	1	-30		Epiphyseal union of the iliac crest is no fused.
Fachiai 3 Part 2	Right	Male	5	40-49		
Fachiai 4 Part 2	Right	Female	4	30-39		
Fachiai 4 Part 2	Right	Male	3	30-39		
Fachiai 5 Part 1	Right	Male	2	-30		
Fachiai 5 Part 2	Right	Female	1	-30		Epiphyseal unions of the iliac crest and
Fachiai 6 Part 1	Right	Female	4	30-39		the ischial tuberosity are not fused.
Tachiai 7 Part 1	Right	Male	1	-30		
Fachiai 7 Part 1	Right	Male	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
Tachiai 7 Part 2	Right	Female	1	-30		,
Tachiai 8 Part 2	Right	Female	1	-30		Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
Fachiai 8 Part 2	Right	Female	1	-30		Epiphyseal union of the iliac crest is no fused.
Fachiai 9 Part 1	Right	Male	6	40-49		ruseu.
Fachiai 10 Part 2	Right	Female	1	-30		
Fachiai 11 Part 1	Right	Female	2	-30		
Fachiai 12 Part 2	Right	Female	2	-30		
Fachiai 12 Part 2	Right	Male	6	40-49		
Fachiai 13 Part 1	Right	Male	7	50-59		
Fachiai 14 Part 1	Right	Male	5	40-49		
Fachiai 16 Part 1	Right	Male	_	-	Poorly preserved	Epiphyseal unions of the iliac crest and the ischial tuberosity are not fused.
Fachiai 16 Part 2	Right	Male	5	40-49		the isemai tuberosity are not iused.
Tachiai 16 Part 2	Right	Male	5	40-49		
Fachiai 17 Part 1	Right	Female	1	-30		
Fachiai 18 Part 1	Right	Female	5	40-49		
Fachiai 19 Part 1	Right	Male	4	30-39		
fachiai 19 Part 2	Right	Male	1	-30		Epiphyseal union of the ischial tuberosi is not fused.
Fachiai 21 Part 1	Right	Male	2	-30		
Fachiai 21 Part 1	Right	Unknown	4	30-39		
Fachiai 22 Part 1	Right	Female	2	-30		
Fachiai 24 Part 1	Right	Male	4	30-39		
	Right	Male	3	30-39		
Fachiai 25 Part 1	Right	Male	4	30-39		
			1	-30		
Fachiai 25 Part 1	Right	Male				
Tachiai 25 Part 1 Tachiai 25 Part 1	Right Right	Male Male		30-39		
Tachiai 25 Part 1 Tachiai 25 Part 1 Tachiai 25 Part 1 Tachiai 26 Part 1 Tachiai 27 Part	Right Right Right	Male Male Male	4			

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Specimen	Side	Sex	Age stage of the auricular surface of the ilium ¹	Estimated age based on the auricular surface of the ilium	Preservation of the auricular surface of the ilium	Other traits of the pelvic bones
Tachiai 29 Part 2	Right	Female	5	40-49		
Tachiai 29 Part 2	Right	Female	1	-30		Epiphyseal union of the iliac crest is no fused.
Tachiai 29 Part 2	Right	Male	3	30-39		
Tachiai 30 Part 2	Right	Male	4	30-39		
Tachiai 30 Part 2	Right	Female	4	30-39		
Tachiai 31 Part 1	Right	Female	5	40-49		
Tachiai 31 Part 2	Right	Female	2	-30		
Tachiai 31 Part 2	Right	Male	3	30-39		
Tachiai 31 Part 2	Right	Male	3	30-39		
Tachiai 31 Part 2	Right	Male	3	30-39		
Tachiai 32 Part 1	Right	Male	3	30-39		
Tachiai 33 Part 1	Right	Female	4	30-39		
Tachiai 34 Part 1	Right	Female	3	30-39		
Tachiai 34 Part 2	Right	Female	3	30-39		
Tachiai Part 1	Right	Male	6	40-49		

Appendix 1: (Continued)

¹ Lovejoy et al. (1985)