DEMOGRAPHIC PARAMETERS OF THE UXBRIDGE OSSUARY POPULATION

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ABSTRACT

The minimum number, probable age and sex of individuals included in the Uxbridge Ossuary (BbGt-1) has been determined using dental and pelvic indicators. The site is in southern Ontario and C14 dated to AD 1490 ± 80. The minimum of 457 individuals include 145 (32%) that are immature, aged by dental emergence. The adult pelvic material yielded age-at-death information, but the skewed sex ratio (1.5:1.0), cremation and evidence of particular infectious disease factors make these values suspect. It is argued that extensive paleodemographic reconstruction would be inappropriate.

INTRODUCTION

The ossuary mode of burial appears to offer researchers interested in paleodemography excellent opportunities for study. Its inclusion of virtually all the deceased from a fixed time period make it an attractive vehicle for the study of human lifespan and mortality. There are now demographic calculations available from three Iroquoian ossuaries, Fairty (Melbye 1981), Kleinburg (Pfeiffer 1974) and Ossossane (Katzenberg and White 1979), plus more limited, partial age profiles from several others. The study described here was designed as a contribution to this area of research. In its description, however, considerable emphasis needs to be placed on its limitations. Three known disturbances to normal bone preservation make the adult age-at-death values suspect. These factors are cremation, preferential loss of female pubic regions, and infectious disease.

MATERIALS AND METHODS

The Uxbridge Ossuary (BbGt-1) is approximately 65 miles northeast of Toronto, Ontario. It was excavated from 1975 to 1977 by Patsy Cook and members of the Ontario Archeological Society. It has a radiocarbon date of AD 1490 ± 80. The excavators found virtually no grave goods, a characteristic of prehistoric Iroquoian ossuaries (cf. Jamieson 1981), but with such a late date the site cannot be assigned to a pre- or proto-historic category with certainty. The excavators reported a layer of burnt human bone underlying most of the ossuary (Cook 1977). A large portion of this cremated bone was examined by the author. Of 32 individuals (assuming no mixing among features), six are immature. There is no evidence of one sex being more commonly represented. Hence, neither sex nor age factors were clearly and consistently considered in determining which individuals would be cremated. While it is unknown how many individuals were cremated, the bulk of the ossuary material shows no sign of burning.

The human skeletal material was cleaned and catalogued, and certain key elements were differentiated, including all dental and jaw material and all adult innominate material. Because mandibles and mandibular fragments are relatively easy to differentiate and are composed of sturdy bone, counts of minimum numbers were based on mandibular landmarks.

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All mandibular material was assessed for age-at-death, using the modified Schour and Massler dental formation and eruption chronology constructed by Ubelaker (1978). While all age estimates were ultimately lumped into five-year categories, estimates were initially made as specifically as possible (i.e. 2 years ± 8 months, 9 months ± 3 months, 10 years ± 30 months). To be considered as representing an individual, the most anterior, interior region of the mandible (the genial tubercles) had to be intact. For those infant mandibles where death preceded the fusion of the symphysis menti, only the left side (the more common) was counted. Dental eruption was more useful than formation, because so many tooth buds or unerupted crowns were missing.

Dental eruption was used to estimate age up to the emergence of M3, arbitrarily set at 18 years. We also used a "young adult" category, meaning that M3's were erupted but unworn. The true age range for these late-adolescents and young-adults is uncertain.

All adult innominate material was assessed for sex and age at death (Table 1). Three independent sex determinations were made, based on anterior pubis morphology as described by Phenice (1969), on observations of the sciatic notch angle, and on observation of the preauricular sulcus. Three categories, male, female and neutral or undetermined, were used. When there was disagreement, the Phenice indicators were preferred.

TABLE 1
REPRESENTATION OF ADULT INNOMINATE SKELETAL ELEMENTS IN THE UXBRIDGE SAMPLE

	Right	Left
Ischial tuberosity	247	223
Ilium	133	124
Pubis	124	117
Complete enough for Phenice sex	106	117
Complete enough for age estimation	95	95
Mandible, genial tubercles (minimum number of adults)	312	

Adult age estimates are based on assessment of the pubic symphyses using the techniques of McKern and Stewart (1957) for males and Gilbert and McKern (1973) for females. Each of these techniques result in an estimated age range (i.e. 22-28 years). To transform these age estimates into five-year categories, it was assumed that the true age might fall on any year in the range with equal probability. For example, if there were 14 individuals in the 22-28 year range, 2 individuals would be assigned to each of the seven years. The resulting distribution of ages-at-death was then applied proportionally to the total adult sample size of 312. This technique was used for ages 20 years and above.

Results of the two age estimation techniques, dental emergence and public symphysis remodeling, are combined in the figures and tables herein. The use of different techniques for subadults and adults necessarily leads to inaccuracies in the transition years. Hence the number of individuals in the 16-19 year age category is especially suspect.

RESULTS

The distribution of ages-at-death is represented in survivorship and mortality profiles (Figs. 1 and 2) and as a life table (Table 2). No adjustment has been made for the possible underrepresentation of newborn infants (Brothwell 1971). Life expectancy at birth is calculated to be 25 years. The crude death rate is thus 40.0/1000 per year. Using Acsadi and

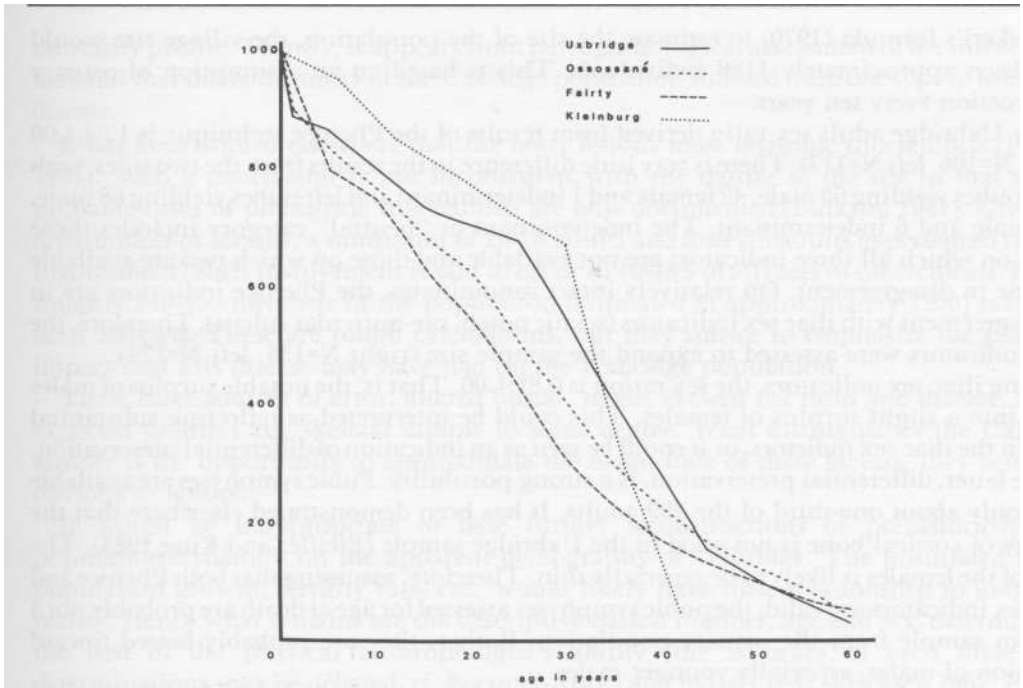

Fig. 1. Survivorship (ℓ^x) curves. Expressed as a proportion of survivors.

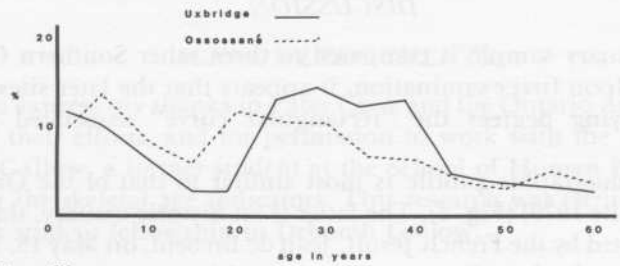

Fig. 2. Mortality (d^x) profiles.

TABLE 2
LIFE TABLE, UXBRIDGE OSSUARY

Age	Yx	dx	lx	Qx	Lx	ex°
0	52	113.8	1000	.1138	943.1	25.0
1	10	21.9	886.2	.0247	875.2	27.1
2-5	31	67.8	864.3	.0784	3321.6	26.8
6-10	28	61.3	796.5	.0770	3829.3	24.9
11-15	13	28.5	735.2	.0388	3604.8	21.8
16-19	13	28.5	706.7	.0403	2769.8	17.6
20-24	59.5	130.2	678.2	.1920	3065.5	14.2
25-29	65.5	143.3	548	.2615	2381.8	12.0
30-34	55.9	122.3	404.7	.3022	1717.7	10.4
35-39	58.7	128.4	282.4	.4547	1091	8.8
40-44	22.2	48.6	154	.3156	648.5	9.1
45-49	17.6	38.5	105.4	.3653	430.8	7.1
50-54	16.6	36.2	66.9	.5411	244	4.8
55-59	14	30.6	30.7	1.0000	76.8	2.5

N = 4 5 7

Nemeskeri's formula (1970) to estimate the size of the population, the village size would have been approximately 1188 individuals. This is based on an assumption of ossuary construction every ten years.

The Uxbridge adult sex ratio derived from results of the Phenice technique is 1.54:1.00 (right N=106, left N=117). There is very little difference in the results from the two sides, with right pubes yielding 63 male, 42 female and 1 indeterminant and left pubes yielding 68 male, 43 female and 6 indeterminant. The indeterminant or "neutral" category includes those pubes on which all three indicators are not available and those on which two are available but one in disagreement. On relatively intact innominates, the Phenice indicators are in good agreement with iliac sex indicators (sciatic notch, pre-auricular sulcus). Therefore, the iliac indicators were assessed to expand the sample size (right N=133, left N=124).

Using iliac sex indicators, the sex ration is 0.83:1.00. That is, the notable surplus of males turns into a slight surplus of females. This could be interpreted as reflecting substantial error in the iliac sex indictors, or it could be seen as an indication of differential preservation.

The latter, differential preservation, is a strong possibility. Pubic symphyses are available from only about one-third of the 309 adults. It has been demonstrated elsewhere that the quality of cortical bone is not good in the Uxbridge sample (Pfeiffer and King 1983). The bone of the females is likely to be especially thin. Therefore, assuming that both Phenice and iliac sex indicators are valid, the pubic symphyses assessed for age at death are probably not a random sample from the ossuary population. Rather, they are probably biased toward inclusion of males, especially younger males.

DISCUSSION

The Uxbridge ossuary sample is compared to three other Southern Ontario Iroquois samples in Fig. 1. Upon first examination, it appears that the later sites more generally demonstrate to varying degrees the "rectangular curve" associated with increasing longevity.

The Uxbridge demographic profile is most similar to that of the Ossossane Ossuary (Katzenberg and White 1979) (Fig. 2). The latter is an historic ossuary, the construction of which was documented by the French Jesuit, Jean de Brebeuf, on May 13, 1636 (Kidd 1953). The figures for age at death at Ossossane are derived from measurement of subadult ilia (Merchant 1973) and assessment of adult pubic remodeling.

Much of the difference in survivorship between Uxbridge and Fairty (prehistoric, AD 1400) (Melbye 1981) can be attributed to different proportions of infants and young children represented in the Fairty material. Such a difference could reflect differences of culture rather than mortality. The values for ages 30 to 80 years from Fairty have been statistically smoothed.

The Kleinburg (AD 1600) (Pfeiffer 1974) survivorship profile differs from all others, partly by virtue of its lack of infants, partly by its lack of adults past age 45. Its composition is unusual and very difficult to explain through population dynamics.

Of the four samples displayed, Uxbridge does not appear anomalous, except perhaps in the low mortality enjoyed by young adults, aged 15-25 years. The "normal" appearance of the Uxbridge mortality data is of interest, since there are at least three potential sources of significant error within it. First, an unknown proportion of the deceased population was cremated. This may not have been more than about 50 individuals, and they may not have been biased by age or sex, but these factors remain unknown. Secondly, the adult mortality figures are based on a sample of pubic symphyses that clearly overrepresents males. If this population experienced any sex differences in adult mortality, this sex bias will affect the

mortality profile. Thirdly, it appears from paleopathological assessment of the infracranial material that many members of the Uxbridge population suffered from one type of infectious disease.

It has been argued elsewhere that the bony lesions most resemble tuberculosis (Pfeiffer 1981). Such a conclusion is not inconsistent with the dating of the site in that several probable cases of prehistoric tuberculosis are now documented (Buikstra 1981). Given the distribution of lesions, a minimum of 20-26 adults and four subadults experienced skeletal involvement. Such involvement is said to occur in 10-15% of all cases of tuberculosis. Hence, roughly 240-450 members of the population (estimated at approximately 1200) may have been affected. These are rough calculations, but they suffice to emphasize the potential impact that this disease may have had on the Uxbridge population.

These three sources of error, altered burial mode, skewed sex ratio and disease, can be expected to affect any skeletal sample to some degree. What distinguishes the Uxbridge sample is the opportunity to approximate the magnitude of these factors, they being too obvious to ignore.

It would be inappropriate to base further reconstructions of prehistoric-historic population dynamics on the apparent demography of Uxbridge. The postulated rate of population growth, fertility rate, etc., would likely have little relationship to long-term reality. Hence what remains are the descriptive basics: number, age and sex, determined to the best of the physical anthropologist's ability (the accuracy of even these basic determinations may be debated, cf. Bocquet-Appel and Masset 1982, Ericksen 1982, Howell 1982).

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REFERENCES CITED

Acsadi, Gy, and J. Nemeskeri
1970 *History of Human Lifespan and Mortality.* Akademiai Kiado. Budapest.

Bocquet-Appel, J. P., and C. Masset
1982 Farewell to Paleodemography. *Journal of Human Evolution* 11:321-333.

Brothwell, D. R.
1971 Palaeodemography. In *Biological Aspects of Demography (W.* Brass, editor), pp. 111-130. Society for the Study of Human Biology, Symposium Volume 10. Taylor and Francis. London, England.

Buikstra, J. E. (editor)
1981 *Prehistoric Tuberculosis in the Americas.* Northwestern University Archeological Program. Evanston, Illinois.

Cook, P.
1977 A Comparison of Prehistoric and Historic Ossuary Burial Practices. Paper presented to the 1977 annual symposium of the Ontario Archaeological Society, Toronto, Ontario.

Ericksen, M. F.
1982 Aging Changes in Thickness of the Proximal Femoral Cortex. *American Journal of Physical Anthropology* 59:121-130.

Gilbert, **B.** M., and T. W. McKern
1973 A Method for Aging the Female Os Pubis. *American Journal of Physical Anthropology* 38:31-38.

Howell, N.
1982 Village Composition Implied by a Paleodemographic Life Table: the Libben Site. *American Journal of Physical Anthropology* 59:263-370.

Jamieson, S. M.
1981 Economics and Ontario Iroquoian Social Organization. *Canadian Journal of Archaeology* 5:19-30.

Katzenberg, M. A., and R. White
1979 A Paleodemographic Analysis of the *Os Coxae* from Ossossane Ossuary. *Canadian Review of Physical Anthropology* 1:10-28.

Kidd, K. E.
1953 The Excavation and Historical Identification of a Huron Ossuary. *American Antiquity* 18:359-379.

McKern, T. W., and T. D. Stewart
1957 Skeletal Age Changes in Young American Males. Technical Report EP-45, Quartermaster Research and Development Center. Natick, Massachusetts.

Melbye, F. J.
1981 The Fairty Site Revisited. Paper presented to the ninth annual meeting of the Canadian Association for Physical Anthropology, Banff, Alberta.

Merchant, V. L.
1973 A Cross-sectional Growth Study of the Proto-historic Arikara from Skeletal Material Associated with the Mobridge Site (39WW1), South Dakota. Unpublished MA thesis, Department of Anthropology, American University, Washington, D.C.

Pfeiffer, S.
1974 A Paleodemographic Study of the Kleinburg People. Paper presented to the third annual meeting of the Canadian Association for Physical Anthropology, Trent University, Peterborough, Ontario.
1981 Preliminary Report of Paleopathology from the Uxbridge Ossuary. Paper presented to the ninth annual meeting, Canadian Association for Physical Anthropology, Banff, Alberta.

Pfeiffer, S., and P. King
1983 Cortical Bone Formation and Diet Among Protohistoric Iroquoians. *American Journal of Physical Anthropology* 60:23-28.

Phenice, T. W.
1969 A Newly Developed Visual Method of Sexing the Os Pubis. *American Journal of Physical Anthropology* 30:297-302.

Ubelaker, D. H.
1978 *Human Skeletal Remains: Excavation, Analysis, Interpretation.* Aldine Publishing Company. Chicago.

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