

I hereby declare that the dissertation  
Skeletal characteristics and population demography as reflected by materials  
Skeletal characteristics and population demography as reflected by materials  
from Toutswe tradition sites in eastern  
Botswana, west of the Shashe-Limpopo  
basin

submitting to the  
University of Pretoria  
Department of Anatomy  
for the Degree  
of  
MSc with specialization in Anatomy

By

it is my own work and has not been submitted by me to any other university for  
Morongwa Nancy Mosothwane

University of Pretoria  
Department of Anatomy

2004/03/02  
Date  
MSc with Specialization in Anatomy

2004

I hereby declare that the dissertation

**Skeletal characteristics and population demography as reflected by materials  
from Toutswe tradition sites in eastern Botswana, west of the Shashe-Limpopo  
basin**

which I

**Morongwa Nancy Mosothwane**

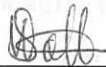
am submitting to the

**University of Pretoria  
Department of Anatomy**

for the degree

**MSc with specialization in Anatomy**

is my own work and has not been submitted by me to any other university for  
degree purposes



Morongwa Nancy Mosothwane

2004/03/02

Date

## Table of Contents

Acknowledgements	ix
Abstract	xi
Key-words	xii
Abbreviations	xiii
List of tables	xv

'The year is 1026 A.D. almost a thousand years ago. The place is a hilltop called Toutswemogala, about 50 kilometers north of present- day Palapye... It is early in the morning. The sun is just peeking over the horizon and the cattle are slowly making their way down the narrow path from the hilltop to the pastures below. In the distance a lion's roar can be heard echoing between the hills (James and Jocelyne Denbow)'.

### 2. LITERATURE REVIEW

2.1 Introduction	19
2.2 Toutswemogala	20
2.3 Mphahane	21
2.4 Mphahane	22
2.5 Mphahane	23
2.6 Mphahane	24
2.7 Mphahane	25
2.8 Mphahane Hill	26
2.9 Mphahane Hill	27
2.10 Mphahane Hill	28
2.11 Kgafwe B-53	29

### 3. MATERIALS AND METHODS

3.1 Materials	30
3.2 Age estimation	31
Newborn/fetal	31
Zero to five years	32
Five to 15 years	33
15 to 20 years	34
20 years and over	34

## Table of Contents

Acknowledgements	i
Abstract	iii
Note on terminology	iv
Abbreviations	iv
List of tables	v
List of figures	vi
4. GRAVE DESCRIPTIONS AND SKELETAL ANALYSIS	
1. INTRODUCTION	1
2. LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Toutswe Mogala	14
2.3 Taukome	15
2.4 Bosutswe	16
2.5 Thatswane	18
2.6 Dikalate	19
2.7 Mosu 3	19
2.8 Thataganyane Hill	21
2.9 Serowe Hill	21
2.10 Swaneng Hill	21
2.11 Kgaswe B-55	21
3. MATERIALS AND METHODS	27
3.1 Materials	27
3.2 Age estimation	29
Newborn/fetal	31
Zero to five years	32
Five to 15 years	33
13 to 20 years	34
20 years and over	34

3.3 Sex determination	36
3.3.1 The pelvis	36
3.3.2 Cranium	37
Size differences	37
3.4 Stature	38
3.5 Other Observations	39
4. GRAVE DESCRIPTIONS AND SKELETAL ANALYSIS	40
4.1 Introduction	40
4.2 Toutswemogala Burials	41
4.3 Taukome Burials	66
4.4 Bosutswe Burials	73
4.5 Thatswane Burials	91
4.6 Dikalate Burial	95
4.7 Mosu 3 Burial	96
4.8 Thataganyane Burial	97
4.9 Serowe Hill Burial	98
4.10 Swaneng Hill Burial	99
4.11 Kgaswe B-55 Burials	100
5. PALAEODEMOGRAPHY	125
5.1 Introduction	125
5.2 Problems and limitations	126
5.3 Other similar studies	130
5.4 Analysis of survival times	131
5.4.1 Life table	132
Methods	133
Results	134
5.4.2 Survivorship curve	134
5.4.3 Kaplan-Meier survival estimates	136
Methods	137

Results	138
5.5 Adult sex distribution	138
5.6 Discussion	141
6. HEALTH AND TRAUMA CHARACTERISTICS	143
6.1 Introduction	143
6.2 Problems and limitations	145
6.3 Specific diseases found in the Toutswe population	149
6.3.1 Spina Bifida	149
Methods	150
Results	151
6.3.2 Arthritic and degenerative diseases	151
Methods	152
Results	152
6.3.3 Possible case of Diffuse Idiopathic Skeletal Hyperostosis (DISH)	156
Skeletal manifestation of DISH	157
Results	157
Differential diagnosis	162
Discussion	163
6.4 Trauma	164
Methods	164
Results	164
6.5 Nonspecific lesions	167
6.5.1 Cribra orbitalia and porotic hyperostosis	168
6.5.1.1 Cribra orbitalia	170
Methods	170
Results	171
6.5.1.2 Porotic hyperostosis	174
Methods	175
Results	175

6.6 Enamel hypoplasia	176
9.3 Buris Methods	177
9.4 Health Results	178
9.5 Dental health and diet	231
7. DENTAL HEALTH AND CHARACTERISTICS	184
7.1 Introduction	184
7.2 Dental Pathology	184
7.2.1 Dental caries	186
Methods	187
Results	188
7.2.2 Calculus	193
Methods	193
Results	194
7.3 Dental wear	194
Methods	197
Results	198
7.4 Odontometric characteristics	199
Methods	202
Results	203
7.5 Dental Modification and miscellaneous characteristics	204
Methods	207
Results	207
8. SKELETAL GROWTH	209
8.1 Introduction	209
8.2 Problems and limitations	210
8.3 Materials and methods	212
8.4 Results	213
9. DISCUSSION	219
9.1 Introduction	219

9.2 Problems and limitations of the study	221
9.3 Burial practices	224
9.4 Health and adaptation	228
9.5 Dental health and diet	231
9.6 Biological distance	232
9.7 Conclusion	233
Appendix 1a Cranial measurements	236
Appendix 1b Mandibular measurements	239
Appendix 2 Postcranial measurements	241
Appendix 3 Isolated and commingled bones from Toutswe Mogala and Taukome	247
Appendix 4 Recommendations to BNMMAG for scientific handling and storage of human tissue	251
References	252



### Acknowledgements

Throughout my study I experienced ups and downs but ultimately succeeded in completing my dissertation. A lot of people contributed to the success of this research and I will forever feel indebted to them. I feel greatly indebted to my sister Miss Priscilla Mosothwane for financing my study and stay in Pretoria. This was an unpredictable investment that she made and for that saying thank you seems not enough for me. It is absolutely appropriate for me to thank God for giving me a sister like you. You are a million in one and words can never be good enough for me to express my gratitude and love for you and the rest of the family. My dearest grandmother Mrs Ellen T Raleru had no clue what I was up to but, nevertheless, contributed financially and emotionally and insisted that everything will workout. I sincerely appreciation your for being there for me.

I would like to express my sincere gratitude and appreciation to the ever-patient professor Maryna Steyn who braced herself with undoubtedly one of the most difficult challenges of converting an arts oriented student to a medical oriented student. I know my coming from an archaeological background was no easy task for you but you still made it. For that I feel honored and would like to say a big thank you. My heartfelt thanks also goes to the late Dr Susan Loth for helping me to put together a proposal and for giving advice on how to tackle my study during the initial phase of data collection.

The staff at the Archaeology Unit of BNNMAG was magnificent and supportive in many ways. A special thank you to Mr Phillip Segadika and Miss Nonofu Mathibidi for their support of my requests research and loan permits. This research was a rocky learning experience for the Museum and me but we both managed to put it together and moved forward. A big thanks to Miss Segametsi Moatlhaping and Miss Mmateme Thebe who very kindly offered me accommodation during work at the BNMMAG. Professor Piet Becker of the Medical Research Council, Unit for Biostatistics, in Pretoria assisted with the statistical analysis of my findings and I would like to acknowledge and appreciate his efforts.

The last minute acceptance to Bosutswe excavation team, long discussions around the camp fire, provision of unpublished field notes and photographs of burials excavated decades ago, comments made on my interpretation of the Toutswe complex and the provision of the much needed funds to help in my studies were all because of professor Jim Denbow from the University of Texas, America. I sincerely pass my gratitude and appreciation for your honest support and for your words of encouragement when I felt I was not going to make it.

I now take this opportunity to thank the terrific and absolutely marvelous staff of the Department of Anatomy, University of Pretoria. My gratitude goes to Mr. Johan Nel who volunteered to transport the skeletons between Gaborone and Pretoria and to Mr. Coen Nienaber for lending his car to collect the skeletons from Gaborone. Mr. Marius Loots' patience with my personal computer problems did not go unnoticed and for that I say thank you. Miss Marinda Smith's assistance with some photo scans is appreciated. A special thanks also goes to Mrs. Louisa Hutten who made some equipment available to me.

The list of friends and relatives who assisted me in one way or the other is endless but I would like to pass my gratitude to all of them. I would like to make special mention of my former lecturers Dr Karim Sadr who is now at Witwatersrand University, Johannesburg, and Dr Andrew Reid currently at the Archaeology Institution, Cambridge University College London. I would like you to know that I really appreciate the efforts you made in trying to find a source to fund my study. My gratitude also goes to Miss M Thebe and Miss SO Moatlaping for accommodating me during my data collection in Gaborone. And to Miss Nana Motsoane I would just say 'o tsala yame ya botlhokwa'

This research was approved by BNMMAG and permitted by the Office of the President, Gaborone, Botswana.

The sites from which the skeletons come from are characterised by similar ceramics and settlement layout. From the archaeological point of view, it has been accepted that while these were different villages or towns, the communities were culturally homogeneous. There is no evidence to suggest that the communities were genetically heterogeneous and this investigation took on a premise that the skeletons are of the same population affinity.

The low frequencies of nonspecific markers of stress and the absence of chronic infection suggest that the communities were generally healthy especially when compared to K2/Mapungubwe people. However, the demographic profile, which is characterised by high infant mortality, suggests that the children may have been more prone to acute diseases. Degenerative diseases and traumatic lesions are within frequencies often reported in southern African prehistory and there is a possible case of DISH. The analysis of dental health suggests that the diet of the Toutswe people was non-cariogenic.

## ABSTRACT

Eighty-four skeletons pooled from 10 Toutswe tradition sites in east central Botswana are used to investigate the lifestyles of Early Iron Age inhabitants of Botswana. The Toutswe people arrived in central Botswana at approximately AD 700 into a land previously occupied seasonally by hunter-gatherers. The investigation entails an assessment of the demographic profile, gross pathology, dental health and characteristics as well as skeletal growth of the Toutswe polity. Macroscopic observation of age markers, sex indicators, skeletal and dental lesions is the main tool used in the analysis.

The sites from which the skeletons come from are characterised by similar ceramics and settlement layout. From the archaeological point of view, it has been accepted that while these were different villages or towns, the communities were culturally homogeneous. There is no evidence to suggest that the communities were genetically heterogeneous and this investigation took on a premise that the skeletons are of the same population affinity.

The low frequencies of nonspecific markers of stress and the absence of chronic infection suggest that the communities were generally healthy especially when compared to K2/Mapungubwe people. However, the demographic profile, which is characterised by high infant mortality, suggests that the children may have been more prone to acute diseases. Degenerative diseases and traumatic lesions are within frequencies often reported in southern African prehistory and there is a possible case of DISH. The analysis of dental health suggests that the diet of the Toutswe people was non-cariogenic.

## List of Tables

Table	Title	Page
3.1	Summary of burials obtained from different sites	28
<b>Note on terminology</b>		
4.1	Summary of individuals aged 0-5 years	121
	Quite often people use Toutswe and Toutswe Mogala (hill) interchangeably to mean either the Toutswe tradition or Toutswe Mogala Hill from which Toutswe tradition derives its name. In this study, the author has tried to use terminology proposed by Denbow (1983a). Toutswe Mogala (occasionally cited as Toutswe Mogala Hill or Toutswe Hill) refers to the actual site while Toutswe refers to a tradition defined on the basis of a ceramic typology. In earlier publications (e.g., Lepionka 1971; 1978; 1979; Welbourne 1975; De Villiers 1976) the site was erroneously spelt, as Tautswe or Tautswe Mogala but this spelling has not been used in the text.	122
6.3	Comparison of the prevalence of cribra orbitalia on different samples	173
	Data pooled from K2 and Mapungubwe has been used for comparison with Toutswe results. Unless otherwise stated, the pooled data is denoted as K2/Mapungubwe.	175
6.5	Ages at which enamel hypoplastic lesions were formed on permanent teeth	180
6.6	Prevalence of enamel hypoplastic lesions on permanent teeth from various samples	183
<b>Abbreviations</b>		
7.1a	Distribution of dental caries on permanent teeth	189
	BNMMAG – Botswana National Museum Monuments and Art Gallery	190
	UB – University of Botswana	191
7.3	Caries intensities and frequencies on permanent teeth from various populations	192
7.4	Summary of scores of dental wear on permanent teeth	203
7.5	Mean and standard deviations of mesiodistal and buccolingual lengths of permanent teeth	205
7.5a	Matrix of Procrustes shape distance (maxilla)	206
7.5b	Matrix of Procrustes shape distance (mandible)	206
8.1	Mean long bone lengths of Toutswe subadults	214
8.2	Estimated statures of adults	216

## List of Tables

Table	Title	Page
3.1	Summary of burials obtained from different sites	28
4.1	Summary of individuals aged 0-5 years	121
4.2	Summary of individuals ages 5-10 years	122
4.3	Summary of individuals aged 10-20 years	123
4.4	Summary of individuals aged 17 years and over	123
5.1	Life table of the Toutswe population	135
5.2	Survivorship functions of Toutswe and K2/Mapungubwe samples	139
5.3	Adult age and sex distribution of the Toutswe sample	140
6.1	Distribution of arthritic lesions on adults	154
6.2	Summary of age distribution of cribra orbitalia	173
6.3	Comparison of the prevalence of cribra orbitalia on different samples	174
6.4a	Distribution of enamel hypoplastic lesions on permanent teeth	179
6.4b	Distribution of enamel hypoplastic lesions on deciduous teeth	180
6.5	Ages at which enamel hypoplastic lesions were formed on permanent teeth	180
6.6	Prevalence of enamel hypoplasia on permanent teeth from various samples	183
7.1a	Distribution of dental caries on permanent teeth	189
7.1b	Distribution of dental caries on deciduous teeth	189
7.2	Summary of caries intensities of Toutswe sample	190
7.3	Caries intensities and frequencies on permanent teeth from various populations	192
7.4	Summary of scores of dental wear on permanent teeth	200
7.5	Mean and standard deviations of mesiodistal and buccolingual lengths of permanent teeth	205
7.6a	Matrix of Penrose shape distance (maxilla)	206
7.6b	Matrix of Penrose shape distance (mandible)	206
8.1	Mean long bone lengths of Toutswe subadults	214
8.2	Estimated statures of adults	218
6.4	Vertebral osteophytosis on thoracic and lumbar regions of Bosutswe Burial 12	157
6.5	Fixed axis and C3, Bosutswe Burial 12	161
6.6	Osteophytes on the manubrium where first ribs articulate, Bosutswe Burial 12	166

## List of Figures

Figure	Title	Page
2.1	Some Toutswe sites in east central Botswana	20
2.2	Aerial view of Toutswe Mogala (photo courtesy of JR Denbow)	22
2.3	Bosutswe viewed from the south (photo courtesy of JR Denbow)	23
2.4	Base of excavation unit at Thatswane (photo courtesy of JR Denbow)	23
2.5	Map of features and burials at Kgaswe B-55 (Denbow 1999)	24
4.1	Reconstructed grave of Toutswe Mogala Burial 25 (photo courtesy BNMMAG)	62
4.2	Taukome Burial 4 in situ (photo courtesy of JR Denbow)	71
4.3	Bosutswe Burial 3 in situ note stones placed by the knees and feet	86
4.4	Bosutswe Burial 4 in situ	87
4.5	Bosutswe Burial 5 in situ	87
4.6a	Bosutswe Burial 6 before stones were removed	88
4.6b	Bosutswe Burial 6 after removal of stones note twisted vertebral column	88
4.7	Close up view of ostrich eggshell bead necklace on Bosutswe Burial 7	89
4.8	Bosutswe Burial 8 in situ	89
4.9	Bosutswe Burial 11 in situ	90
4.10	Bosutswe Burial 12 in situ	90
4.11	Bosutswe Burial 13 in situ	91
4.12	Thatswane Burial 4 in situ (photo courtesy of JR Denbow)	93
4.13	Thatswane Burial 5 in situ (photo courtesy of JR Denbow)	95
4.14	Mosus 3 Burial 1 in situ (photo courtesy of A Reid)	97
5.1	Survivorship curve of the Toutswe people	136
5.2	Comparison of survival curves using Kaplan-Meier survival estimates	140
6.1	Fused lumbar vertebrae on Taukome Burial 5	155
6.2	Bone growth on the head of the left humerus Taukome Burial 5	156
6.3	Vertebral osteophytosis on the cervical region of Bosutswe Burial 12	158
6.4	Vertebral osteophytosis on thoracic and lumbar regions of Bosutswe Burial 12	159
6.5	Fused axis and C3, Bosutswe Burial 12	160
6.6	Osteophytes on the manubrium where first ribs articulate, Bosutswe Burial 12	160

6.7	Lesion on the right mandibular condyle, Bosutswe Burial 12	161
6.8	Exostosis on the anterior aspect patella. Bosutswe Burial 12	161
6.9	Exostosis on the posterior aspect of the calcanei, Bosutswe Burial 12	162
6.10	Healed fracture on a left foot metatarsal of Bosutswe Burial 3	166
6.11	A round hole on the skull of Toutswe Mogala Burial 4	166
6.12	Cribrra orbitalia on Toutswe Mogala Burial 16	173
6.13	Chronology of formation of enamel hypoplasia on the Toutswe population	182
7.1	Bosutswe Burial 12 with moderate calculus deposits on mandibular teeth	195
7.2	Mandibular teeth of Taukome Burial 2 showing advanced wear	198
7.3	V-shape dental modification on Toutswe Mogala Burial 16	208
7.4	Lateral view of the skull of Toutswe Mogala Burial 16	208
8.1	Growth curves of humeri of Toutswe children and other population	215
8.2	Growth curves of radii of Toutswe children and other population	215
8.3	Growth curves of ulnae of Toutswe children and other population	217
8.4	Growth curves of femora of Toutswe children and other population	217
8.5	Growth curves of tibiae of Toutswe children and other population	218

Initial research at Toutswe Mogala consisted mainly of surface collection of pottery by Leidlé from South Africa in the 1930s (Lepionka 1978, Debnor 1983a; Campbell 1999, Reid 1998). Excavations on the site began in the early 1970s and were carried out by Lepionka. He concluded that the site was closely related to the Mapungubwe complex on the eastern side of the Limpopo River. During excavations by Lepionka (1977, 1978) numerous human graves were found. In 1978, Debnor conducted a survey of the east central part of the country and reported around 200 archaeological sites, all of them with remnants of Toutswe pottery (Debnor 1979a, 1982, 1983a; Campbell 1999). He began systematic excavations at numerous sites for his Ph.D. project in the early 1980s.

Archaeologists have used the spread and evolution of ceramic decoration motifs and distribution of cultural artifacts such as glass beads to suggest an active interaction between Toutswe and K2/Mapungubwe peoples. In fact, it has been proposed that the