

Stature Variability in Prehistoric and Modern South Asian Populations: A Bio-Cultural Approach

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ABSTRACT Certain evolutionary adaptations manifested in human biological diversity may be expressed as body size and shape variables measurable by anthropometric procedures. Standing height, or stature, is the phenotypic feature examined in this study with respect to both ancient and living populations of South Asia. The problem investigated is to discern differences in stature in samples of extinct and extant populations in this part of the world, and to account for these differences within an evolutionary model. Stature data for prehistoric populations were obtained from calculations of stature regression formulae based upon long bone lengths of skeletons. All prehistoric skeletons in the sample were recovered from well documented archaeological sites. For living populations, stature data were gathered from published anthropometric surveys. Stature values for males and females of adult subjects were not pooled, and statures were divided into arbitrary "height classes." These data were plotted on maps, prehistoric and modern samples being sorted separately, as were values for sex analysis of these spatial and temporal distributions of stature suggests that ancient populations had somewhat greater stature than modern populations. It is hypothesized that the decreased stature of living South Asians, particularly those in urban and village socioeconomic settings, may indicate an adaptive advantage under conditions of chronic protein deficiency, as well as exemplify a condition of relaxed natural selection where muscular-skeletal robusticity no longer plays the significant role that characterizes larger body mass and physical strength in ancient hunting-foraging communities.

"It has been found that there is an increase in stature in all parts of the world during the last few decades... The reason(s) for the upward trend in height are yet to be discovered, but it must be pleasing to find that our race is not becoming diminutive (*sic*) or there is nothing inherently wrong with our social order" (Majumdar and Bahadur, 1949). Anthropologists have been recording stature of South Asians for many years, but the early literature about this subject implicitly or explicitly reinforces a bias that tallness correlates with cultural superiority while shortness is diagnostic of lower status. Not surprisingly this prejudice, shared by western as well as eastern anthropologists, colored interpretations of anthropometric data. Stature was a critical sorting criterion of Risley's (1901) anthropometry and racial classification, but the notion of tall-

ness as already well established in the traditional literature and belief systems of Vedic and post-Vedic India (Chanda, 1916; Childe, 1926).

With the fall of the concept of biological race in systematic biology some 40 years ago, racial classification was recognized as an unscientific approach to the study of human physical diversity and distribution of populations in time and space (Kennedy, 1976). However, in the half century preceding this shift in biology the anthropometric surveys conducted by Risley and his successors had a profound influence upon the formulation of racial typologies applied to classifications of South Asian populations which were already sorted out by cultural hierarchies of caste, social class, and language. In the *Census of 1901*, Risley included anthropometric measurements of several thousand subjects, additional subjects being included in the *Census of 1931*. These latter anthropometric data were interpreted by Guha (1935) within a more com-

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plex racial scheme than that proposed by Risley since he included descriptions of prehistoric human skeletal remains in efforts to establish racial affinities of the peoples of India. Stature was an important variable in the compilation of biological and demographic data in these and later *Census* reports, but the model used in any of them was a typology based upon now discredited notions of human races as natural and relatively unchanging subspecies. Today we know that some biological criteria used to identify distinct species, be these human or nonhuman, do not apply to arbitrary divisions of populations within the same species. But until quite recently there has been little serious effort to document stature variability and other phenotypic expression of body size and shape in prehistoric and modern populations in an evolutionary context, an orientation which takes into account geographical clines of trait incidence and expression as well as consideration of adaptive responses to different and changing environmental settings.

The present study examines stature variability in prehistoric and modern populations in South Asia in order to discover significant differences of expression of this variable within a spatial and temporal framework and to suggest an evolutionary model to account for these differences.

STATURE VARIABILITY

Stature is chosen as a significant physical expression of human biological diversity for the reasons that it can be measured directly and easily with living subjects as well as be determined for archaeological (skeletal) subjects by means of certain well established methods for correlating body height during life with long bone lengths. Furthermore, stature is both heritable as well as phenotypically modifiable under influences of nutrition, pathology, patterns of activity during growth, and other stressors of the natural and cultural environment. Even skeletally mature adults may undergo striking changes in stature under conditions of reduced nutrient

intake. The average stature of a population can vary over the course of several generations as environmental conditions outside of the genome may prevail to affect the phenotype. In short, stature is a continuous variable, not a discrete trait with its phenotypic expression under strict genotypic control, as with other biological traits such as Carabelli's cusp, oxycraspedoty of the nasal sill, and a host of other nonmetric, discontinuous variables anthroposcopically observable in human subjects.

The Indian subcontinent is an ideal laboratory for investigation of stature clines given its remarkable range of ecological settings and availability of skeletal remains from Palaeolithic, Mesolithic, Neolithic, Harappan (Bronze Age), Chalcolithic, and Iron Age (Megalithic) cultural contexts (Kennedy, 1980; Kennedy and Caldwell, 1984). In the absence of any contradictory archaeological or biological evidence, it is probable that there is a biological continuum of human populations flowing across these prehistoric cultural periods and persisting into the present day. Certainly some of the Mesolithic people were ancestral to some of the Neolithic people, and the architects of the Harappan Civilization do not appear to be so biologically different from other South Asians as to suggest their sudden migration from some unknown homeland into the Indus Valley or their complete isolation from post-Harappan population of Sind, the Punjab, and other regions of their cultural sphere. Where new genetic influx might have occurred, it does not seem to have exerted a profound effect upon the larger South Asian gene pool since the ancient and living peoples of the subcontinent resemble each other in genetic constitution and phenotypic expression much more closely than they resemble populations of the European, African and central and eastern Asiatic landmasses. South Asia's distinct biological identity is a consequence of its relative geographic isolation, although some gene exchange beyond the Himalayas and the desert lands of the northwestern sector did take place prior to the period of European colonial expansion. Today South Asia is the

home of one-fifth of the world's population (Hammond Inc., 1988), and despite increasing frequencies of gene flow across her national borders South Asia represents a biologically self-contained evolutionary field as well as a distinctive culture area. Given these circumstances the forces of inquiry in the present study is to document variability in stature measurements as well as to offer an evolutionary explanation of stature gradients in space and time.

MATERIALS AND METHODS

Stature data derived from South Asia prehistoric human skeletal remains were based upon firsthand anthropometric measurements and observations made by one of the authors (K.A.R.K.) and upon published sources reporting stature values. In most instances, stature has been estimated by employment of living stature-long bone length regression formulae. The procedures developed by Trotter (1970) are those favored and used by the authors, and in those instances where long bone lengths were recorded in published sources the Trotter formulae were calculated. Although stature estimations from long bone lengths of South Asians are few (Athawale, 1964), it has been our experience that the Trotter tables for "White" males and females are most appropriate for use in South Asian samples. A number of other methods based upon metrical data and regression models have been used by other investigators; however, many of them do not fit the South Asian pattern and are better suited to population enclaves of European, American, and African populations. Least appropriate for South Asian samples are stature regression formulae for individuals of eastern Asiatic ancestry.

Twenty-one prehistoric human skeletal series were included in the study, these ranging from Mesolithic to Iron Age cultural periods and covering a number of archaeological sites in Pakistan, India and Sri Lanka. Only intact long bones of the humerus, radius, ulna, femur, tibia and fibula were included in the study since a max-

imum length measurement is required. Where several long bones are present for one individual, the length of the femur was used preferentially; if both femora are present, stature was calculated from average lengths. In order of preference following the femur are the tibia, humerus, and fibula. Stature estimates based upon radius and ulna lengths were not included in this study. Also excluded were bones of skeletally immature individuals, *i.e.*, juveniles and children, since these bones do not contribute towards an understanding of adult body height. All measurements are recorded in millimeter units, maximum lengths of long bones being measured on an osteometric board in samples examined by one of the authors. Long bone lengths recorded in the anthropological literature as well as statements of reconstructed stature were all recalculated in the present study using the Trotter procedure, and these stature data were plotted on the maps (Figs. 1 and 2).

Sampling bias is present, as in any study of archaeological skeletons. Not all skeletal specimens have well preserved long bones which can be used for living stature estimations, or only certain intact long bones are recoverable. Reconstructions of stature are based upon maximum values for long bone lengths, but other components of body height derived from trunk dimensions are not reflected in the final estimation for stature. Thus extremity to trunk size proportions are not deducible from the metric data of long bone lengths by themselves. This is evident in the fact that the ratio of sitting height to standing height varies from population to population, even within a single geographic region (Das, 1981). The place of individual skeletal specimens within the range of variability of their population for a trait such as stature remains unresolved, even in unusual cases of availability of numerous specimens within a single series, as with skeletons from Harappa's Cemetery R-37. Hence we never know if the specimens within a series are "typical" of the macropopulation from whence the series was derived and the possibility that specimens may represent a margi-

Fig. 1: Mean Statures for Modern Populations: Males

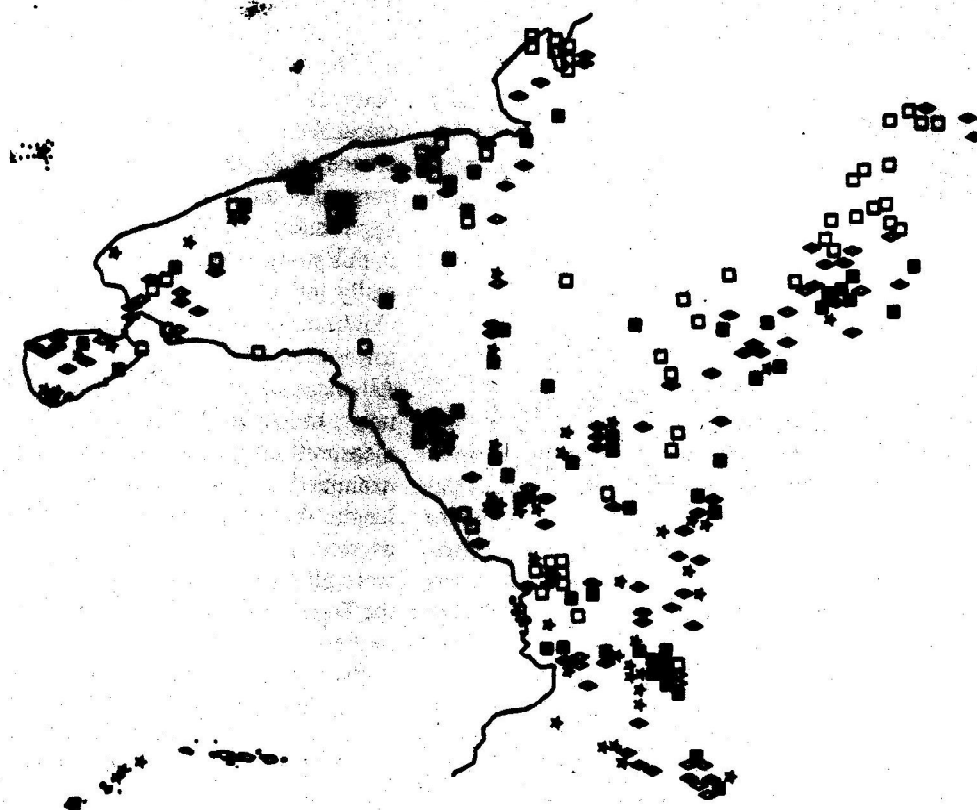
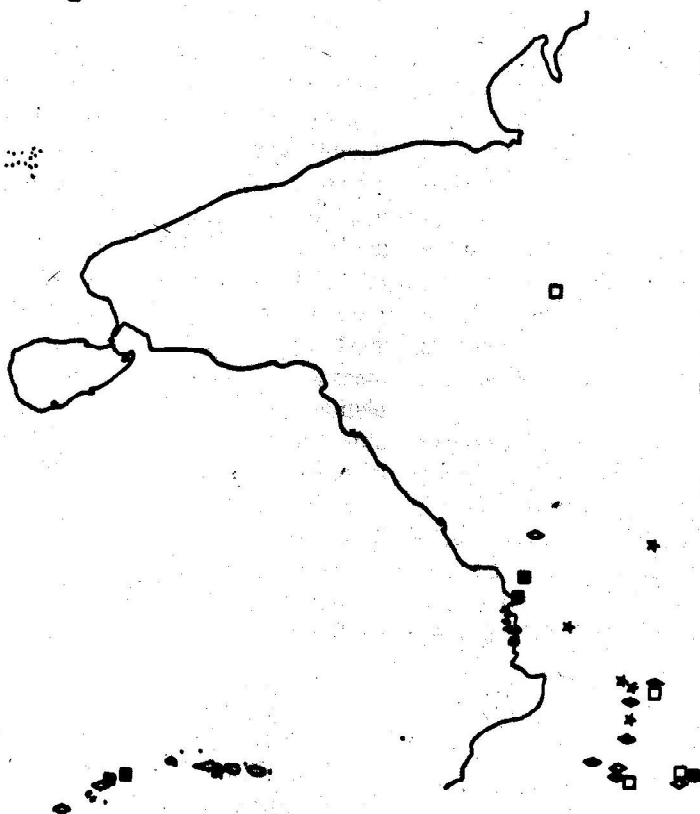


Fig. 2: Mean Statures for Modern Populations: Females



nal enclave of their populations must be considered. These limitations are very familiar to skeletal biologists, but to disregard data that are available for study and comparative analysis is to abandon any effort to reconstruct the physique and lifeways of ancient populations for which a skeletal record is preserved.

The 21 prehistoric skeletal series of this study are grouped according to their cultural associations as: (1) Mesolithic hunter-gatherer populations; (2) agricultural and pastoral populations of the northwest sector of the Indian subcontinent which include specimens from the Harappan Civilization and the Gandharan Grave Complex; (3) agricultural and pastoral populations of central and southern India from Neolithic and Chalcolithic sites; (4) the Iron Age, or Megalithic, populations which farmed and tended their herds in the final period of prehistory ending with the diffusion of the great cultural traditions of India and Sri Lanka in the early Historic period.

The methods used in the study of modern population of the Indian subcontinent include a judicious evaluation and selection of the published anthropometric accounts of caste groups, tribal populations, and populations inhabiting given geographical areas. This is a vast and often frustrating literature which reflects many theoretical biases of its authors. For example, Risley instructed his associates to select among their subjects to be measured only those who exemplified the racial type to which he assumed they belonged. Thus a lightly pigmented member of a social group identified as "tribal" would be excluded in preference to a dark-skinned member of the same community, and a dark-skinned individual of high caste would not be included in the sample with his fair-skinned cohorts. Where bias of this kind is stated explicitly in the published written account, the anthropometric data have been excluded from the present study. However, many of the older anthropometric reports do not provide details of how individuals were selected as subjects, a problem understood by Mahalanobis and his associates (Mahalanobis et al., 1949) who achieved a statistically sound anal-

ysis of their anthropometric survey of Uttar Pradesh in 1941.

Modern populations defined on the basis of caste and tribe compose the bulk of the anthropometric literature in South Asia. While tribal groups are generally defined as endogamous populations occupying restricted and often isolated geographical areas, caste groups are defined as a different kind of endogamous entity using the criteria of profession, social status, and religion. However, a single caste may have members distributed across a broad geographical range, or an isolated region may contain a broad spectrum of caste (Maloney, 1974). Since the present study is concerned with geographic distribution of stature variables among modern populations, data are included only for populations inhabiting specific geographical regions. For widely diffused tribes and castes, no effort has been made to isolate them and track them across geographical space. To do so would be to obscure any attempt to discern stature variability within an evolutionary context of regional ecological and bio-cultural adaptations.

Another advantage to a geographical approach to stature variability is that body height measurements can be observed against the backgrounds of differences of altitude, climate, reliability of the food resource base of an area, and socio-economic lifeway. Furthermore, many prehistoric and modern populations occupy clearly circumscribed geographical habitats, thus allowing for the study of stature along both spatial and temporal dimensions in circumstances where ancient skeletal material is available. This palaeodemographic approach is preferable to that practiced by those anthropologists using a racial typology model whereby it is assumed that all tribal groups constitute some biologically homogenous population or that all Brahmins share the same restricted range of phenotypic characters whatever their geographical distribution.

All stature data of the present study had to meet certain criteria to be included in the analysis. First, individuals who had been measured for stature and other variables had to reside

Table 1: Mean stature for ancient populations

#	Site	Region	Males			Females			Reference
			St	S.D.	N	St	S.D.	N	
I. MESOLITHIC HUNTER-GATHERER COMMUNITIES									
1.	Baradomba Lena	SL	1653		1	1617		1	Kennedy et al., 1986a
2.	Bellari Bandi Palassa	SL	1610		1	1595		1	Kennedy, 1965
3.	Langhnaj	Gj	1715	69.3	3	1587		1	Ehrhardt & Kennedy, 1965
4.	Mahadaha	UP	1796	57.0	11	1700	48.7	4	Kennedy, 1984 & 1989
5.	Sarai Nahar Rai	UP	1775	45.0	6	1767	23.3	2	Kennedy et al., 1986b
II. FARMING AND NOMADIC POPULATIONS OF THE NORTHWEST SECTION									
6.	Harappa R 37	Pk	1743	108.1	3	1619	66.8	5	Gupta et al., 1962
7.	Harappa H	Pk	1727	46.1	7	1574	69.0	7	Gupta et al., 1962
8.	Lothal	Gj	1722	101.5	5				Sarkar, 1972
9.	Mohenjodaro	Pk	1719	116.6	3	1494	91.2	3	Marshall, 1931
10.	Sarai Khola	Pk	1678		15				Bernhard, 1969
11.	Timargarha	Pk	1710	53.3	12	1587	52.0	9	Bernhard, 1967
12.	Burzahom	Km	1714	23.5	4	1567	75.7	2	Basu & Pal, 1980
13.	Rupar	Pj	1655		1				Dutta et al., 1980
III. EARLY FARMING AND HERDING COMMUNITIES OF CENTRAL AND SOUTHERN INDIA									
14.	Bagor	Rj				1304		1	Lukacs et al., 1982
15.	Inamgaon	Mh	1685	59.4	2	1560		1	Lukacs & Walimbe, 1986
16.	Nagarjunakonda	AP	1767		1				Gupta et al., 1970
17.	Nevasa	Mh	1680		1	1619	48.1	2	Kennedy & Malhotra, 1966
18.	Piklilal	Kn	1763		1	1645		1	Ayer, 1960 & Sarkar, 1972
IV. THE MEGALITH BUILDERS AND THEIR IRON-AGE COLLATERALS									
19.	Brahmagiri	Kn	1688	56.6	2				Sarkar, 1972
20.	Nagarjunakonda	AP	1743	51.8	4	1631	9.2	2	Gupta et al., 1970
21.	Yaleswaram	AP	1754	2.8	2	1673		1	Sarkar, 1972

Abbreviations: St = mean stature in mm S.D. = standard deviation in mm

N = number of individuals in sample

AP = Andhra Pradesh Gj = Gujarat Kn = Karnataka Km = Kashmir Mh = Maharashtra Pk = Pakistan Pj = Punjab Rj = Rajasthan SL = Sri Lanka UP = Uttar Pradesh

within a limited geographical region, and this region had to be accurately defined by the recording investigator. Second, in some published sources it is recorded that individuals had been measured from several localities and that the measurements for each variable were pooled. In such cases, if the localities were relatively close

to each other, their mean values were included in the present study and a point equidistant to these localities was plotted on the trait distribution maps (Figs. 3 and 4). If a preponderance of subjects came from a single area but a few additional subjects from adjacent or distant locations were included in the published record, then

only populations in adjacent political districts were included in the analysis. Again, on mapping these locations the locus of highest population density was marked.

In the anthropological record of stature, many investigators have been interested in recording the body height of members of an entire caste, even including in their samples subjects from far distant political states or provinces, then pooling the metrical data. Such efforts were not accepted into the present study. The same selective criteria for excluding biased samples of this kind were applied to anthropometric data identified as "tribal" without regard for regional habitats. Nor do the present studies imply that tribal populations are universally closer to archaeological mortuary populations simply on the basis of a few shared socioeconomic practices, although in certain instances the biological continua of prehistoric with modern populations can be established (Kennedy et al., 1986). Modern populations designated as "tribals" may not be direct descendants of ancient populations represented by specific skeletal series, as has been assumed by earlier investigators (Sarkar, 1954).

Data on stature for modern populations are organized according to alphabetical listing of authors and each source bears a number from 1 to 52. If a single group is measured, its location is given on a map and labeled with the number of the published source. If several groups are measured, they are identified by their appropriate source number followed by a letter. Male and female samples from the same group are identified by the same number and letter, but the sexes are represented on separate maps. The information recorded for each modern population includes: (1) the name of the group; (2) the status assigned to the group as tribe, caste, or other type of community; (3) author of the source from which the anthropometric data on stature were taken; (4) cultural information where relevant; (5) location of residence of subjects in the series; (6) gender; (7) mean stature; (8) standard deviation of stature when this information is given; (9) frequency of the individuals in a sample.

Table 2 summarizes this information. Details of data collection are presented in Appendix 1 for prehistoric subjects and in Appendix 2 for living (modern) subjects.

RESULTS

The data are presented concisely in the following figures.

Figures 1 (male) and 2 (female). Each modern population is shown on an outline map of South Asia. The average statures for the populations are divided into 5 height classes with a nearly equal number of populations in each class. The location of residence for each population is then marked with a symbol indicating the height class of its population. The height classes are as follows:

(M)	- 1594.9: *	(F)	- 1474.9: *
1595.0	- 1612.9: ♦	1475.0	- 1483.9: ♦
1613.0	- 1631.9: ■	1484.0	- 1494.5: ■
1632.0	- 1644.9: ♦	1494.6	- 1509.9: ♦
1645.0	- : □	1510.0	- : □

When more than one population is present at one location, symbols for the populations are placed close together, and as near as possible to the actual location.

Figures 3 (male) and 4 (female). Stature classes for ancient populations are represented on an outline map in the same way that modern populations are shown in Figures 1 and 2. Stature classes are as follows;

(M)	- 1679: *	(F)	- 1569: *
1680	- 1711: ♦	1570	- 1589: ♦
1712	- 1725: ■	1590	- 1619: ■
1726	- 1759: ♦	1620	- 1659: ♦
1760	- : □	1660	- : □

It should be noted that although the ordering of the symbols remains constant, i.e. the same symbol always means the tallest group, the height classes are different for each of the four kinds of populations: modern and ancient, male and female.

Fig. 3: Mean Statures for Ancient Populations: Males

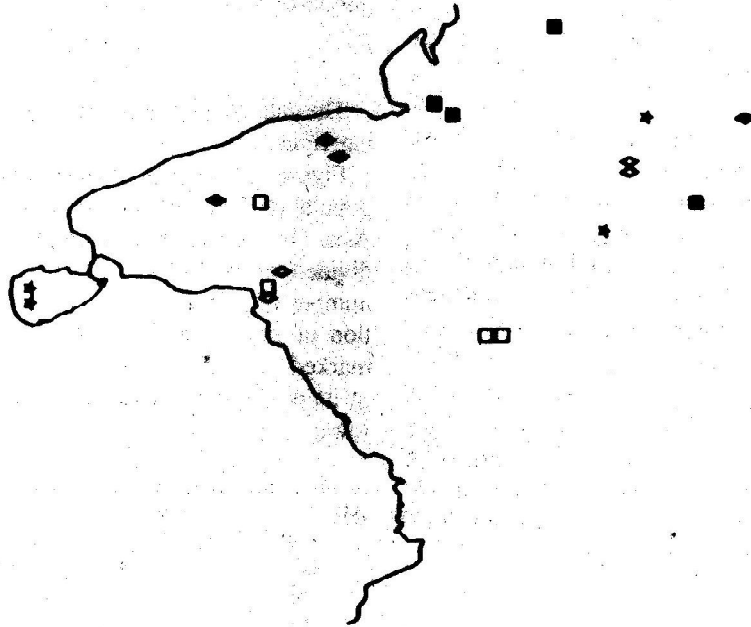


Fig. 4: Mean Statures for Ancient Populations: Females

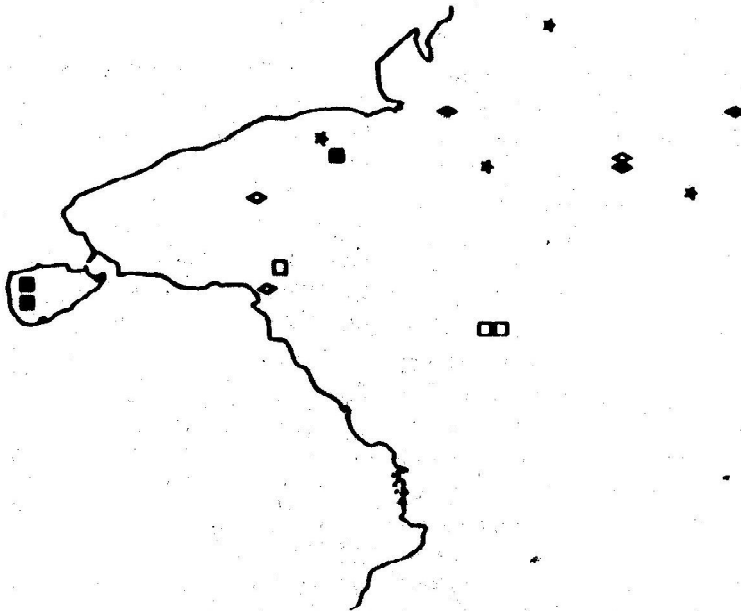


Table 2: Mean stature for modern populations

# Group	Region	Males		N	Reference
		St	S.D.		
1. Pardhan	MP	1628.9	53.74	101	Ahmad, 1972
2. Kavar	MP	1620.2	46.01	109	Ahmad, 1973
3. Pande	MP	1594.3	55.12	101	Ahmad, 1973
4. Kodaku	MP	1579.5	49.36	100	Ahmad, 1976
5. Kola	UP	1639.8	56.86	50	Banerjee, M.K., 1967
6. Saharaya	UP	1624.6	57.09	50	Banerjee, M.K., 1969
7a. Kondh	Or	1587.4	49.99	103	Banerjee, M.K., 1970
b. Nuka Dora	Or	1620.9	53.05	103	
8. Midnapurians	WB	1634.9	62.70	272	Banerjee, P., 1969
9. Korku	MA	1620.6	56.09	50	Basu, A., 1970
10. Noluta	MA	1571.8	61.2	200	Basu, M.N., 1953
11a. Kanyakubja Brahmins	UP	1666.0	55.20	100	Bhatnagar, 1970
b. Sarajuparia Brahmins	UP	1643.5	88.05	100	
12. Lodha	WB	1591.3	61.6	200	Bhowmick, 1956
13a. Changpa	KN	1612.8		21	Bowles, 1970
b. C. Ladakhi	KN	1629.3		36	
c. Puriki	KN	1599.6		40	
d. Balti	KN	1619.1		63	
e. Moslem Kashmiri	JK	1647.9		45	
f. Dogri	JK	1650.0		42	
g. Mirpur Moslem	JK	1666.5		40	
h. Poonch	JK	1651.8		40	
i. Afghani	Af	1636.8		40	
j. Mohmandi	Pk	1689.3		42	
k. Afridi	Pk	1705.5		40	
l. Khattak-Bangash	Pk	1707.0		40	
m. Hindki	Pk	1682.2		26	
n. Potwari	Pk	1689.3		26	
p. Lahnda Punjabi	Pk	1663.8		106	
q. Doab Punjabi	Pj	1653.3		58	
r. Gujar	Pj	1693.2		41	
s. E. Punjab Hindi	Pj	1597.8		27	
t. Kangri	Pj	1638.9		75	
u. Mandawali-Suketi	HP	1641.3		112	
v. Chambyali	HP	1648.5		44	
w. Chaurahi	HP	1641.9		44	
x. Gaddi	HP	1632.6		50	
y. Kulu Kanet	Pj	1630.5		60	
z. Kochi-Sodochi	Pj	1632.0		80	
aa. Keonthali	Pj	1645.2		43	
ab. Manchati-patni	Pj	1625.7		103	
ac. Tinan	Pj	1614.3		43	
ad. Bunan	Pj	1634.7		45	
ae. Kinnauri	Pj	1630.5		54	
af. Lahuli Bhotia	HP	1614.9		41	
ag. Spiti Tibetans	Pj	1605.0		60	
ah. Nyamkat	HP	1594.5		40	
ai. Tehri Barhwali	UP	1634.4		123	
aj. Pauri Barhwali	UP	1616.1		76	
ak. Chamoli Garhwal	UP	1640.1		60	
al. Kumaoni	UP	1643.1		60	
am. Danpuriya	UP	1608.0		25	
an. Silipkat	UP	1608.9		35	

# Group	Region	Males		N	Reference
		St	S.D.		
ao. Johari Bhotia	UP	1620.6		47	
ap. Dharma Bhotia	UP	1562.1		43	
aq. Dotiyali	Np	1616.1		40	
ar. Central Nepali	Np	1609.5		40	
as. Thakur	Np	1627.8		100	
at. Chettri	Np	1600.4		117	
au. Magar	Np	1625.5		118	
av. Gurun	Np	1619.1		107	
aw. Tamang	Np	1586.1		150	
ax. Thami	Np	1539.4		66	
ay. Newari	Np	1631.9		60	
az. Sunwari	Np	1500.0		69	
ba. Rai	Np	1598.1		102	
bb. Limbu	Np	1612.8		100	
bc. Sherpa	Np	1611.0		80	
bd. Lepcha	Sk	1588.8		80	
be. Sikkim Tibetans	Sk	1599.6		40	
bf. Bhutanese	Bt	1640.1		70	
bg. Oraon Munda	Br	1605.6		54	
bh. Ho Munda	Br	1591.8		67	
14. Kabui	Mn	1558.7	55.1	100	Chakladar, 1957
15a. Meitei	Mn	1603.6		105	Chakravarti, 1986
b. Pangan	Mn	1493.1		98	
c. Kabui Naga	Mn	1571.6		155	
d. Tangkhul Naga	Mn	1604.1		106	
16. Rabha	As	1624.5	50.8	100	Das, B.M., 1956
17a. Hills Garo	As	1594.5	55.0	100	Das, B.M., 1960
b. Plains Garo	As	1619.2	40.8	100	
18a. Khasi	As	1571.3		790	Das, B.M., 1970
b. Bodo	As	1616.7		1011	
c. Naga	As	1598.8		542	
d. Kuki	As	1576.0		120	
e. Abor	As	1584.3		419	
f. Khamyang	As	1599.0		85	
g. Miri	As	1611.1		100	
h. Deuri	As	1637.3		100	
19a. Khyntiam	Mg	1566.2	51.7	100	Das, B.M., 1978
b. Pnar	Mg	1573.5	58.9	100	
c. Bhoi	Mg	1570.0	57.2	100	
d. War	Mg	1556.8	55.6	100	
20. Kaibarta	As	1609.3	64.1	100	Das, B.M. and Das, M.S., 1969
21. Kayastha	As	1640.6	50.7	104	Das, B.M. et al., 1980
22. Kalita	As	1636.3	53.3	120	Das, B.M. & Das, R., 1965
23a. Brahmin	As	1623.0		24	Das, P., 1974
b. Baishya	As	1645.3		24	
c. Kaibarta	As	1626.6		22	
24. Kalita	As	1629.6	56.2	51	Das, P.B., 1971
25a. Kaibarta	As	1616.5		60	Dutta, 1980
b. Brahmin	As	1642.0		50	
26a. Car Nicobarese	Ni	1586.5	49.0	175	Ganguly, 1976
b. Chowran	Ni	1567.0	44.7	110	
c. Terressan	Ni	1591.4	39.6	77	
d. South Islander	Ni	1614.4	56.0	63	
27. Ho	Br	1600	51.6	100	Ghosh, 1967

# Group	Region	Males		N	Reference
		St	S.D.		
28. Lambadi	AP	1648.6	54.5	97	Gupta & Basu, 1962
29. Padar	Gj	1625.1	59.42	102	Haque, 1984
30a. Agarja	Or	1641.8		50	Karve, 1954
b. Binzhal	Or	1570.8		50	
c. Bhatra	Or	1612.8		52	
d. Bhuinya, north	Or	1581.3		40	
e. Bhuinya, south	Or	1602.9		51	
f. Bondo	Or	1573.5		46	
g. Aranyak Brahmin	Or	1635.3		24	
h. Samavedin Brahmin	Or	1663.0		53	
i. Dora	Or	1600.8		34	
j. Godaba	Or	1594.7		52	
k. Gond	Or	1607.2		51	
l. Juang	Or	1536.4		40	
m. Kondh	Or	1566.7		51	
n. Kharia	Or	1578.1		28	
o. Koya	Or	1588.7		51	
p. Kulta	Or	1631.0		51	
q. Kumhar	Or	1646.9		51	
r. Meher	Or	1614.5		16	
s. Munda	Or	1623.7		32	
t. Porja	Or	1575.9		52	
u. Bhangi	Or	1603.9		39	
v. Oraon	Or	1587.9		39	
w. Ager	Kn	1569.8		34	
x. Havig Brahmin	Kn	1637.6		41	
y. Devang Koshti	Kn	1620.3		48	
z. Ganiga	Kn	1648.2		33	
aa. Gauda	Kn	1622.2		56	
ab. Halakki Vokkal	Kn	1628.1		41	
ac. Harkantra	Kn	1619.6		35	
ad. Holer	Kn	1644.9		48	
ae. Kunchitiga	Kn	1667.3		27	
af. Jenu Kuruba	Kn	1581.2		63	
ag. Bette Kuruba	Kn	1531.3		35	
ah. Kuruba	Kn	1632.2		36	
ai. Kodagu	Kn	1665.0		100	
aj. Nadavara	Kn	1667.1		42	
ak. Namdhari	Kn	1640.8		40	
al. Pattasali	Kn	1617.1		41	
am. Sadaru	Kn	1638.2		49	
an. Sholega	Kn	1609.7		40	
ao. Valmiki	Kn	1637.0		27	
31a. Halbi	Mh	1585.0		33	Karve & Dandekar, 1951
b. Sonar	Mh	1612.4		28	
c. Brahmin	Mh	1617.0		123	
d. Brahmin	Mh	1622.0		74	
e. Maratha	Mh	1623.2		44	
f. Kohali	Mh	1626.2		26	
g. Koshti	Mh	1626.8		28	
h. Brahmin	Mh	1628.8		73	
i. Maratha	Mh	1630.7		108	
j. Brahmin	Mh	1630.8		57	
k. Brahmin	Mh	1631.1		62	
l. Brahmin	Mh	1632.7		26	

#	Group	Region	Males		N	Reference
			St	S.D.		
m.	Brahmin	Mh	1633.3		72	
n.	Maratha	Mh	1633.8		64	
o.	Maratha	Mh	1634.0		80	
p.	Brahmin	Mh	1635.7		75	
q.	Brahmin	Mh	1636.9		57	
r.	Maratha	Mh	1638.9		96	
s.	Maratha	Mh	1639.7		110	
t.	Maratha	Mh	1640.5		159	
u.	Maratha	Mh	1642.7		106	
v.	Maratha	Mh	1646.5		55	
w.	Khatrri	Mh	1646.5		26	
x.	Brahmin	Mh	1649.8		29	
y.	Maratha	Mh	1651.3		143	
z.	Maratha	Mh	1654.8		47	
32a.	Khatrriya	WB	1607.7	62.3	188	Kumar, 1970
b.	Desi	WB	1600.5	50.9	123	
c.	Paliya	WB	1591.5	53.6	109	
d.	Rajbansi	WB	1607.6	57.3	103	
33a.	Kannikar	Kr	1531.7		140	Kumar, 1971
b.	Urali	TN	1544.5		125	
34.	Rajput	UP	1668.9	52.5	151	Majumdar, 1949
35a.	Bhil	Gj	1595.8		215	Majumdar & Sen, 1950
b.	Machi-Kharwa	Gj	1596.3		141	
c.	Bhangi	Gj	1597.2		41	
d.	Koli	Gj	1608.0		121	
e.	Artisan	Gj	1613.1		127	
f.	Memon	Gj	1637.2		100	
g.	Oswal Jain	Gj	1639.8		100	
h.	Brahmin	Gj	1643.4		102	
i.	Khoja	Gj	1645.3		103	
j.	Luhana	Gj	1645.7		132	
k.	Bhatia	Gj	1658.1		30	
l.	Miana	Gj	1673.2		50	
m.	Parsi	Gj	1677.3		137	
n.	Waghar	Gj	1679.5		117	
o.	Rabari	Gj	1682.2		106	
p.	Mher	Gj	1695.1		100	
36a.	Brahmin	UP	1645.1	50.8	85	Mahalanobis, 1949
b.	Agharia	UP	1674.7	57.7	107	
c.	Muslim	UP	1624.5	59.1	168	
d.	Bhatu	UP	1633.8	65.0	148	
e.	Habru	UP	1649.1	76.8	122	
f.	Dom	UP	1665.3	60.7	113	
g.	Chero	UP	1620.3	53.4	100	
h.	Panika	UP	1597.6	52.8	157	
i.	Kharwar	UP	1607.9	55.6	197	
j.	Oraon	UP	1614.5	60.0	99	
k.	Rajwar	UP	1597.1	53.3	105	
l.	Korwa	UP	1581.7	50.7	101	
m.	Tharu	UP	1633.3	52.2	191	
37a.	Brahmin	Bg	1638.6	70.4	97	Majumdar & Rao, 1960
b.	Garó	Bg	1586.6	56.0	72	
c.	Kaibarta	Bg	1621.3	57.6	67	
d.	Kaibarta	Bg	1598.2	64.6	62	
e.	Kayastha	Bg	1626.1	61.1	56	

#	Group	Region	Males		N	Reference
			St	S.D.		
f.	Kayastha	Bg	1633.2	65.8	178	
g.	Kshatriya	Bg	1602.5	55.5	133	
h.	Namasudra	Bg	1594.9	62.2	219	
i.	Rishi	Bg	1591.5	68.1	100	
j.	Sankhari	Bg	1597.3	63.0	135	
k.	Muslim	WB	1647.2		25	
l.	Muslim	WB	1624.2		37	
m.	Muslim	Bg	1617.7	61.9	299	
n.	Muslim	WB	1617.4	57.0	170	
o.	Muslim	Bg	1609.1	57.8	139	
p.	Muslim	WB	1602.7		19	
38.a	Kho 1	Pa	1641.0	61.5	150	Mazumdar, 1976
b.	Kho 2	Pa	1632.0	66.7	90	
c.	Pathan	Pa	1645.1	64.3	50	
39a.	Radhiya Brahmin	WB	1667.5	54.66	95	Mitra, 1970
b.	Mahisya	WB	1638.6	56.02	109	
c.	Kayastha	WB	1646.2	64.30	53	
d.	Goala	WB	1649.9	59.08	54	
e.	Barga	WB	1604.4	49.76	102	
f.	Suvarna Vanika	WB	1695.3	57.87	250	
g.	Kraunchi Dwipi	Br	1613.5	62.5	26	
h.	Daksina Maharashtra	Br	1633.5	56.4	57	
40.	Gayawal	Br	1651.1	45.6	50	Mitra, 1970
41.	Plains Mande	As	1619.2	40.8	100	Pakrasi & Das, 1956
42a.	Sonowal	As	1634.6		100	Phookan, 1975
b.	Jharua	As	1632.9		100	
c.	Thenga	As	1614.9		100	
d.	Dimasa	As	1598.7		100	
43.	Khatri	UP	1679.5	58.9	223	Raghibir, 1972
44a.	Dorla	MP	1600.2	49.7	100	Rakshit, 1960
b.	Dhurwa	MP	1612.9	57.7	100	
45a.	Bhatra	MP	1603.6	61.8	100	Rakshit, 1963
b.	Muria	MP	1618.0	59.0	100	
46.	Pahira	Br	1522.3	57.1	80	Ray, 1958a
47.	Juang	Or	1576.7	69.9	116	Ray, 1958b
48a.	Pandit	Km	1640.8	52.65	206	Raychaudhuri, 1961
b.	Muslim	Km	1651.2	64.73	52	
49a.	Iyer	TN	1635.4	61.0	100	Sanghvi et al., 1982
b.	Iyengar	TN	1634.8	65.6	88	
c.	Vellalan 1	TN	1609.1	57.5	41	
d.	Vellalan 2	TN	1635.8	67.8	75	
e.	Naidu	TN	1665.8	76.7	100	
f.	Mudaliar	TN	1609.3	50.6	108	
g.	Chettiar	TN	1630.1	54.2	56	
h.	Vanniya	TN	1635	60.5	100	
i.	Parayan	TN	1597	62.2	99	
j.	Mutracha	TN	1607	60.4	100	
k.	Chakkiliyan	TN	1604	57.9	100	
l.	Kallan 1	TN	1645	65.3	63	
m.	Kallan 2	TN	1648	47.4	98	
50.	Madras Hindu	TN	1648	55.9	188	Sankaranarayanan, 1955
51.	Maharashtrian	MP	1679.0	42.7	19	Sharma, 1970
52a.	Sinhalese	SL	1592.1	62.0	131	Stoudt, 1959
b.	Sinhalese	SL	1603.6	51.4	101	
c.	Sinhalese	SL	1607.3	53.6	28	

# Group	Region	Males		N	Reference
		St	S.D.		
d. Sinhalese	SL	1603.5	62.8	90	
e. Sinhalese	SL	1598.8	78.2	15	
f. Sinhalese	SL	1621.4	57.4	62	
g. Sinhalese	SL	1602.3	58.6	61	
h. Sinhalese	SL	1608.9	60.6	147	
i. Tamil	SL	1609.2	60.9	453	
j. Tamil	SL	1644.1	73.2	26	
k. Tamil	SL	1631.4	57.2	64	
l. Tamil	SL	1641.5	39.8	15	
m. Tamil	SL	1593.1	62.2	33	
n. Veddah	SL	1589.5	68.0	24	
o. Veddah	SL	1588.2	63.2	114	
p. north islander	MI	1598.7	57.8	52	
q. south islander	MI	1583.9	57.6	82	

# Group	Region	Females		N	Reference
		St	S.D.		
8. Midnapurian	WB	1489.0	59.40	232	Banerjee, P., 1969
10. Noluta	Bg	1461.2	58.0	50	Basu, M.N., 1953
12. Lódha	WB	1494.5	68.0	50	Bhowmick, 1956
15a. Meitei	Mn	1504.1		82	Chakravarti, 1986
b. Pangan	Mn	1480.6		100	
c. Kabui Naga	Mn	1480.6		100	
d. Tangkhul Naga	Mn	1603.5		108	
19a. Khynriam	Mg	1464.3	46.4	65	Das, B.M., 1978
b. Pnar	Mg	1474.2	50.7	100	
c. Bhoi	Mg	1483.8	49.1	100	
d. War	Mg	1456.5	44.9	60	
20. Kaibarta	As	1479.1	53.9	77	Das, B.M. and Das, M.S., 1969
24. Kalita	As	1551.8	50.7	51	Das, P.B., 1971
26a. Car Nicobarese	NI	1484.8	44.8	166	Ganguly, 1976
b. Chowran	NI	1494.5	42.3	58	
c. Terressan	NI	1496.0	41.7	81	
d. south islander	NI	1507.9	53.7	50	
27. Ho	Br	1498	53.5	50	Ghosh, 1967
36m. Tharu	UP	1511.3	58.0	181	Mahalanobis, 1949
42a. Sonowal	As	1491.1		100	Phookan, 1975
b. Jharua	As	1494.6		100	
c. Thenga	As	1514.1		100	
d. Dimaa	As	1482.1		100	
46. Pahira	Br	1424.2	35.7	32	Ray, 1958a
51. Maharashtra	MP	1577.0	33.5	13	Sharma, 1970

Abbreviations: St = mean stature in mm S.D. = standard deviation in mm

= number of individuals in sample

= Afghanistan As = Assam AP = Andhra Pradesh Bg = Bangladesh Bt = Bhutan

= Bihar GJ = Gujarat HP = Himachal Pradesh JK = Jammu and Kashmir

= Karnataka Km = Kashmir Kr = Kerala MP = Madhya Pradesh Mh = Maharashtra

= Maldives Mn = Manipur Mg = Meghalaya Np = Nepal NI = Nicobar Islands

= Orissa Pk = Pakistan Pj = Punjab Rj = Rajasthan Sk = Sikkim

= Sri Lanka TN = Tamil Nadu UP = Uttar Pradesh WB = West Bengal

Figures 5 (male) and 6 (female). These graphs show how many groups share an average stature within each 10 mm range. Modern populations are represented by closed squares ■ and ancient populations by open squares □ on the same graph. The numerals above the dots are keyed to Table 1 and Appendix 1: a population has the same identifying number in the table, appendix, and graph.

DISCUSSION

The most striking result of this stature analysis of prehistoric and modern South Asians is that the taller subjects are from the ancient populations (Figs. 5 and 6). Subjects with highest values for reconstructed stature are from the Mesolithic sites of Sarai Nahar Rai and Mahadaha on the Gangetic plain. Another Mesolithic series from Langhnaj, which is in northern Gujarat, has medium stature values when compared to the other ancient populations of the sample, but these individuals are somewhat taller than the tallest subjects in the sample of modern populations. Other Mesolithic subjects are of lesser stature, Batadomba lena and Bellanbandi Palassa skeletons representing the shortest within the ancient series. However, these Sri Lankan subjects are of average stature when compared to averages of modern populations in the sample.

The extreme tallness of the Mesolithic Gangetic hominids is a distinctive feature of their populations, and the results of an earlier multivariate analysis of the cranial morphology of specimens from Sarai Nahar Rai and Mahadaha are interpreted to mean that they share a number of phenotypic features which may reflect parallel attainment of ontogenetic development as well as close genetic affinity (Kennedy et al., 1984). However, multivariate analysis of South Indian Iron age populations from Brahmagiri, Nagarjunakonda, and Yeleswaram indicates that there was considerable genetic distance between them. Stature variables for these series show that while they were of medium body height for ancient populations they were well above average height

from modern populations (Kennedy and Levi-sky, 1984). Since some of these Iron Age people were contemporary with early Historic populations of south India, it is likely that gene flow increased during the past two millennia. However, today the stature of Indians of the southern region of the peninsula appears to be well below that of their Iron Age antecedents. Since there is no biological evidence to support a theory of an abrupt demographic episode in this part of the subcontinent with the emergence of megalithic cultures of the Iron Age, it is probable that a close degree of biological affinity connects the ancient and modern populations of the southern Indian states.

What are the causes of decreasing stature values of South Asian populations from ancient to modern times if demographic transitions of a dramatic and geographically extensive scale are excluded from consideration? Evolutionary adaptational explanations are more rewarding than genetic or population migration replacement models in answering this question. Indeed, the beginnings of an adaptive trend towards shorter stature is already discernible in those prehistoric populations of South Asia who made the transition from full-time hunting-gathering to the socioeconomic strategy of food production, agriculture leading to sedentism and pastoralism contributing to nomadism and habitat expansion.

The recognition that there is a gradient of stature distribution in modern populations from northwest to east and south portions of the Indian subcontinent is not new (Buechi, 1968). The inhabitants of Rajasthan, Kashmir, and Baluchistan are, in general, of taller stature than the inhabitants of other regions, a feature especially marked among the higher castes. Takahashi (1971) attributes this cline to differential diet, noting that the western and northern inhabitants of South Asia include many herding groups who consume high quantities of dairy food. Milk products are high in protein relative to grains that make up the diet of Indians living in eastern and southern habitats. Takahashi goes beyond nutritional explanations in his correlation of stature

clines with climatic zones, observing that taller statures are found in the arid belt of the northern and northwestern sectors of the subcontinent while shorter statures occur in the humid regions of the eastern and southern zones.

The relationship of this current picture of stature clines to the prehistoric pattern of stature variability is found in the archaeological record of South Asia. Agriculture and pastoralism have a longer history in northern regions of the subcontinent than they do in the south, as evidenced by the rise of Neolithic communities at Mehrgarh in Baluchistan by 6000 B.C. and the flowering of the Harappan Civilization in the Indus valley and vicinity in the third millennium B.C. Dates for early agriculture in central and south India are much later, some Neolithic communities making the transition from hunting and gathering by 2500 B.C., but others doing so as late as 1000 B.C. (Agrawal, 1982:122). However, flesh foods remained a relatively high portion of Neolithic diets, thus guaranteeing an adequate amount of protein nutrients. Only with specialization of the food-producing lifeway with development of more sedentary village life and the emergence of urban centres does protein decrease significantly from flesh food resources. This nutritional factor is well documented from other parts of the ancient and modern world, as represented in pre-Columbian Mexico (Saul, 1972) and modern Latin America (Stini, 1975) where protein deficiency diseases leave their marks on skeletal tissue and result in a failure of protein-deprived individuals to attain their full ontogenetic growth potential. Under these conditions of chronic protein deficiency stress, smaller body size (of which stature is a critical component) may be highly adaptive for survival. Natural selection for reduction of body size and mass may continue in a population existing under these nutritional conditions which may persist over many generations. However, the genotype is not altered, and realization of full ontogenetic development may be attained in a high proportion of the population when adequate protein is introduced into the diet (Goodman et

al., 1984).

Differences in stature are attributed by Wolpoff (1980) to a very different mechanism. He suggests that tallness was adaptive for prehistoric people who were nomadic, travelling long distances in pursuit of game which migrated seasonally to different ecozones. The physical demands of the hunting-gathering lifeway which involved tracking of large and dangerous game placed a selective advantage on high muscular-skeletal robusticity and large body size, particularly among males who were involved in procurement of flesh foods under conditions of high risk and strenuous demands upon physical strength and stamina. Selection for large and robust body form was relaxed among sedentary food-producing populations where the physical demands and risks are of a very different sort. Pastoralism may involve selection for efficiency of long-distance walking, and the tallest modern South Asians are from the northwest sector of the subcontinent where herding is a common way of life. Wolpoff's hypothesis to account for the fact of muscular-skeletal robusticity and body size reduction in *Homo sapiens* over the past 100,000 years correlates with our interpretation of the prehistoric skeletal record and modern populations of South Asia with respect to temporal and spatial changes in stature as well as with Takahashi's observations of geographical gradients of stature with respect to diet and climatic environmental variables.

CONCLUSIONS

This study addresses the question of discerning changes in stature in South Asian populations from prehistoric to modern times and plotting stature measurements across broad geographical regions of the Indian subcontinent. We find that there are significant modifications of this phenotypic variable within the framework of time and space. Explanations for such trends and gradients are sought in evolutionary models that take into account the changing lifeways of those hunting-gathering populations which made the

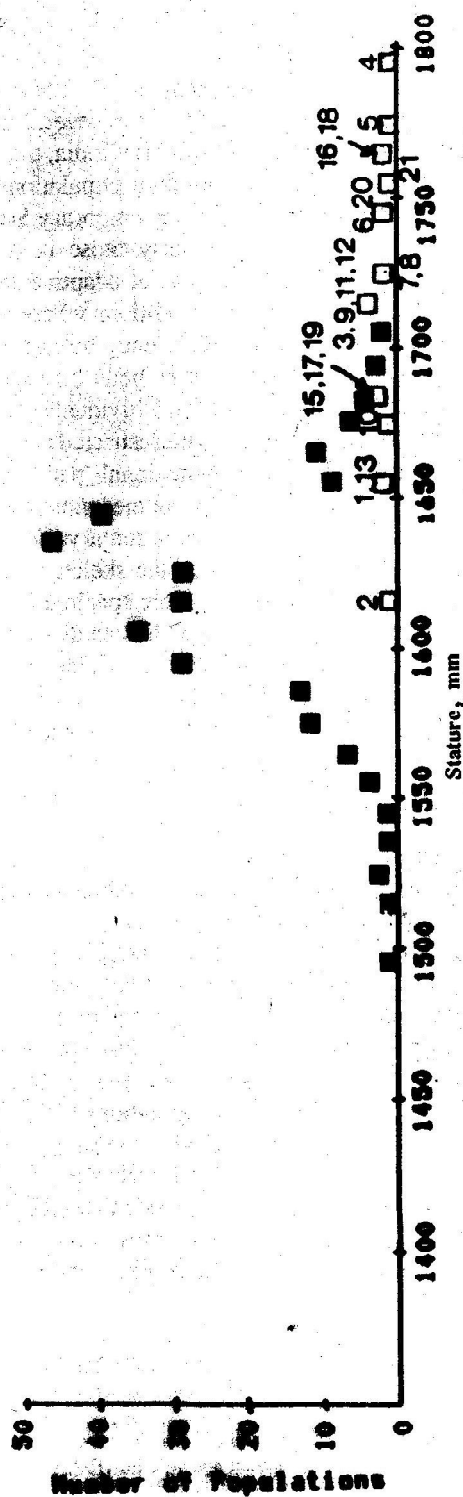


Fig. 5: Distribution of Average Statures, Ancient and Modern: Males

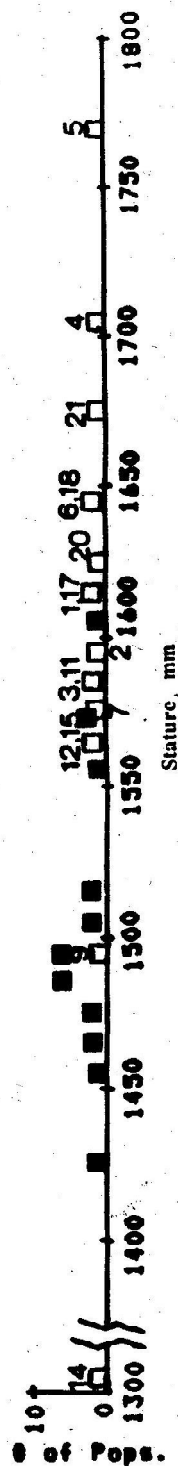


Fig. 6: Distribution of Average Statures, Ancient and Modern: Females

socioeconomic transition to food production through agricultural and pastoral practices. Given that stature, or standing height, is a critical component of total body size and mass and related to degrees of expression of muscular-skeletal robusticity, it serves as a reliable indicator of plasticity of phenotypic responses to stresses imposed by the natural or cultural environment.

Samples of 21 prehistoric human skeletal series and 314 modern population series from South Asia were compared for degrees of expression of stature variability with respect to sex, geographical location, and prehistoric and cultural contexts. These data were collected from published descriptions of prehistoric skeletal remains recovered from well documented archaeological sites and from anthropometric surveys conducted by government census takers and anthropologists. Some unpublished data collected by one of the authors (K.A.R.K.) in the course of his morphometric study of certain prehistoric skeletal series were included in this study. Stature values were plotted on maps for prehistoric and modern population samples with male and female data recorded on separate maps. While sampling bias is an inevitable problem in this type of analysis, the study includes prehistoric and modern population series that they have the property of "random" selection since no single geographical region, caste, or religious group was predominantly represented, and the skeletons are derived from a broad diversity of archaeological sites.

Analysis of these spatial and temporal distributions of stature data suggests that ancient populations had somewhat greater body heights than modern populations. This trend towards decreasing stature was initiated in Neolithic communities where natural selection for greater body height and muscular-skeletal robusticity no longer played the significant role it held in the life of full-time hunting-gathering populations. The geographical clines of stature gradients in modern South Asia reflect this biological and cultural history of the socioeconomic transition to food production strategies, taller statures appear-

ing today in the northwestern sector of the Indian subcontinent where agriculture and pastoralism were first established. These food production practices took place several millennia later in central and southern India, the region of shorter statures in modern populations. Decreased stature of many contemporary South Asia populations, particularly those in urban and village habitats, may be of adaptive advantage for survival under conditions where the chronic threat of protein deficiency diseases is present. Individuals of larger body size are known to be at higher risk than individuals of smaller body size in societies with restricted access to protein-rich nutrients. Nutritional pathology is only one market of the socioeconomic transition to food production and sedentary lifeways, and it can be documented in the skeletal record of Neolithic and post-Neolithic specimens from archaeological sites in South Asia as well as in other parts of the Old World and the Americas.

Stature variability is one of several phenotypic characters observable in ancient and contemporary populations, but it is highly significant as an indicator of evolutionary adaptability as well as a measure of degree of realization of ontogenetic growth potential which may be affected by nutritional and pathological stressors. Therefore, the relationship of body size to socioeconomic and pathological variables is recognized by skeletal biologists and palaeoanthropologists working in various parts of the world. However, stature variability has not been examined previously within the broad context of prehistoric and modern populations of South Asia. Our conclusions support the hypothesis that stature reduction in this part of the world is an adaptive response to socioeconomic changes taking place since the dawn of neolithic times within the various ecological zones in the Indian subcontinent.

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APPENDIX 1: PREHISTORIC SKELETAL SUBJECTS

All measurements are given in mm. Stature is listed $\pm$ Standard Error. Standard Error is calculated by Trotter (1970) and refers to the error in estimating stature from the given long bone. Radiocarbon date is in years before the present and is taken from Agrawal (1982) unless another reference is given. The primary reference for the site is given in parentheses in the first line of the entry.

1. MESOLITHIC HUNTER-GATHERER COMMUNITIES

1. Batadomba Lena, Kuruvita, Sabaragamuwa, Sri Lanka (Kennedy et al., 1986a).
Radiocarbon Date- 15,830 $\pm$ 680-580 (Kennedy et al., 1986a)
Excavation-1978.
Specimens:

1.	(M)	H=308.5	St=1653 $\pm$ 40.5
2.	(F)	H=309	St=1617 $\pm$ 44.5
	(M)	X=1653 N=1	(F) X=1617 N=1
2. Bellen Bandi Palassa, Balangoda Sabaragamuwa, Sri Lanka (Kennedy, 1965).
Radiocarbon Date-6,500 $\pm$ 700 (Kennedy et al., 1986).
Excavation-1956
Specimen:

BP 2/17	(M)	F=419	St=1610 $\pm$ 32.7
BP 3/27-34	(F)	H=302	St=1595 $\pm$ 44.5
(M)	X=1610 N=1	(F)	X=1595 N=1

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Specimens:

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2.	(F)	H=309	St=1617 $\pm$ 44.5
	(M)	X=1653	N=1
	(F)	X=1617	N=1
2. Bellen Bandi Palassa, Balangoda Sabargamuva, Sri Lanka (Kennedy, 1965).
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Specimen:

BP 2/17	(M)	F=419	St=1610 $\pm$ 32.7
BP 3/27-34	(F)	H=302	St=1595 $\pm$ 44.5
(M)	X=1610	N=1	(F) X=1595 N=1

3. Langhnaj, Mehesana, Gujarat, India (Ehrhardt and Kennedy, 1965).

Radiocarbon Date-4030 $\pm$ 110

Excavation-1942-1963

Specimens:

III	(M)	F=440	St=1680 $\pm$ 32.7
V	(M)	F=495	St=1795 $\pm$ 32.7
XII	(F)	H=300	St=1787 $\pm$ 34.5
1963	(M)	T=360	St=1680 $\pm$ 32.7
(M)	X=1715	SD=69.3 N=3 (F)	X=1649 SD=66.8 N=5

4. Mahadaha, Pratappgarh, Uttar Pradesh, India (Kennedy, 1984 and 1989).

Date-c.10,000 (not radiocarbon) (Sharma et al., 1980).

Excavation-1978-1979.

Specimens:

1.	(M)	H=364	St=1827 $\pm$ 40.5
2.	(M)	F=464	St=1718 $\pm$ 32.7
3.	(M)	H=373	St=1833 $\pm$ 40.5
8.	(M)	F=512	St=1833 $\pm$ 32.7
10.	(M)	F=470	St=1739 $\pm$ 32.7
11.	(M)	F=522	St=1856 $\pm$ 32.7
12.	(M)	F=422	St=1830 $\pm$ 32.9
13.	(M)	F=504	St=1812 $\pm$ 32.7
18.	(F)	H=338	St=1717 $\pm$ 44.5
19.	(F)	H=351	St=1760 $\pm$ 44.5
21.	(F)	F=449	St=1650 $\pm$ 37.2
22.	(M)	T=405	St=1808 $\pm$ 33.7
23.	(M)	H=344	St=1760 $\pm$ 40.5
26.	(M)	F=457	St=1703 $\pm$ 32.7
27.	(F)	H=325	St=1673 $\pm$ 37.2
(M)	X=1796	SD=57.0 N=11 (F)	X=1700 SD=48.7 N=4

5. Sarai Nahar Rai, Pratappgarh, Uttar Pradesh, India (Kennedy et al., 1986b).

Radiocarbon Date-10,385 $\pm$ 110 (Agrawal and Kusumgar, 1969).

Excavation-1968-1980.

Specimens:

1973 II	(M)	H=357	St=1803 $\pm$ 40.5
1972 III	(M)	H=336	St=1740 $\pm$ 40.5
1973 IV	(M)	F=499	St=1803 $\pm$ 32.7
1972 IX	(M)	F=480	St=1756 $\pm$ 32.7
1972 X	(M)	F=512	St=1833 $\pm$ 32.7
1973 III	(F)	H=348	St=1750 $\pm$ 44.5
1972 XIII	(F)	H=358	St=1783 $\pm$ 44.5
1970 IV	(M)	H=463	St=1715 $\pm$ 32.7
(M)	X=1775	SD=45.0 N=6 (F)	X=1767 SD=23.3 N=2

II. FARMING AND NOMADIC POPULATIONS OF THE NORTHWEST SECTOR

6. Harappa cemetery R 37, Montgomery, Sind, Pakistan (Gupta et al., 1962). Date -4,340 (not radiocarbon) (Wheeler, 1947).

Excavation - 1938-1946.

Specimens:

Skl 1	(M)	F=518	St=1848 $\pm$ 32.7
Skl 10	(M)	F=545	St=1910 $\pm$ 32.7
H 793	(M)	F=467	St=1725 $\pm$ 32.7
H 794	(M)	F=479	St=1754 $\pm$ 32.7
H 796 (B)	(M)	H=344?	St=1763 $\pm$ 40.5
H 798 (ii)	(M)	H=321	St=1693 $\pm$ 40.5
H 811	(M)	F=475?	St=1745 $\pm$ 32.7

Abbreviations: F=Femur H=Humerus T=Tibia P=Phalanx
(M)=Male (F)=Female St=Stature X=mean SD=Standard Deviation
N=Number of samples.

H 780	(F)	F=437	St=1620 $\pm$ 37.2
H 818	(M)	F=378	St=1513 $\pm$ 32.7
H 821	(M)	T=379	St=1740 $\pm$ 33.7
Skl 2	(F)	T=372	St=1693 $\pm$ 36.6
H 780	(F)	F=437	St=1620 $\pm$ 37.2
H 805 (a)	(F)	H=314	St=1633 $\pm$ 44.5
H 806/A	(F)	H=293	St=1563 $\pm$ 44.5
H 820	(F)	T=386	St=1735 $\pm$ 36.6
(M)	X=1743	SD=109.1 N=9 (F)	X=1649 SD=66.8 N=5

7. Harappa cemetery H, Montgomery, Sind, Pakistan (Gupta et al., 1962).

Radiocarbon Date- * * * *

Excavation-1929-1934

Specimens:

H 184(k)	(M)	H=321	St=1693 $\pm$ 40.5
H 484(a)	(M)	T=410	St=1820 $\pm$ 33.7
H 502(G)	(M)	H=326	St=1708 $\pm$ 40.5
H 694	(M)	H=326	St=1708 $\pm$ 40.5
H 695	(M)	H=329	St=1718 $\pm$ 40.5
H 696	(M)	H=320	St=1690 $\pm$ 40.5
H 698	(M)	H=341	St=1755 $\pm$ 40.5
H 306(a)	(F)	H=298	St=1580 $\pm$ 44.5
H 488	(F)	H=379	St=1478 $\pm$ 37.2
H 501(a)	(F)	H=294	St=1567 $\pm$ 44.5
H 710	(F)	F=410	St=1553 $\pm$ 37.2
H 61	(F)	T=365	St=1673 $\pm$ 36.6
H 206(c)	(F)	H=319	St=1650 $\pm$ 44.5
H 206(d)	(F)	H=279	St=1517 $\pm$ 44.5
(M)	X=1727	SD=46.1 N=7 (F)	X=1574 SD=69.0 N=7

8. Lothal, Ahmedabad, Gujarat, India (Sarkar, 1972).

Radiocarbon Date-3990 $\pm$ 125.

Excavation-1958-1960.

Specimens:

7	(M)	T=	St=1856
10	(M)	H=	St=1652
11	(M)	F=	St=1801
16	(M)	F=	St=1678
18	(M)	H=	St=1621

Note: The lengths of the bones were not given. The estimates were made using Pearson's (1899) formula, calculating from the bone indicated.

(M) X=1722 SD=101.5 N=5

9. Mohenjodaro, Larkana, Sind, Pakistan (Marshall, 1931)

Radiocarbon Date-3990 $\pm$ 65.

Excavation-1922-1927.

Specimens:

1	(F)	H=295	St=1570 $\pm$ 44.5
6	(M)	F=440	St=1660 $\pm$ 32.7
7	(F)	F=345	St=1393 $\pm$ 37.2
10	(F)	F=396	St=1520 $\pm$ 37.2
11	(M)	T=340	St=1643 $\pm$ 33.7
23	(M)	T=423	St=1853 $\pm$ 33.7
(M)	X=1719	SD=116.6 N=3 (F)	X=1494 SD=91.2 N=2

10. Sarai Khola, Gandhara, Pakistan (Bernhard, 1969).

Date-5,000-4,000 (not radiocarbon) (Bernhard, 1969).

Excavation-1968.

Specimens:

Bernhard (1931) states that long bones from 15 male specimens indicate that the average stature at this site was 1678 mm, with a range of 1590 to 1790 mm. The actual lengths of the bones were not listed. Calculation was by Manouvrier's formula.

(M) X=1678 N=15

11. Timargarha, Dir, Pakistan (Bernard, 1967).

Radiocarbon Date-3,520 and 2,930 $\pm$ 61.

Excavation-1964-1965.

Specimens:

101c	(M)	H=328	St=1713 $\pm$ 40.5
111B	(M)	F=486	St=1770 $\pm$ 32.7
123	(M)	F=440	St=1680 $\pm$ 32.7
138	(M)	F=447	St=1688 $\pm$ 32.7
142c	(M)	F=440	St=1680 $\pm$ 32.7
151	(M)	T=365	St=1705 $\pm$ 33.7
165a	(M)	F=445	St=1673 $\pm$ 32.7
173a	(M)	H=338	St=1747 $\pm$ 40.5
182	(M)	F=458	St=1704 $\pm$ 32.7
190	(M)	T=410	St=1820 $\pm$ 33.7
197	(M)	T=376	St=1733 $\pm$ 33.7
210	(M)	F=493	St=1788 $\pm$ 32.7
228	(M)	T=338	St=1636 $\pm$ 33.7
256	(M)	F=446	St=1675 $\pm$ 32.7
270	(M)	F=452	St=1680 $\pm$ 32.7
101b	(F)	F=418	St=1573 $\pm$ 32.2
165b	(F)	F=415	St=1565 $\pm$ 37.2
180	(F)	Fi=329	St=1560 $\pm$ 35.7
197	(F)	F=446	St=1643 $\pm$ 37.2
204	(F)	H=300	St=1587 $\pm$ 44.5
210	(F)	T=357	St=1650 $\pm$ 36.6
212	(F)	F=381	St=1483 $\pm$ 37.2
256	(F)	F=425	St=1590 $\pm$ 37.2
262	(F)	F=443	St=1635 $\pm$ 37.2

(M) X=1710 SD=55.3 N=12 (F) X=1567 SD=52.0 N=9

12. Burzahom, Kashmir, India (Basu and Pal, 1980).

Radiocarbon Date-4,100 $\pm$ 115.

Excavation-1961-1968.

Specimens:

Ski 1	(M)	F=446	St=1723 $\pm$ 32.7
Ski 6	(M)	F=450	St=1685 $\pm$ 32.7
Ski 9	(M)	F=473	St=1740 $\pm$ 32.7
Ski 10	(M)	F=459	St=1706 $\pm$ 32.7
Ski 8	(F)	F=437	St=1620 $\pm$ 37.2
Ski 3	(F)	F=393	St=1513 $\pm$ 37.2

(M) X=1714 SD=23.5 N=4 (F) X=1567 SD=75.7 N=2

13. Rupa, Ambala, Punjab, India (Datta et al., 1980).

Date-c. 4090-3,390 (no radiocarbon date available).

Excavation-1952-1955.

Specimen:

3	(M)	T=345	St=1655 $\pm$ 33.7
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(M) X=1655 N=1

III. EARLY FARMING AND HERDING COMMUNITIES OF CENTRAL AND SOUTHERN INDIA

14. Bagor, Bhilwara, Rajasthan, India (Lukacs et al., 1982).

Date-2400-1600 (not radiocarbon) (Lukacs et al., 1982).

Excavation-1967.

Specimen:

Sp IV (F) F=309 St=1304 $\pm$ 37.2

15. Inamgaon, Pune, Maharashtra, India (Lukacs and Walimbe, 1986).

Excavation-1960-1983.

Radiocarbon Date-3400-2700.

Specimens:

IMN 106	(F)	H=292	St=1560 $\pm$ 44.5
IMN 146B	(M)	F=432	St=1643 $\pm$ 32.7
IMN 200	(M)	H=332	St=1727 $\pm$ 40.5

(M) X=1685 SD=59.4 N=2 (F) X=1560 N=1

16. Nagarjunakonda, Guntur, Andhra Pradesh, India (Gupta et al., 1970).

Date-"Neolithic"

Excavation-1956-1960

Specimen:

Neo 11	(M)	H=345	St=1767 $\pm$ 40.5
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(M) X=1767 N=1

17. Nevasa, Ahmadnagar, Maharashtra, India (Kennedy and Malhotra, 1966).

Radiocarbon Date-3,390 $\pm$ 110

Excavation-1954-1956

Specimens:

10	(F)	H=320	St=1653 $\pm$ 44.5
18	(F)	F=423	St=1585 $\pm$ 37.2
21	(M)	H=317	St=1680 $\pm$ 40.5

(M) X=1680 N=1 (F) X=1619 SD=48.1 N=2

18. Piklihal, Raichur, Karnataka, India (Ayer, 1960 and Sarkar, 1972).

Radiocarbon Date-4120 $\pm$ 150 (?) (Ayer, 1960).

Excavated-1960.

Specimens:

Site VII	(F)	St=1645
Site VIII	(M)	St=1763

Note: The specific bones used to calculate stature and their exact lengths were not given. Stature is found using Dupertius and Hadden's (1951) formula.

(M) X=1743 SD=51.8 N=4 (F) X=1621 SD=9.2 N=2

IV. THE MEGALITH BUILDERS AND THEIR IRON AGE COLLATERALS

19. Brahmagiri, Chitaldrug, Karnataka, India (Sarkar, 1972).

Date-2190-1940 (not radiocarbon) (Wheeler, 1947-48).

Excavation-1947-1948.

Specimens:

Br. Meg. 1a	(M)	F=434	St=1648 $\pm$ 32.7
Br. Meg. 1c	(M)	F=468	St=1728 $\pm$ 32.7

(M) X=1688 SD=56.6 N=2

20. Nagarjunakonda, Guntur, Andhra Pradesh, India (Gupta et al., 1970).

Date-"Megolithic".

Excavation-1956-1960.

Specimens:

Meg. II	(M)	F=466	St=1723 $\pm$ 32.7
Meg. V	(M)	F=506	St=1818 $\pm$ 32.7
Meg. VI	(M)	F=456	St=1700 $\pm$ 32.7
Meg. XI	(M)	F=469	St=1730 $\pm$ 32.7
Meg. XIV	(F)	F=440	St=1628 $\pm$ 37.2
Meg. XV	(F)	F=435	St=1615 $\pm$ 37.2

(M) X=1743 SD=51.8 N=4 (F) X=1621 SD=9.2 N=2

21. Yelcsawaram, Nalgonda, Andhra Pradesh, India (Sarkar, 1972).

Date-2,240-1,790 (not radiocarbon) (Khan, 1963).

Excavation-1966.

Specimens:

2/61	(M)	F=478	St=1752 $\pm$ 32.7
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1/62 (M) F=480 $S=1736 \pm 22.7$
 2/62 (F) F=458 $S=1673 \pm 37.2$
 (M) X=1754 SD=2.8 N=2 (F) X=1673 N=1

APPENDIX 2: LIVING SUBJECTS

All measurements are given in mm. The primary reference for the group is given in parentheses in the first line of the entry. The exact location(s) where the measurements were taken is given in the second line of the entry.

1. Pardhan tribe (Ahmad, 1972)
Dindori Tahsil, Mandla, Madhya Pradesh
(M) X=1628.9 SD=53.74 N=101
2. Kavar tribe (Ahmad, 1973)
Samri Tahsil, Surguja, Madhya Pradesh
(M) X=1620.2 SD=46.01 N=109
3. Pando tribe (Ahmad, 1973)
Surajpur and Ambikpur Tahsils, Surguja, Madhya Pradesh
(M) X=1594.3 SD=55.12 N=101
4. Kodaku tribe: inferior to all other tribes and castes (Ahmad, 1976)
Pal Tahsil, Surguja, Madhya Pradesh
(M) X=1579.5 SD=49.36 N=100
5. Kolta caste: lowest caste in area (Banerjee, M.K., 1969)
Chapna village, Jaunpur-Bawar, Uttar Pradesh
(M) X=1639.82 SD=56.86 N=50
6. Saharaya caste: low status (Banerjee, M.K., 1969)
Jaura, Bamauli, Miraura villages, Jhansi, Uttar Pradesh
(M) X=1624.58 SD=57.09 N=50
7. Kondh and Nuka Dora tribes (Banerjee, M.K., 1970)
Nandpur Tahsil, Koraput, Orissa
a. Kondh (M) X=1587.4 SD=49.99 N=103
b. Nuka Dora (M) X=1620.9 SD=53.05 N=103
8. People of Midnapur: no specific group (Banerjee, P., 1969).
Contai village, Midnapur, West Bengal
(M) X=1634.90 SD=62.70 N=272
(F) X=1489.00 SD=59.40 N=232
9. Korku tribe: tribe of the Malghat Forest (Basu, A., 1970)
Amraoti, Maharashtra
(M) X=1620.60 SD=55.09 N=50
10. Nohia tribe (Basu, M.N., 1953)
Jessore, Khulna, Faridpur, and Nadia, Bangladesh
(M) X=1571.8 SD=61.2 N=200
(F) X=1461.2 SD=58.0 N=50
11. Kanyakubja and Sarujuparia Brahmins: endogenous groups (Bhatnagar, 1970) Lucknow city, Uttar Pradesh
a. Kanyakubja Brahmins (M) X=1666.0 SD=53.35 N=400
b. Sarujuparia Brahmins (M) X=1643.5 SD=58.05 N=100
12. Lodha caste: ex-criminal jungle caste (Bhowmick, 1956)
jungles of Midnapur, West Bengal
(M) X=1591.3 SD=61.6 N=200 (F) X=1494.5 SD=58.0 N=50
13. Various ethnic groups (Bowles, 1970)
a. Changpa: Hamis, Ladakh, Kashmir (M) X=1612.8 N=21
b. C. Ladakhi: Leh and vicinity, Kashmir (M) X=1629.3 N=36
c. Puriki: Kargil and vicinity, Kashmir (M) X=1599.6 N=40
d. Balti: Skardu and vicinity, Kashmir (M) X=1619.1 N=63
- e. Moslem Kashmiri: Srinagar and vicinity, Jammu and Kashmir (M) X=1647.9 N=45
- f. Dogri: Jammu, Jammu and Kashmir (M) X=1650.0 N=42
- g. Mirpur Moslem: Poonch-Rajouri, Jammu and Kashmir (M) X=1666.5 N=40
- h. Poonch: Poonch-Rajouri, Jammu and Kashmir (M) X=1651.8 N=40
- i. Afghani: East Afghanistan (M) X=1636.8 N=40
- j. Mohmandi: Pakistan (M) X=1689.3 N=42
- k. Afridi: Pakistan (M) X=1705.5 N=40
- l. Khattak-Bengash: Pakistan (M) X=1707.0 N=40
- m. Hindki: Pakistan (M) X=1682.2 N=26
- n. Potwari: Pakistan (M) X=1689.3 N=26
- p. Lahnda Punjabi: Pakistan (M) X=1663.8 N=106
- q. Doab Punjabi: Ludhiana, Punjab (M) X=1653.3 N=55
- r. Gujari of Hoshiarpur, Hoshiarpur, Punjab (M) X=1693.2 N=41
- s. E. Punjab Hindi: Ambala, Punjab (M) X=1597.8 N=27
- t. Kangri: Kangra, Punjab (M) X=1638.9 N=75
- u. Mandali-Sukoti: Mandi-Sukot, Himachal Pradesh (M) X=1641.3 N=112
- v. Chambyali: Chamba, Himachal Pradesh (M) X=1648.5 N=44
- w. Chaurahi: Tisa (Chamba), Himachal Pradesh (M) X=1641.9 N=44
- x. Gaddi: Brahmatur (Chamba), Himachal Pradesh (M) X=1632.6 N=50
- y. Kulu Kanet: Lahaul and Spiti, Punjab (M) X=1630.5 N=60
- z. Kochi-Sodochi: Mahasi, Punjab (M) X=1632.0 N=80
- aa. Keonthali: Mahasi, Punjab (M) X=1645.2 N=43
- ab. Manchati-Patni, Lahaul and Chamba, Punjab (M) X=1625.7 N=103
- ac. Timar: Lahaul, Punjab (M) X=1614.3 N=43
- ad. Bunan: Lahaul, Punjab (M) X=1634.7 N=45
- ae. Kinnauri: Lahaul, Punjab (M) X=1630.5 N=54
- af. Lahuli Bhotia: Lahaul, Himachal Pradesh (M) X=1614.9 N=41
- ag. Spiti Tibetans: Spiti, Punjab (M) X=1605.0 N=60
- ah. Nyamakot: Kinora, Himachal Pradesh (M) X=1594.5 N=40
- ai. Tehri Barhwali: Tehri, Uttar Pradesh (M) X=1634.4 N=123
- aj. Pauri Barhwali: Garhwal, Uttar Pradesh (M) X=1616.1 N=76
- ak. Chamoli Garwal: Chamoli, Uttar Pradesh (M) X=1640.1 N=60
- al. Kumaoni: Almora,

Abbreviations: (M)=Males (F)=Females X=mean
 SD=Standard Deviation N=Number of samples

- | | | | | | |
|--|---------------|-------|--|--------------|--------|
| Uttar Pradesh: | (M) X=1643.1 | N= 60 | Abor: East Siang, Arunachal Pradesh | | |
| am. Danpuriya: Pithoragarh, | | | Khamyang: Mon, Nagaland | | |
| Uttar Pradesh | (M) X=1608.0 | N= 25 | Miri: Dibrugarh, Assam | | |
| an. Silipkat: Pithoragarh, | | | Douri: North-eastern Sibsagar, Assam | | |
| Uttar Pradesh | (M) X=1608.9 | N= 35 | a. Khasi | (M) X=1571.3 | N= 790 |
| ao. Johari Bhotia: | | | b. Bodo | (M) X=1616.7 | N=1011 |
| Pithoragarh, Uttar Pradesh | (M) X=1620.6 | N= 47 | c. Naga | (M) X=1598.8 | N= 542 |
| ap. Dharma Bhotia: | | | d. Kuki | (M) X=1576.0 | N= 120 |
| Pithoragarh, Uttar Pradesh | (M) X=1562.1 | N= 43 | e. Abor | (M) X=1584.3 | N= 419 |
| aq. Dotiyali (W. Nepal): | | | f. Khamyang | (M) X=1599.0 | N= 85 |
| Nepal | (M) X=1616.1 | N= 40 | g. Miri | (M) X=1611.1 | N= 100 |
| ar. Central Nepali: Nepal | (M) X=1609.5 | N= 40 | h. Douri | (M) X=1637.3 | N= 100 |
| as. Thakur: Nepal | (M) X=1627.8 | N=100 | 19. Khyntiam, Pnar, Bhoi, and War groups of Khasi tribe | | |
| at. Chetri: Nepal | (M) X=1640.4 | N=117 | (Das, B.M., 1978) | | |
| au. Magar: Nepal | (M) X=1606.5 | N=118 | All groups are found in the eastern half of Meghalaya. | | |
| av. Gurun: Nepal | (M) X=1619.1 | N=107 | Khyntiam: western part of the region | | |
| aw. Tamang: Nepal | (M) X=1586.1 | N=150 | Pnar: Jaintia Hills, eastern part of the region | | |
| ax. Thami: Nepal | (M) X=1559.4 | N= 66 | Bhoi: low hills, north and northwest part of the region | | |
| ay. Newari: Nepal | (M) X=1631.9 | N= 60 | War: slopes and valleys, south part of the region | | |
| az. Sunwari: Nepal | (M) X=1590.0 | N= 69 | a. Khyntiam (M) X=1566.2 SD=51.7 N=100 (F) X=1464.3 SD=46.4 N= 65 | | |
| ba. Rai: Nepal | (M) X=1598.1 | N=102 | b. Pnar (M) X=1573.5 SD=58.9 N=100 (F) X=1474.2 SD=50.7 N=100 | | |
| bb. Limbu: Nepal | (M) X=1612.8 | N=100 | c. Bhoi (M) X=1570.0 SD=57.2 N=100 (F) X=1483.8 SD=49.1 N=100 | | |
| bc. Sherpa: Nepal | (M) X=1611.0 | N= 80 | d. War (M) X=1556.8 SD=55.6 N=100 (F) X=1456.5 SD=44.9 N= 60 | | |
| bd. Lepcha: Sikkim | (M) X=1583.6 | N= 80 | 20. Kaibarta caste: Hindu (Das, B.M. and Das, M.S., 1969) | | |
| be. Sikkim Tibetans: Sikkim | (M) X=1599.6 | N= 40 | Kamrup, Assam | | |
| bf. Bhutanese: Punaka | | | (M) X=1609.3 SD=64.1 N=100 (F) X=1479.1 SD=53.9 N=77 | | |
| Region, Bhutan | (M) X=1640.1 | N= 70 | 21. Kayastha caste: Hindu (Das, B.M. et al., 1980) Kamrup, Assam | | |
| bg. Orson Munda: Singh | | | (M) X=1640.6 SD=50.7 N=104 | | |
| Bhum, Bihar | (M) X=1605.6 | N= 54 | 22. Kalita caste: Hindu (Das, B.M. and Das, R., 1965) Rangia, | | |
| bh. Ho Munda: Singh | | | Kamrup, Assam | | |
| Bhum, Bihar | (M) X=1591.8 | N= 67 | (M) X=1636.3 X=53.3 N=120 | | |
| 14. Kabui tribe (Chakladar, 1957) Bishampur village, Manipur | | | 23. Brahmin, Baishya, and Kaibarta castes: All Hindu (Das, P., 1974) | | |
| (M) X=1558.7 SD=55.1 N=100 | | | Rural areas of Kamrup, Assam | | |
| 15. Four groups of Manipur (Chakravarti, 1986) | | | a. Brahmin | (M) X=1623.0 | N= 24 |
| Meitei: Hindus from Singjamal and Lamphelpal, Manipur; | | | b. Baishya | (M) X=1645.3 | N= 24 |
| Pangan: Muslims from Canchipore and Lillong, Manipur; | | | c. Kaibarta | (M) X=1626.6 | N= 22 |
| Kabui Naga: Christian tribal people from Majokhul, Manipur; | | | 24. Kalita caste: agricultural, Hindu (Das, P.B., 1971) Kamrup, | | |
| Tangkhu Naga: Christian tribal people from Uthul, Manipur | | | Assam | | |
| a. Meitei | (M) X=1603.59 | N=105 | (M) X=1629.6 SD=56.2 N=51 (F) X=1551.8 SD=50.7 N=51 | | |
| | (F) X=1504.08 | N= 82 | 25. Brahmin and Kaibarta castes (Dutta, 1980) Village around Dib- | | |
| b. Pangan | (M) X=1493.12 | N= 98 | rugarh city, Assam | | |
| | (F) X=1480.61 | N=100 | a. Kaibarta | (M) X=1616.5 | N= 60 |
| c. Kabui Naga | (M) X=1571.58 | N=155 | b. Brahmin | (M) X=1642.0 | N= 50 |
| | (F) X=1480.61 | N=100 | 26. People from four regions of the Nicobar Islands (Ganguly, 1976) | | |
| d. Tangkhu Naga | (M) X=1604.08 | N=106 | a. Car Nicobar (M) X=1586.5 SD=49.0 N=175 (F) X=1484.8 SD=44.8 (M) X=166 | | |
| | (F) X=1603.49 | N=108 | b. Chowra Is. (M) X=1567.0 SD=44.7 N=110 (F) X=1494.5 SD=42.3 N=58 | | |
| 16. Rabha tribe (Das, B.M., 1956) Chotamati ... Habangiri vil- | | | c. Teressa (M) X=1591.4 SD=39.6 N=77 (F) X=1496.0 SD=41.7 N=81 | | |
| lage, Goalpara, Assam | | | d. South Is. (M) X=1614.4 SD=56.0 N=63 (F) X=1507.9 SD=53.7 N=50 | | |
| (M) X=1624.5 SD=50.8 N=... | | | 27. Ho tribe (Ghosh, 1967) | | |
| 17. Garo tribe (Das, B.M., 1960) | | | Seraikella, Singhbhum, Bihar | | |
| Hills Garo: Tikirkilla village, ... from Goalpara toward Tura, | | | (M) X=1600 SD=51.6 N=100 (F) X=1498 SD=53.5 N=50 | | |
| Assam: | | | 28. Lambadi tribe (Gupta and Basu, 1962) Gunter and Nalgonda, | | |
| Plains Garo: Dudknei village, 65 m. from Gauhati | | | Andhra Pradesh | | |
| toward Goalpara, Assam | | | (M) X=1648.6 SD=54.5 N=97 | | |
| a. Hills Garo (M) X=1594.5 SD=55.0 N=100 | | | 29. Padar tribe (Haque, 1984) Ranagadh, Surendranagar, Gujarat | | |
| b. Plains Garo (M) X=1619.2 SD=40.8 N=100 | | | (M) X=1625.1 SD=59.42 N=102 | | |
| 18. Various tribes of Assam (Das, B.M., 1970) | | | 30. Various groups of Orissa and Karnataka (Karve, 1954) All in | | |
| Khasi: Southern West Khasi Hills, Meghalaya | | | Orissa. All agriculturalists except as noted: | | |
| Bodo: East Garo Hills and eastern West Garo Hills, Meghalaya | | | Agaria caste: Sundergad | | |
| Naga: Phek and Tuensang, Nagaland | | | Binzhai tribe: Padampur | | |
| Kuki: Southern Mizoram | | | Bhatra caste: Jeypore | | |

Bhuiya tribe, north: Keonjhar
 Bhuiya tribe, south: Koraput and Jeypore
 Bondo tribe: Southern Orissa
 Aranyak Brahmin caste: Cuttack and Sambalpur
 Samavedin Brahmin caste: Cuttack and Puri
 Dora caste: Koraput and Jeypore
 Godaba tribe: Jeypore
 Gond tribe: Keonjhar and Nowrangpur
 Juang tribe: Keonjhar
 Kondh tribe: Fulbani, Koraput, and Jeypore
 Kharia agricultural laborer tribe: Sundergad
 Koya hunter-gatherer tribe: extreme southern Orissa
 Kulita caste: Bargadha near Sambalpur
 Kumhar potter caste: Puri
 Meher weaver caste: Padampur
 Munda tribe: southern Bihar and northern Orissa
 Porja caste: south Orissa
 Bhangi sweeper caste: Cuttack
 Oraon tribe: southern Bihar and northern Orissa

All in Karnataka:

Ager near-untouchable caste: Ankola and Karwar
 Havig Brahmin Caste: Kumta and Karwar
 Devang Koshti weaver caste: northern Karnataka
 Ganiga oil presser caste: northern Karnataka
 Gauda agricultural caste: Coorg
 Halakki Vokkal agricultural laborer caste: Kumta, Ankola, and Karwar
 Harkantra fishing caste: Kumta, Ankola, and Karwar
 Holer untouchable caste: northern Karnataka
 Kunchitiga agricultural caste: southern and eastern Karnataka
 Jenu Kuruba jungle tribe: Coorg
 Bette Kuruba jungle tribe: Coorg
 Kuruba caste: northern Karnataka
 Kodagu aristocratic caste: Coorg
 Nedavara land-owning caste: Ankola and Karwar
 Namdhari agricultural caste: Ankola and Karwar
 Pattasali weaver caste: Dharwar, Raibemmur, and Guledgad
 Sadaru land-owning caste: Northern Karnataka
 Sholega primitive tribe: border of Karnataka and Tamil Nadu
 Valmiki watchman caste: northern Karnataka

a. Agaria	(M) X=1641.8	N=50
b. Binzhal	(M) X=1570.8	N=50
c. Bhatra	(M) X=1612.8	N=52
d. Bhuiya, north	(M) X=1581.3	N=40
e. Bhuiya, south	(M) X=1602.9	N=51
f. Bondo	(M) X=1573.5	N=46
g. Aranyak Brahmin	(M) X=1635.3	N=24
h. Samavedin Brahmin	(M) X=1663.0	N=24
i. Dora	(M) X=1600.8	N=34
j. Godaba	(M) X=1594.7	N=52
k. Gond	(M) X=1607.2	N=51
l. Juang	(M) X=1536.4	N=40
m. Kondh	(M) X=1566.7	N=51
n. Kharia	(M) X=1578.1	N=28
o. Koya	(M) X=1588.7	N=51
p. Kulita	(M) X=1631.0	N=51
q. Kumhar	(M) X=1646.9	N=51
r. Meher	(M) X=1614.5	N=16
s. Munda	(M) X=1623.7	N=32
t. Porja	(M) X=1575.9	N=52

u. Bhangi	(M) X=1603.0	N= 39
v. Oraon	(M) X=1587.9	N= 39
w. Ager	(M) X=1569.8	N= 34
z. Havig Brahmin	(M) X=1637.6	N= 41
y. Devang Koshti	(M) X=1620.3	N= 48
z. Ganiga	(M) X=1648.2	N= 33
aa. Gauda	(M) X=1622.2	N= 56
ab. Halakki Vokkal	(M) X=1628.1	N= 41
ac. Harkantra	(M) X=1619.6	N= 35
ad. Holer	(M) X=1644.9	N= 48
ae. Kunchitiga	(M) X=1667.3	N= 27
af. Jenu Kuruba	(M) X=1581.2	N= 63
ag. Bette Kuruba	(M) X=1531.3	N= 35
ah. Kuruba	(M) X=1632.2	N= 36
ai. Kodagu	(M) X=1665.0	N=100
aj. Nadavara	(M) X=1667.1	N= 42
ak. Namdhari	(M) X=1640.8	N= 40
al. Pattasali	(M) X=1617.1	N= 41
am. Sadaru	(M) X=1638.2	N= 49
an. Sholega	(M) X=1609.7	N= 40
ao. Valmiki	(M) X=1637.0	N= 27

31. Various groups of Maharashtra (Karve and Dandekar, 1951)

Halbi caste: Bhandara, Maharashtra
 Sonar cultivator and servant caste: Bombay, Maharashtra
 Brahmin caste: Nasik, Maharashtra
 Brahmin caste: Parbhani, Maharashtra
 Maratha caste: Hyderabad, Maharashtra
 Kohali cultivator caste: Bhandara, Maharashtra
 Koshti weaver caste: Nagpur, Maharashtra
 Brahmin caste: Aurangabad, Maharashtra
 Maratha caste: Ahmednagar, Maharashtra
 Brahmin caste: Poona, Maharashtra
 Brahmin caste: Barshi, Maharashtra
 Brahmin caste: Nagpur, Maharashtra
 Brahmin caste: Amraoti, Maharashtra
 Maratha caste: Satara, Kolhapur, Maharashtra
 Maratha caste: West Poona, Maharashtra
 Brahmin caste: Jalgaon, Maharashtra
 Brahmin caste: Nagpur, Maharashtra
 Maratha caste: Ahmednagar, Maharashtra
 Maratha caste: Kolhapur, Maharashtra
 Maratha caste: Satara, Maharashtra
 Maratha caste: Satara, Maharashtra
 Maratha caste: Poona, Maharashtra
 Khatri clerk and professional caste: Bombay, Maharashtra
 Brahmin caste: Jalna, Maharashtra
 Maratha caste: Miraj, Sangli, Maharashtra
 Maratha caste: West Poona, Maharashtra

a. Halbi	(M) X=1585.0	N= 33
b. Sonar	(M) X=1612.4	N= 28
c. Brahmin	(M) X=1617.0	N=123
d. Brahmin	(M) X=1622.0	N= 74
e. Maratha	(M) X=1623.2	N= 44
f. Kohali	(M) X=1626.2	N= 26
g. Koshti	(M) X=1626.8	N= 28
h. Brahmin	(M) X=1628.8	N= 73
i. Maratha	(M) X=1630.7	N=108
j. Brahmin	(M) X=1630.8	N= 57
k. Brahmin	(M) X=1631.1	N= 62
l. Brahmin	(M) X=1632.7	N= 26
m. Brahmin	(M) X=1633.3	N= 72

- n. Maratha (M) X=1633.8 N= 64
 o. Maratha (M) X=1634.0 N= 80
 p. Brahmin (M) X=1635.7 N= 75
 q. Brahmin (M) X=1636.9 N= 57
 r. Maratha (M) X=1638.9 N= 96
 s. Maratha (M) X=1639.7 N=110
 t. Maratha (M) X=1640.5 N=159
 u. Maratha (M) X=1642.7 N=106
 v. Maratha (M) X=1646.5 N= 55
 w. Khatri (M) X=1646.5 N= 26
 x. Brahmin (M) X=1649.8 N= 29
 y. Maratha (M) X=1651.3 N=143
 z. Maratha (M) X=1654.8 N= 47
32. Rajbansi tribe (Kumar, 1970)
 Khatriya Rajbansi: Jalsaganj, West Bengal
 Desi Rajbansi: West Dinajpur, West Bengal
 Paliya Rajbansi: Matla, West Bengal
 Rajbansi: Murshidabad, West Bengal
 a. Khatriya (M) X=1637.7 SD=62.3 N=188
 b. Desi (M) X=1600.5 SD=50.9 N=123
 c. Paliya (M) X=1591.5 SD=53.6 N=109
 d. Rajbansi (M) X=1607.6 SD=57.3 N=103
33. Kannikar and Uruli tribes (Kumar, 1971)
 Kannikar: Kallar village, southern Kerala
 Uruli: Coimbatore, Tamil Nadu
 a. Kannikar (M) X=1531.73 N=140
 b. Uruli (M) X=1544.52 N=125
34. Rajput caste (Majumdar, 1949)
 Soroon, Etah, Uttar Pradesh
 (M) X=1668.9 SD=52.5 N=151
35. Various groups from Gujarat (Majumdar and Sen, 1950)
 a. Bhil tribe Rajpipla, Gujarat
 b. Machi-Kharwa fisherman caste: Saurashtra, Cutch, Gujarat
 c. Bhangi untouchable caste: Porbander, Botad, Gujarat
 d. Koli agricultural and laborer caste: Bilimora, Gujarat
 e. Artisan caste: Bilimora, Ahmedabad, Gujarat
 f. Memon Cultivator caste: Mithapur, Botad, Gujarat
 g. Oswal Jain trader caste: Cutch, Gujarat
 h. Brahmin caste: Rajpipla, Saurashtra, Gujarat
 i. Khoja urban trader caste: Kandla, Gujarat
 j. Luhana business caste: Porbandar, Gujarat
 k. Bhatia trader caste: Mandvi, Gujarat
 l. Miana nomad caste: Kandla, Gujarat
 m. Parsi educated urbanite caste: Bilimora, Gujarat
 n. Waghar trader and breeder caste: Mandi, Mithapur, Gujarat
 o. Rabari herder caste: Kandla, Gujarat
 p. Mher martial Caste: Porbandar, Gujarat
 a. Bhil (M) X=1595.8 N=215
 b. Machi-Kharwa (M) X=1596.3 N=141
 c. Bhangi (M) X=1597.2 N= 41
 d. Koli (M) X=1608.0 N=121
 e. Artisan (M) X=1613.1 N=127
 f. Memon (M) X=1637.2 N=100
 g. Oswal Jain (M) X=1639.8 N=100
 h. Brahmin (M) X=1643.4 N=102
 i. Khoja (M) X=1645.3 N=103
 j. Luhana (M) X=1645.7 N=132
 k. Bhatia (M) X=1658.1 N= 30
 l. Miana (M) X=1673.2 N= 50
 m. Parsi (M) X=1677.3 N=137
 n. Waghar (M) X=1679.5 N=117
 o. Rabari (M) X=1682.2 N=106
 p. Mher (M) X=1695.1 N=100
36. Various tribes and castes (Mahalanobis, 1949)
 Brahmin caste: Basti, Uttar Pradesh
 Agharia caste: Agra, Uttar Pradesh
 Muslim community: Bareilly and Moradabad, Uttar Pradesh
 Bhatu tribe: Moradabad, Uttar Pradesh
 Habru tribe: Kanpur, Uttar Pradesh
 Dom Caste: Gorakhpur, Uttar Pradesh
 Chero caste: Mirzapur, Uttar Pradesh
 Panika tribe: Mirzapur, Uttar Pradesh
 Kharwar tribe: Mirzapur, Uttar Pradesh
 Oraon tribe: Mirzapur, Uttar Pradesh
 Rajwar caste: Mirzapur, Uttar Pradesh
 Korwa tribe: Mirzapur, Uttar Pradesh
 Tharu tribe: Lakhimpur-Kheri, Uttar Pradesh
 a. Brahmin (M) X=1645.1 SD=50.8 N= 85
 b. Agharia (M) X=1674.7 SD=57.7 N=107
 c. Muslim (M) X=1624.5 SD=59.1 N=168
 d. Bhatu (M) X=1633.8 SD=65.0 N=148
 e. Habru (M) X=1649.1 SD=76.8 N=122
 f. Dom (M) X=1665.3 SD=60.7 N=113
 g. Chero (M) X=1620.3 SD=53.4 N=100
 h. Panika (M) X=1597.6 SD=52.8 N=157
 i. Kharwar (M) X=1607.9 SD=55.6 N=197
 j. Oraon (M) X=1614.5 SD=60.0 N= 99
 k. Rajwar (M) X=1597.1 SD=55.3 N=105
 l. Korwa (M) X=1581.7 SD=50.7 N=101
 m. Tharu (M) X=1633.3 SD=52.2 N=191
 Tharu (F) X=1511.3 SD=58.0 N=181
37. Various castes (Majumdar and Rao, 1960)
 Districts of Undivided Bengal, Now West Bengal, India and Bangladesh
 a. Brahmin: Dacca (M) X=1638.6 SD=70.4 N= 97
 b. Garo: Mymensingh (M) X=1586.6 SD=56.0 N= 72
 c. Kaibarta: Faridpur (M) X=1621.3 SD=57.6 N= 67
 d. Kaibarta: Mymensingh (M) X=1598.2 SD=64.6 N= 62
 e. Kayastha: Barisa (M) X=1626.1 SD=61.1 N= 56
 f. Kayastha: Dacca (M) X=1633.2 SD=65.8 N=178
 g. Kshatriya: Rangpur (M) X=1602.5 SD=55.5 N=133
 h. Nmasudra: Dacca (M) X=1594.9 SD=62.2 N=219
 i. Rishi: Khulna (M) X=1591.5 SD=68.1 N=100
 j. Sankhari: Dacca (M) X=1597.3 SD=63.0 N=135
 k. Muslim: Midnapur (M) X=1647.2 N= 25
 l. " Murshidabad (M) X=1624.2 N= 37
 m. " Mymensing (M) X=1617.7 SD=61.9 N=299
 n. " Nadia (M) X=1617.4 SD=57.0 N=170
 o. " Rangpur (M) X=1609.1 SD=57.8 N=139
 p. " Tipperah (M) X=1602.7 N= 19
38. Five tribes of the north west Himalayan region (Mazumdar, 1976)
 Kho 1: upper Chitral, Pakistan
 Kho 2: lower Chitral, Pakistan
 Pathan: Bijaur, Pakistan
 a. Kho 1 (M) X=1641.0 SD=61.5 N=150
 b. Kho 2 (M) X=1632.0 SD=66.7 N= 90
 c. Pathan (M) X=1645.1 SD=64.3 N= 50
39. Various castes (Mitra, 1970)
 Radhiya Brahmin: Haripal, Hugli, West Bengal
 Mahiaya: Haripal, Hugli, West Bengal
 Kayastha: Haripal, Hugli, West Bengal
 Goala: Haripal, Hugli, West Bengal
 Barga: Haripal, Hugli, West Bengal
 Suvarna Vanika: Calcutta, West Bengal
 Kraunchi Dwipi Brahmin: Nalanda, Bihar

- Dakshina Maharashtra: Rajgir, Gaya, Bihar
- a. Radhiya Brahmin (M) X=1667.54 SD=54.66 N=95
 - b. Mahisya (M) X=1638.61 SD=54.02 N=109
 - c. Kayasba (M) X=1646.21 SD=54.30 N=53
 - d. Goals (M) X=1649.93 SD=53.08 N=54
 - e. Barga (M) X=1604.41 SD=49.76 N=82
 - f. Suvarna Varika (M) X=1695.32 SD=57.57 N=229
 - g. Krauchi Dwipi Brahmin (M) X=1613.5 SD=52.5 N=26
 - h. Dakshina Maharashtra (M) X=1633.5 SD=54.4 N=39
40. Gayswal caste: Brahmin (Mitra, 1970)
Old city of Gaya, Bihar
(M) X=1651.1 SD=45.6 N=50
 41. Plains Mande (Garo) tribe (Pakraai and Das, 1956)
Nishangram and Damra, 74m. SW of Gauhati, Assam
(M) X=1619.2 SD=40.8 N=100
 42. Divisions of Kachari tribe (Phookan, 1975)
Sonowal, Jharua, and Thenga: Plains of Lakhimpur, Dibrugarh, and Sibsagar, Assam
Dimasa: hills of North Cachar Hills, Assam
a. Sonowal (M) X=1634.6 N=100 (F) X=1491.1 N=100
b. Jharua (M) X=1632.9 N=100 (F) X=1494.6 N=100
c. Thenga (M) X=1614.9 N=100 (F) X=1514.1 N=100
d. Dimasa (M) X=1598.7 N=100 (F) X=1482.1 N=100
 43. Khatri caste: Hindu trading caste (Raghubir, 1972)
New Delhi, Uttar Pradesh
(M) X=1679.5 SD=58.9 N=223
 44. Doria and Dhurwa tribes (Rakshit, 1960)
Doria: Kanta Tahsil, Bastar, Madhya Pradesh
Dhurwa: south of Jagdalpur town, Bastar, Madhya Pradesh
a. Doria (M) X=1600.2 SD=49.7 N=100
b. Dhurwa (M) X=1612.9 SD=57.7 N=100
 45. Bhatra and Muria castes (Rakshit, 1963)
Bhatra: Jagdalpur Tahsil, NE of Jagdalpur town, Bastar, Madhya Pradesh; Muria: Kondagaon Tahsil, Bastar, Madhya Pradesh
a. Bhatra (M) X=1603.6 SD=61.8 N=100
b. Muria (M) X=1618.0 SD=59.0 N=100
 46. Pahira tribe (Ray, 1958)
Manbhum, Bihar
(M) X=1522.3 SD=57.1 N=80 (F) X=1424.2 SD=35.7 N=32
 47. Juang tribe (Ray, 1958)
Dhenkanal, Pal-Lahara, and Keonjhar, Orissa
(M) X=1576.7 SD=69.9 N=116
 48. Pandit (Brahmin Hindu) and Muslim castes (Raychaudhuri, 1961)
Pandit: Srinagar and Martand, Kashmir
Muslim: Srinagar, Kashmir
a. Pandit (M) X=1640.76 SD=52.65 N=206
b. Muslim (M) X=1651.15 SD=64.73 N=52
 49. Various castes (Sanghvi et al., 1981)
All in Tamil Nadu:
Iyer: Kulitalai and Lalgudi, Tiruchirappalli
Iyengar: Srivilliputtur and Devakottai, Ramanathapuram
Vellalan 1: Madurai
Vellalan 2: Tanjavur
Naidu: Madurai
Mudaliar: Ramanathapuram
Chettiar: Dindigul, Madurai
Venniya: Tanjavur and Kumbakonam, Tanjavur
Parayan: Tirupattur, Ramanathapuram and Musiri, Tiruchirappalli
Mutracha: Tiruchappalli
Chakkiliyan: Ramanathapuram
Kallan 1: Melur, Madurai
Kallan 2: Turukkattappalli and Pattukota, Tanjavur
 - a. Iyer (M) X=1635.4 SD=61.0 N=100
 - b. Iyengar (M) X=1634.8 SD=65.6 N=88
 - c. Vellalan 1 (M) X=1609.1 SD=57.5 N=41
 - d. Vellalan 2 (M) X=1635.8 SD=67.8 N=75
 - e. Naidu (M) X=1665.8 SD=76.7 N=100
 - f. Mudaliar (M) X=1609.3 SD=50.6 N=108
 - g. Chettiar (M) X=1630.1 SD=54.2 N=56
 - h. Venniya (M) X=1635.0 SD=60.5 N=100
 - i. Parayan (M) X=1597.0 SD=62.2 N=99
 - j. Mutracha (M) X=1607.0 SD=60.4 N=100
 - k. Chakkiliyan (M) X=1604.0 SD=57.9 N=100
 - l. Kallan 1 (M) X=1645.0 SD=65.3 N=63
 - m. Kallan 2 (M) X=1648.0 SD=47.4 N=98
 50. Madras Hindu (Sankaranarayanan, 1955)
Tanjore, South Arcot, and Madras, Tamil Nadu
(M) X=1648 SD=55.9 N=188
 51. Maharashtra: lower-middle class city dwellers (Sharma, 1970)
Phopal and Gwalior, Madhya Pradesh
(M) X=1679.0 SD=42.7 N=19 (F) X=1577.0 SD=33.5 N=13
 52. Various group of Sri Lanka (Stoudt, 1959)
In Sri Lanka:
a. Sinhalese from Wattagama, Badagama, Southeastern Jungles, and Bintenne North, Badulla
b. Sinhalese from Akuressa and Malduva, Mantara
c. Sinhalese from Colombo, Colombo
d. Sinhalese from Veddagalla, Kalawana, Panapole, and Kukul-egama, Ratnapura
e. Sinhalese from Eheliyagoda and Mawanella, Kegalle
f. Sinhalese from Narammale and Medagoda, Kuruncgalle
g. Sinhalese from Telangune, Teldeniya, and Narampanawa, Kandy
h. Sinhalese from Ragalla, Haguranketa, and Kotmale, Nuwara Eliya
i. Tamil castes from the Jaffna Peninsula, Jaffna
j. Tamils from Kalpitiya, Narakali, Manaitivu, and Kapireshena, Puttalam
k. Tamil from Kuchchaveli and Tiriya, Trincomalee
l. Tamils from Komari, Batticala
m. Tamils from Kotiyagala, Kandy
n. Veddahs from Manampitiya, Anuradhapura
o. Veddahs from Bingoda, Henebidde, Danigalla, and Bintenne North, Badulla
In Maldives:
p. Maldivians from the Northern Atoll, Maldives
q. Maldivians from the Southern Atoll, Maldives
a. (M) X=1592.1 SD=62.0 N=131
b. (M) X=1603.6 SD=51.4 N=101
c. (M) X=1607.3 SD=53.6 N=28
d. (M) X=1603.5 SD=62.8 N=90
e. (M) X=1598.8 SD=78.2 N=15
f. (M) X=1621.4 SD=57.4 N=62
g. (M) X=1602.3 SD=58.6 N=61
h. (M) X=1609.9 SD=60.6 N=147
i. (M) X=1650.2 SD=60.9 N=453
j. (M) X=1644.1 SD=73.2 N=26
k. (M) X=1631.4 SD=57.2 N=64
l. (M) X=1641.5 SD=39.8 N=15
m. (M) X=1593.1 SD=62.2 N=33
n. (M) X=1589.5 SD=68.0 N=24
o. (M) X=1563.2 SD=63.2 N=114
p. (M) X=1558.7 SD=57.8 N=52
q. (M) X=1583.9 SD=57.6 N=82