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ORIGINAL ARTICLE

Spatial patterns of anthropometric variation in India with reference to geographic, climatic, ethnic and linguistic backgrounds

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Abstract

Background: Anthropometric variation can be fruitfully utilized to investigate microevolutionary processes. Anthropometric variations in the Indian subcontinent based on stature and three indices (Cephalic Index, Nasal Index, and Total Facial Index) are highly variable and discriminative among populations across geographical regions.

Aims: Anthropometric variation in stature, Cephalic Index (CI), Nasal Index (NI) and Total Facial Index (TFI) were investigated with respect to ethnic, linguistic, geographical and climatic affiliation, across the Indian subcontinent.

Subjects and methods: Published data on anthropometric variations of 531 populations from the Indian subcontinent were analysed using discriminant analysis and spatial autocorrelation analysis.

Results: Discriminant analysis of the four anthropometric variables shows that stature and NI are good discriminators for populations of different languages. Stature, NI and CI discriminate well among populations of diverse ethnic origin and climatic conditions in different regions. TFI is not a good discriminator for populations of diverse ethnic, linguistic and climatic attributes. Spatial autocorrelation analysis showed significant departure from randomness, suggesting geographic structuring. The Moran's I estimate is positive and statistically significant for the four variables at low distances but exhibits significant negative association at higher values.

Conclusion: The results suggest geographical clines for the four anthropometric variables and indicate the influence of population structure on the studied variables.

Keywords: *Spatial, autocorrelation, geographical climes, caste hierarchy, population structure*

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Introduction

India is characterized by a wide diversity of populations, which consists of several endogamous groups of varying size and distribution. This is attributed to the settlement of a variety of populations since prehistoric times (Thapar 1966, Kennedy 2000, Misra 2001), geographical isolation, cultural and linguistic barriers and the unique socio-cultural milieu that maintains group endogamy and subdivided population structure among multitudinous communities (Karve 1961, Singh 1994a, b). A recent estimate suggest that there are at least 4635 communities comprising castes, subcastes and tribes of diverse ethnic, linguistic, religious and cultural stocks in different geographical regions of the country (Singh et al. 1994). This stratified population structure and the nature of this vast diversity is of interest to anthropologists, human biologists and population geneticists to investigate the extent and nature of biological diversity, the factors that maintain the diversity and its microevolutionary process.

Morphological features have become the subject of inquiry for classification or for investigating the affinity between populations. The racial classification by Risley (1915), Guha (1935), and others were the early attempts to classify the diversity of Indian populations. This was followed by some regional anthropometric studies among regional castes and tribes. Although these studies were based on different sets of characters and followed a variety of methods they revealed enormous variation between the castes and tribes in different regions (Mahalonobis et al. 1949, Majumdar and Sen 1950, Karve and Dandekar 1951, Majumdar and Rao 1960, Ganguly 1979, Malhotra et al. 1981). Some of the interesting findings of the above studies are insignificant anthropometric variation among subcastes and between upper or lower ranked castes in the same region. The tribal populations showed distinct differences from castes and show wide geographical variation, which is expected in view of their isolation and distribution in different parts of the country.

The earlier studies on anthropometric variation are limited to some specific regions and among a few selected populations. In this regard, it is interesting to investigate whether geographical sub-structuring of anthropometric variation across different castes and tribes can be observed across the country. However, such comprehensive study of anthropometric variation across different regions is little investigated, possibly because of the practical difficulties of handling such national-level projects. One approach is to use the compilations of published work on anthropometric variation and in some way control for the limitations of the problems of sampling, methodology, selection of characters and choice of populations by statistical analysis. A few such studies based on published data have indicated patterns of anthropometric variation along ethnic, geographic, latitude, longitude and altitude, nutrition and several confounding variables. For example Basu et al. (1980) found significant association between climate and Cephalic Index; especially higher indexes were found among cold Himalayan and sub-Himalayan regions. In general, anthropometric traits show significant variation with the caste hierarchy and between tribes in different regions. Based on 82 populations and seven anthropometric traits and accounting for the limitations of the data by statistical treatment, Majumder et al. (1990) found significant anthropometric variation among different regional ethnic groups; however, such patterns have not been observed across geographical regions. Further, the study also has shown that a few anthropometric characters, especially stature and head or cranial measurements, are sufficient to investigate the overwhelming proportion of anthropometric variation among the Indian populations across geographical zones and ethnic categories.

Apart from anthropometric traits, studies on genetic traits and dermatoglyphic characters have also been investigated across geographical regions among different castes and tribes.

These studies show geographical clines (e.g. ABO blood groups, finger pattern frequency), wide genetic diversity among tribes across regions and some unique features specific to some castes and tribes (Roychoudhury 1983, Majumder and Mukherjee 1992, Malhotra and Vasulu 1992, Papiha 1996). A recent study based on palmar interdigital ridge count variation among 57 populations showed within-group homogeneity and sub-structuring with reference to ethnic groups and geography (Reddy et al. 2004). However, in the case of anthropometric characters such geographical patterns based on representative samples of regional samples were hardly investigated. This is because of the paucity of such studies and unequal representation of castes and tribes in different regions of the country. Therefore, to investigate the influence of population substructure with respect to geography, ethnicity, language and other such influencing variables, it is necessary to have a larger data set consisting of samples from multitudinous castes, tribes, etc., from different regions.

Given the characteristic feature of subdivided population structure of Indian populations, it is expected that localization of certain traits is shown in some regions and in some specific populations in view of the isolation and high endogamy among tribes and some caste groups. However, geographical clines or patterns are expected among some large castes, subcastes and tribes residing in contiguous geographical regions over larger areas as per the isolation by distance model of population structure. Thus biological diversity of Indian populations is influenced by geography, social, ethnic and linguistic affiliation; however, the patterns vary with respect to the type of populations and its characteristics. To investigate the above hypothesis based on population structure of Indian populations would require comprehensive samples from different regions that represent the variety of castes, tribes and other groups. Some such limitations of lack of sufficient samples on the part of earlier studies were partly responsible to detect inherent patterns and its influencing factors. In the present study we have considered four anthropometric variables from population samples from different parts of the country and across different regions. Comprehensive statistical analyses have been attempted to detect spatial patterns with respect to ethnic, geographic, and linguistic backgrounds. The data were obtained from two different sources (Singh et al. 1994, Bhasin et al. 1994) on the anthropo-genetic variation across the regional populations of India, both containing similar data on the same populations. Unlike previous data sources, these data provide an opportunity to investigate the patterns of variation in a variety of traits, including anthropometric variation, which can be fruitfully utilized for investigating the microevolutionary processes. Such attempts have been recently reported with respect to head form and climatic variation (Bharati et al. 2001). The present study considers the anthropometric variation of the Indian subcontinent based on stature and three indices (Cephalic Index, Nasal Index, and Total Facial Index), which are highly variable and discriminative among populations across geographical regions. Using spatial autocorrelation analysis as well as discriminant analysis, we have investigated the patterns of variation of these four variables on 531 populations from different regions of India with respect to the following specific population characteristics: geographic region, climate, ethnic origins, and language. In contiguous regional castes and with respect to linguistic backgrounds we expect that the anthropometric variation should follow the isolation by distance model of population structure and such patterns are not expected among tribes due to their discontinuous distribution and isolation.

Materials and methods

Among the set of well defined anthropometric characters that are used to understand the anthropometric variations among human populations, a few characters are found to be more discriminative than others. For example, stature (St), head length (HL), head breadth (HB), bizygomatic breadth (BZB) etc. can explain more than 90% of anthropometric variation (Spielman 1973, Relethford et al. 1980, Majumder et al. 1990, Vasulu 1994). These characters also show high heritability estimates among twins (Clark 1956) and hence are governed by more genetic than environmental influences. Hence, these were commonly used for classification of human populations since the beginning of racial studies (Boyd 1963, Caspari 2003) and so we have considered these characters for the present study.

They are three indices and stature. The three indices are: Cephalic Index (CI), Nasal Index (NI) and Total Facial Index (TFI). Cephalic Index is the per cent ratio of head breadth (HB) to head length (HL), NI is the ratio of nose breadth (NB) and nose length (NL) and TFI is the ratio between total facial height (TFH) and bizygomatic breadth. The indices are the summary figures of anthropometric profiles of important aspects of head and facial features and also represent variation in both size and shape components of facial morphological variations of significant discriminating indicators of populations.

Populations studied

The data analysed pertain to 531 populations belonging to different ethnic, linguistic, geographical and climatic backgrounds of India. The data have been obtained from *People of India* (Singh et al. 1994). This was a national project aimed to characterize the physical, biological, linguistic and cultural diversity of multitudinous communities of the regional populations of India. The distribution of each population with its geographic location in terms of latitude and longitude are given in Figure 1. The data available were only on males

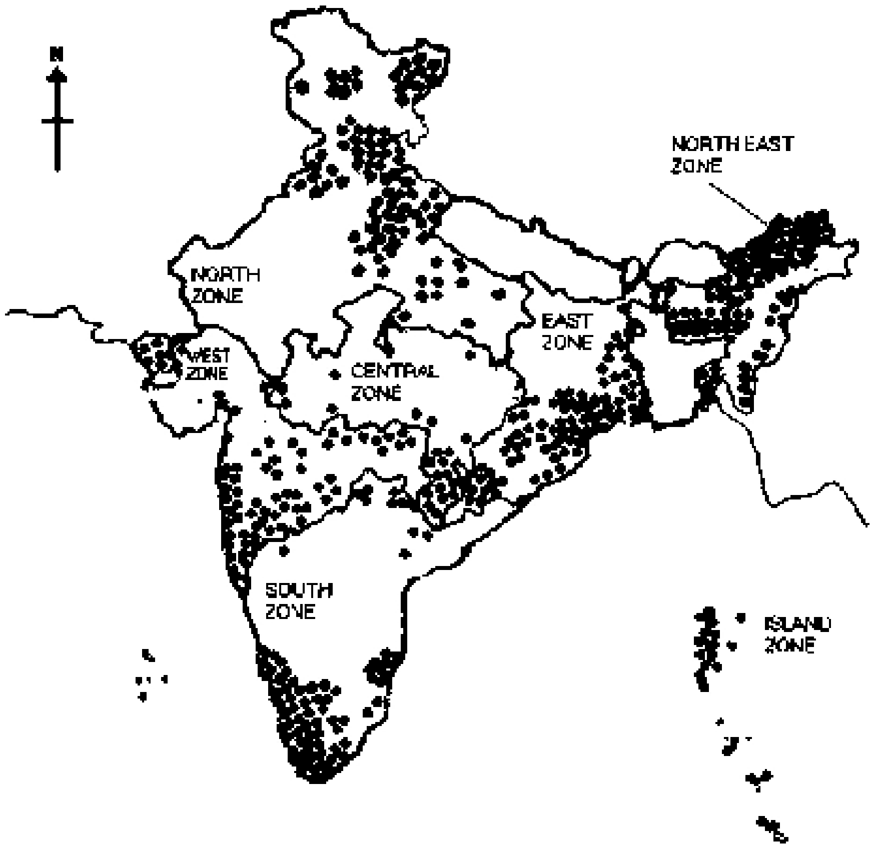

Figure 1. Distribution of the data set in different geographical zones of India.

and the time period of the data was from 1879 to 1991. The detailed list of populations and their ethnic, linguistic and climatic affiliations is separately given in the Appendix and also available from the authors.

The anthropometric data of the samples were considered along with their geographical location and climatic conditions and also linguistic and ethnic backgrounds and these details of their classification for the present study are described below.

Linguistic classification

The major Indian languages can be organized into four linguistic groups (Grierson 1927, Bhasin et al. 1992). These are: (i) The Dravidian languages of the south and some tribes of central and eastern region; (ii) the Indo-Aryan languages of the north and north-west; (iii) Mon Khmer and the Tibeto-Burman region of the north-east and the Himalayan region; and (iv) Austric region of the Aravalli-Vindhya-Chota Nagpur complex.

For the present study, the data were sorted according to the above classifications to their respective caste/ethnic groups and then linked the population to its linguistic, geographical and climatic zones. Thus, population samples could be assigned to appropriate geographical or climatic regions. Latitude and longitude values of each geographical zone were collected from *People of India* (Singh et al. 1994, Bhasin et al. 1994) and from geographic maps.

Ethnic classification

The entire published data consist of caste, tribe and other ethnic groups. Therefore, the data were divided into four groups: (1) scheduled tribal population (ST) are supposed to be the original stock and are confined to specific geographic locations in different parts of the country and are least heterogeneous; (2) Scheduled Castes (SC) are also ancient but occupies a lower position in the caste hierarchy ladder; (3) General Caste (GC), which includes various castes and sub-castes of the Hindu society other than SC and ST; and (4) Others (Oth.), which include some of the minority groups such as Christian, Muslim, Chinese, Parsi, etc.

Climatic classification

Peninsular India contains a wide variety of geophysical regions which have diverse climatic zones. Based on monthly values of temperature and precipitation as per Koppen's method (cited in Bhasin et al. 1992, p. 17) the country can be classified into seven climatic zones): (1) tropical savannah (TS), (2) monsoon with a short dry season (MDS), (3) monsoon with a dry season in the high Sun period (MSD), (4) semi-arid and steppe climate (SS), (5) hot desert, (6) monsoon with dry winters (MDW), (7) cold humid winter with a shorter summer (CH), and (8) Polar.

Geographical classification

The Indian subcontinent contains a variety of natural, geographic or topographical regions such as high altitude, mountains, vast seacoast, rivers, jungles, delta and deserts, etc. with their characteristic climates. India can be divided into seven geographical zones: North–east zone, North zone, East zone, Central zone, West zone, South zone, and Island. These zones and the respective states are:

(1) North zone (N): Jammu and Kashmir, Uttar Pradesh, Himachal Pradesh, Uttranchal, Delhi, Punjab and Hariyana.
(2) North-east zone (NE): Assam, Meghalaya, Arunachal Pradesh, Tripura, Manipur, Mizoram, Nagaland and Sikkim.
(3) East zone (E): Bengal, Bihar, Jharkand and Orissa.
(4) Central zone (C): Madhya Pradesh and Chattisgarh.
(5) South zone (S): Andhra Pradesh, Tamil Nadu, Karnataka, Pondicherry and Kerala.
(6) West zone (W): Gujarat and Maharashtra.
(7) Island zone (IS): Andaman and Nicobar islands and Lakshadwip islands.

Statistical procedures

In order to detect the existence of any geographic pattern for anthropometric variation we first calculated the correlation and partial correlation values of longitude and latitude against the four variables included in the analysis.

Discriminant analysis transforms original variables into a set of factors, which are linear combinations of independent variables that maximize the inter-group differences. This analysis helps by reducing the dimensions of variation through which the relationships among the groups can be visualized in the multivariate space, and identifying the variables that best discriminates the groups. Discriminant analyses based on ethnic, linguistic, geography and climatic factors on the four anthropometric parameters (stature, CI, NI and TFI), gives us an idea about the biological significance of such *a priori* arbitrary separation and, additionally, the pattern of group separation under each factor. Then, discriminant function shows the trend of group variation under each factor, providing also statistical tests; both univariate through *F*-ratios and multivariate through Wilk's Lambda test, which is one of the MANOVA approaches.

Spatial autocorrelation analysis is a statistical method that identifies geographic patterning of a variable over geographical space (Cliff and Ord 1973, Sokal and Oden 1978a, b). Spatial autocorrelation is significant when the variable under consideration exhibits a regular pattern over geographic space in which its values at a given set of geographic locations depend on values of the same variable at other locations (Odland 1988). Therefore, spatial autocorrelation describes the pattern of variation in a sample over a given geographic area, which is determined by the effects of evolutionary forces such as gene flow, genetic drift and natural selection on population structure. It is detected through the value of Moran's I at each lag. The expected value of Moran's I in the absence of autocorrelation is approximately 0. Values greater than 0 indicate positive autocorrelation (patterned similarity between localities), and values less than 0 indicate negative spatial autocorrelation (patterned dissimilarity between localities) (Griffith 1987). The overall significance is assessed through a Bonferroni test (Oden 1984).

The locations were grouped into categories of specified distances called spatial lags. The lags were so spaced that an equal number of data points contribute to the measure of spatial autocorrelation at each lag. We used 18 distance classes, each with an interval of 125 km, because this is roughly the upper limit for marriage distance (Reddy et al. 2004). We have also considered different distances or spatial lags to investigate whether the pattern would change; however, the results remained the same, hence we have shown the results based on spatial lag of 125 km only.

Temporal variation

Since the samples are drawn from different time periods, it is likely that the variables might show temporal changes; hence we have considered the linear regression estimates between time and the four variables. All the four variables show relatively low correlations (0.14–0.24), although statistically significant; Stature, Nasal Index and Total Facial Index show negative temporal trend, whereas Cephalic Index shows positive association. Further, we have considered stepwise regression separately for the four variables and its influence on time, latitude and longitude and it did not show any significant change in the strength of correlations. Although the results of ANOVA and correlation values attain statistical significance this was more due to large sample size since the low correlation values do not suggest a strong or significant association between the studied variables. In view of the low influence of secular trend (time of data collection) on the four variables, time was not considered for further analysis.

Limitations of the study

One of the main limitations of the study is that it is based on available data, which poses problems of consistency of the data quality, interpersonal errors, and sample size and unavailable of comparable data sets of the sampled populations at different times. These limitations are beyond the scope of the authors and are difficult to handle. This might pose problems in drawing inferences and significance of the results obtained. Therefore the results obtained need to be considered with all the limitations of the data structure. Some of the multivariate analysis attempted will help to rectify of these problems to an extent but may not completely eliminate these drawbacks.

Results

Table I shows the geographic patterns of the anthropometric variation and their correlation and partial correlation values with longitude and latitude. Results show that stature and TFI increase significantly at higher latitudes. Conversely, the NI decreases markedly at high latitudes, whereas CI shows no association with this variable.

Regarding longitude, only stature and CI present significant association with this variable; the first variable being negative and the second one positive. Of the four variables, stature alone shows significant association with both latitude and longitude, although in opposite direction. Partial correlations (keeping constant latitude and

Table I. Correlation and partial correlation values between anthropometric variables and latitude and longitude of India.

		Stature	CI	NI	TFI
Latitude	*r*	0.309*	−0.019	−0.456*	0.279*
	N	527	465	432	313
Longitude	*r*	−0.265*	0.266*	−0.044	0.102
	N	527	465	432	313
Latitude (LON)	*r*	0.393*	−0.086	−0.459*	0.264*
	N	524	462	429	310
Longitude (LAT)	*r*	−0.360*	0.278*	0.071	0.039
	N	524	462	429	310

*$p < 0.01$ (two-tailed).

longitude in each separate analysis) do not differ substantially from the results found using correlation analysis. This can be interpreted as both factors are acting independently.

The influence of language

Discriminant analysis was carried out for each factor separately on the four anthropometric variables (Table II). Univariate tests show that there is significant variation among the four language groups in stature, NI and CI (in decreasing order) and TFI shows least variation. The results of the discriminant analysis shows that the first two canonical variables, or discriminant functions, represent about 99.9% of the total variation (62.8% and 37.2% for the first and second functions, respectively), the separation of groups on both vectors being highly significant (Table II). The variables with higher scores in the first vector are stature (negative) and NI (positive). The variation of the second vector is also mostly due to stature and NI, but now both variables have positive weight. The plots representing the relationships of groups by projecting the group centroids onto the first two canonical variables are presented in Figure 2. The first canonical vector separates clearly the Austric

Table II. Discriminant functions, eigenvalues, percentage of variance explained, and chi-squared test of heterogeneity (derived from Wilk's Lambda) for the four factors.

	Function	Eigenvalue	Percentage of variance	Function removed	χ^2	d.f.	P
Language				0	145.69	12	0.000
	1	0.343	62.8	1	56.22	6	0.000
	2	0.204	37.2	2	0.096	2	0.954
	3	0.001	0.1				
Ethnicity				0	152.15	12	0.000
	1	0.561	90.6	1	17.20	6	0.009
	2	0.053	8.5	2	1.60	2	0.450
	3	0.005	0.9				
Climate				0	143.35	20	0.000
	1	0.377	69.5	1	46.64	12	0.000
	2	0.146	26.8	2	5.94	6	0.430
	3	0.019	3.6	3	0.168	2	0.920
	4	0.001	0.1				
Geography				0	367.15	24	0.000
	1	0.679	44.9	1	210.84	15	0.000
	2	0.509	33.6	2	86.78	8	0.000
	3	0.296	19.6	3	8.56	3	0.036
	4	0.029	1.9				

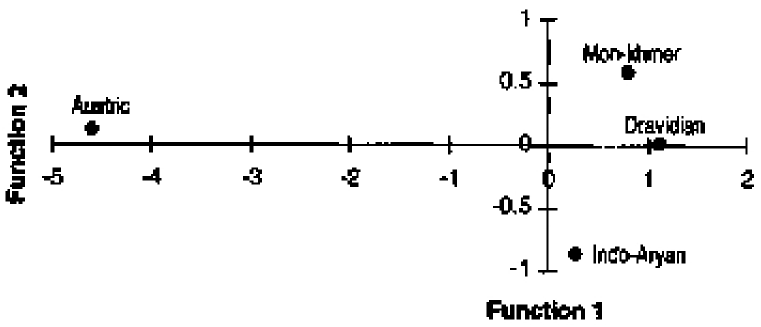

Figure 2. Discriminant functions evaluated through group centroids (language).

speakers tribal populations, supposed to be the earliest settlers, from the rest of the groups. The second vector separates the Indo-Aryan speakers, mostly represented by castes, from Dravidian and Mon-Khmer populations, which cluster together. The mean percentage of cases correctly classified in their respective group is a good estimator of the biological reality of the grouping criteria. In this case there is 61.4% of cross-validated grouped cases correctly classified, more than twice the percentage that one could expect by chance alone (25%). This may be interpreted as the variables investigated (especially stature and NI) being good discriminators for populations of different languages.

Influence of ethnic variation

Univariate tests show that there is significant variation among ethnic groups in stature, NI and CI (in decreasing order) and TFI shows least variation. This result is similar to that which is found in the case of language, in the previous analysis. The first two canonical variables show 99.9% of the total variation, the separation of groups on both vectors being highly significant, like in the previous analysis but here the first axis accumulate over 90% of the total variation. The variables with higher scores in the first vector are stature (positive) and NI (negative). The variation of the second vector is also mostly due to CI (positive load) and NI (negative).

The plot representing the first two canonical variables (Figure 3) shows large separation of four groups along the first axis, principally, which indicates wide ethnic variation in NI and stature. The category 'Other' consists of some of the migrant minor ethnic community and is heterogeneous and they are distinctly different from the other three ethnic groups. This is mainly due to the influence of NI.

The mean per cent of cases correctly classified in their respective group is similar to the previous analysis. Here there is 59.4% of cross-validated grouped cases correctly classified, more than twice the value one could obtain by chance (25%). This may be also interpreted as the variables investigated being good discriminators for groups of different ethnic origin, with the exception of TFI.

Influence of climate

All variables show significant variation among climatic groups. Looking at the *F*-ratios it can be observed that this is especially true for NI, followed by stature, CI, and in this case also for TFI, probably under the influence of NI. The first two canonical variables (69.5% and 26.8% of the variation) accumulate 96.3% of the total variation. The separation of groups

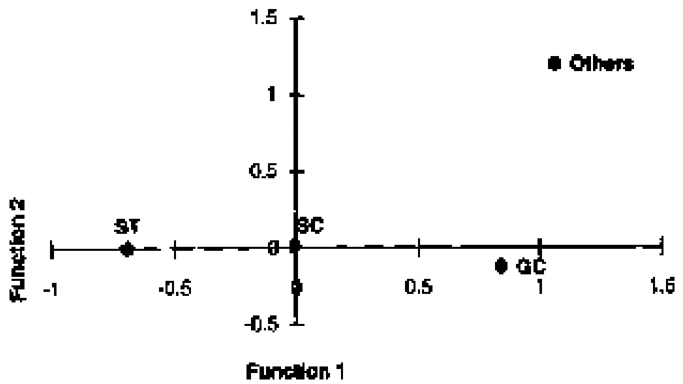

Figure 3. Discriminant functions evaluated through group centroids (ethnic).

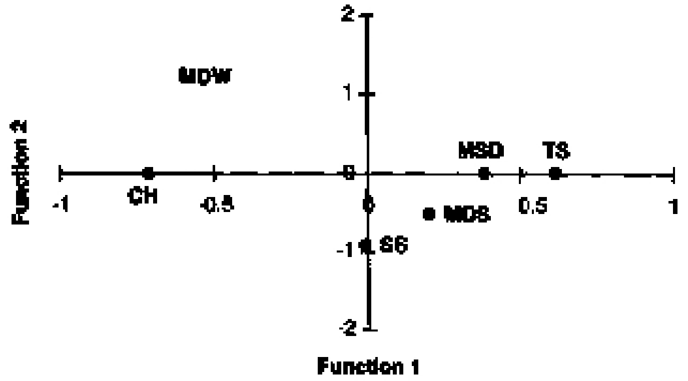

Figure 4. Discriminant functions evaluated through group centroids (climate). TS, tropical savannah; MSD, monsoon with a short dry season; MDS, monsoon with a dry season in the high Sun; SS, semi-arid and steppe; MDW, monsoon with dry winter and CH, cold humid type.

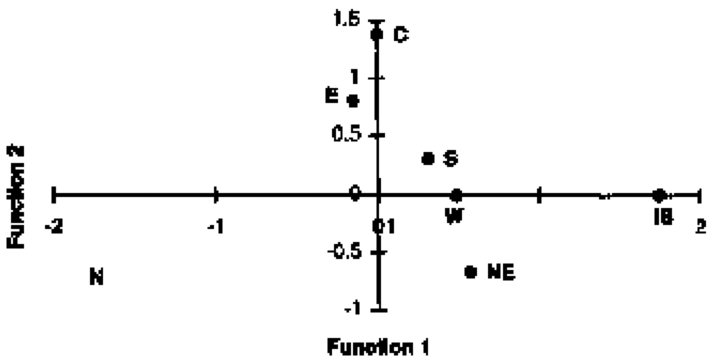

Figure 5. Discriminant functions evaluated through group centroids (geography). N, north; NE, north-east; E, east; C, central; S, south; W, west; and IS, island.

on both vectors is highly significant (Figure 5). As expected from the univariate results, NI is the variable with highest load on the first vector (positive), whereas NI and TFI show negative association with this function. The variation of the second vector is mostly due to stature (negative load) and NI (positive).

The projection of the centroids onto a bi-dimensional plot representing the first two canonical variables (Figure 4) reveals effect of climate on the morphology. The populations living in cold humid winter (CH) and in monsoon with dry winters (MDW) cluster together on the left side of the plot, denoting morphological similitude between them as well as marked differences with populations from other climatic regions. On the other hand, populations living in tropical (TS), semi-arid (SS) and monsoon (MSD, MDS) regions cluster close to each other. The mean per cent of cases correctly classified in their respective group is 43.6%. If we take into account that there are six groups here (16.67% is expected by chance), the result can be considered even better than in previous analyses. That is, the separation of groups based on variables investigated (especially NI) reflects a biological fact and is not arbitrary.

Influence of geography

Univariate tests show that all variables present significant variation among geographic groups. The descending order of *F*-ratios is NI, CI, TFI and stature (Figure 5). It is interesting to note that different variables are important for discriminating for each factor investigated. For example, in this analysis stature is not a good discriminator whereas climate bears significant influence on body morphology, especially in the case of NI and TFI.

The first two canonical variables (44.9% and 33.6% of the variation) accumulate 78.5% of the total variation, the separation of groups on both vectors being highly significant (Figure 5). CI and NI are the variables showing the highest association with the first and the second functions, respectively, both with positive values.

The projection of the centroids onto the first two canonical variables (Figure 5) shows geographical pattern of morphological variation among the Indian populations. The first vector shows the populations from the north (N) in the left and the island populations (IS) in the right margin of the plot, reflecting the two extremes of variation in CI. At an intermediate position, and separated by the second vector, appears the rest of the regions, reflecting a gradient in NI values from central (C) to North eastern (NE) regions. It is worth noting the close resemblance among populations living in southern (S) and western (W) regions.

The mean percent of cases correctly classified in their respective group is 51.9%. If we take into account that there are seven groups here (14.3% is expected by chance to be well classified) this result indicates that the variables employed are excellent discriminators for climatic groups, principally CI and NI.

Influence of time between data sets

In order to test the extent and nature of association between time of collection of data and the studied variable, linear regression was employed. Although statistically significant association between time and three out of four variables were found, the proportion of variation that can be attributed to time (expressed as the adjusted R^2) is quite low (between 0.1 and 4.5%) and therefore we do not believe that it affects the overall inferences that we made based on our other results (Table VII). It is worth noting, however, that for biological analysis the pattern of variation is of primary interest, and significance testing is definitely of subordinate value (Blackith and Reyment 1971). Moreover, the variation observed does not seem to be due to secular trend since stature actually exhibits a negative trend; on the other hand, NI exhibits a positive trend, probably due to regional differences in sampling along time (Figures 6–9).

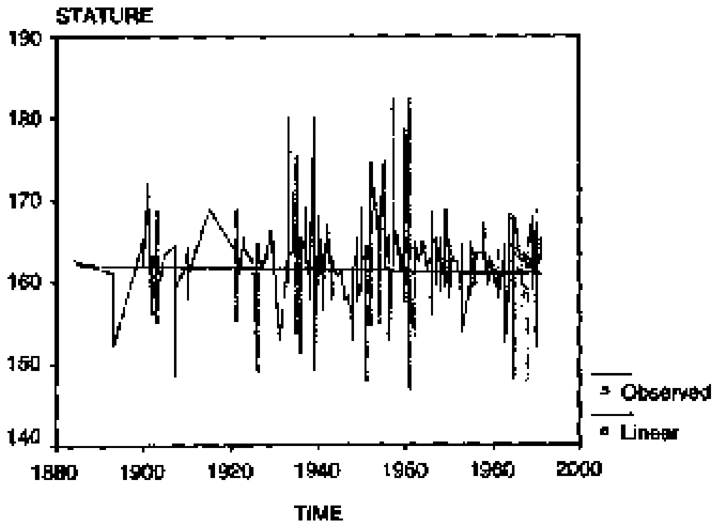

Figure 6. Temporal trend of stature.

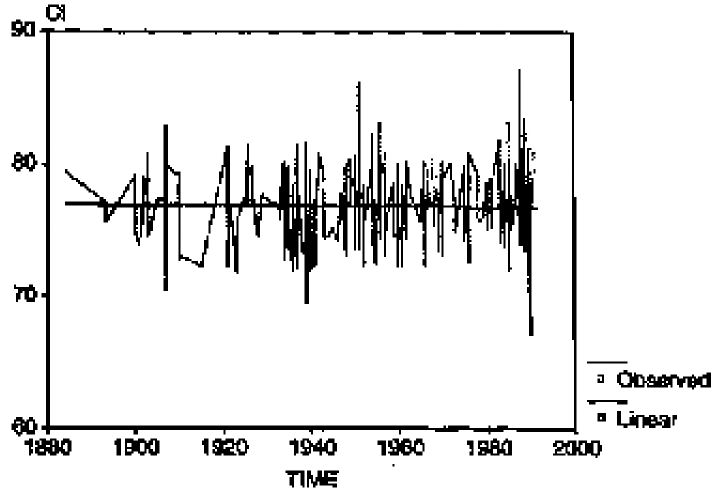

Figure 7. Temporal trend of CI.

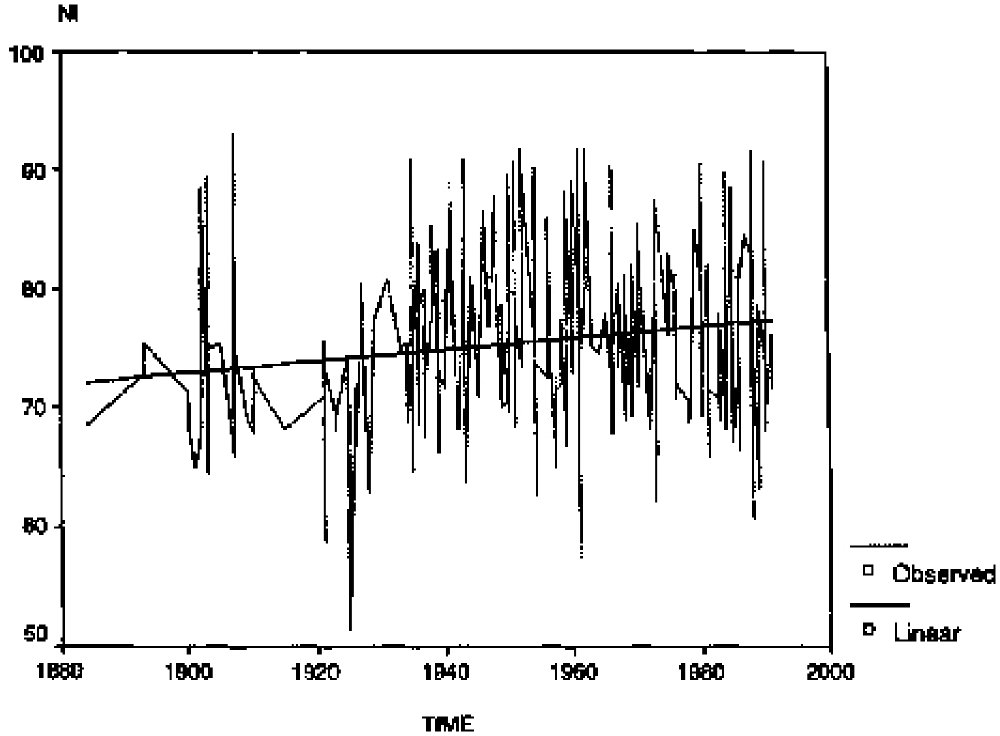

Figure 8. Temporal trend of NI.

Autocorrelation analysis

The pattern of geographic variation of each trait (NI, CI, St and TFI) with stature is described by the plot of autocorrelation coefficients (correlograms) in Figures 6–9. (Tables III–VI.) The horizontal axis indicates the geographic distance between populations (in kilometres) and on the vertical axis is the standardized (z-score) value of Moran's *I* at each spatial lag (Figures 10–13).

The interpretation may be briefly explained as follows: (a) a spatially random distribution result in a series of insignificant Moran's *I* values at all distances. (b) A decreasing set

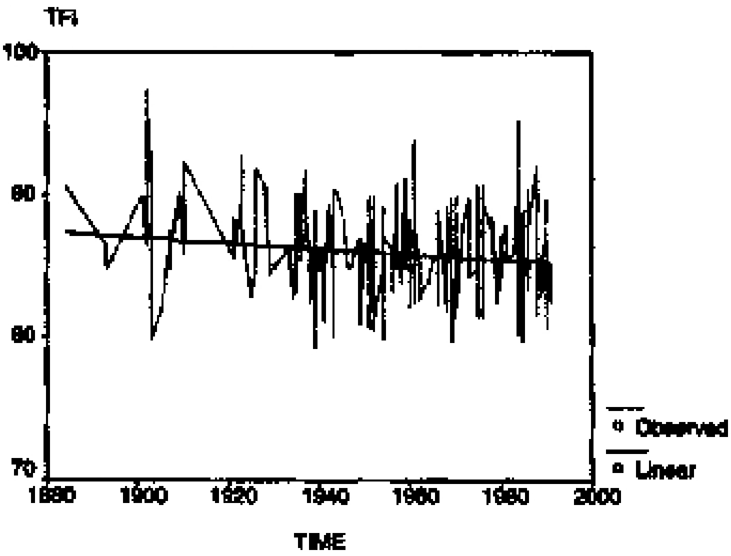

Figure 9. Temporal trend of TFI.

Table III. Spatial autocorrelation (Moran's *I*) results for NI.

Spatial lag	Distance (km)	Data Points	No. of pairs	Mean *I*	SD of *I*	*p*
1	184.5	303	2555	0.384	0.008	0.000
2	335.2	303	2538	0.205	0.008	0.000
3	446.3	303	2587	0.074	0.008	0.000
4	627.0	303	2493	0.203	0.008	0.000
5	805.3	303	2536	−0.046	0.007	0.000
6	945.5	303	2542	−0.141	0.008	0.000
7	1068.9	303	2544	−0.107	0.008	0.000
8	1164.2	303	2546	−0.114	0.008	0.000
9	1258.3	303	2537	−0.081	0.008	0.000
10	1358.0	303	2544	−0.062	0.008	0.000
11	1466.4	303	2541	−0.078	0.008	0.000
12	1560.8	303	2541	0.002	0.008	0.243
13	1675.0	303	2570	0.146	0.008	0.000
14	1855.5	303	2522	0.094	0.008	0.000
15	2087.9	303	2541	−0.082	0.007	0.000
16	2316.2	303	2558	0.024	0.007	0.000
17	2546.3	303	2572	−0.226	0.007	0.000
18	4058.1	303	2486	−0.258	0.002	0.000

Overall correlogram significance (Bonferroni approximation) = 0.000.

of *I* coefficients, from positive significant to negative significant, describes a cline. (c) A decreasing correlogram from positive significant to insignificant at large distances is expected for allele frequencies under isolation by distance, i.e. when genetic diversity reflects only genetic drift and short-range gene flow.

Although differences exist among variables, all four correlograms departed significantly from randomness and share some common features. First, almost all the *I* value are statistically significant, denoting high geographical structure. Second, spatial auto-correlation is generally positive and significant for the four variables at low distances. Third, beyond 2200 km the four variables exhibit negative values and are statistically significant. At intermediate distances the interpretation is not so easy and there are some differences

Table IV. Spatial autocorrelation (Moran's *I*) results for CI.

Spatial lag	Distance (km)	Data Points	No. of pairs	Mean *I*	SD of *I*	*p*
1	186.6	314	2738	0.114	0.007	0.000
2	336.4	314	2722	0.115	0.007	0.000
3	446.2	314	2735	0.043	0.007	0.000
4	619.0	314	2728	0.027	0.007	0.000
5	787.4	314	2736	0.026	0.007	0.000
6	927.4	314	2728	−0.007	0.007	0.315
7	1051.4	314	2772	−0.054	0.007	0.000
8	1149.6	314	2691	−0.040	0.007	0.000
9	1240.5	314	2726	−0.029	0.007	0.000
10	1344.8	314	2739	−0.082	0.007	0.000
11	1451.5	314	2717	−0.036	0.007	0.000
12	1546.9	314	2730	−0.066	0.007	0.000
13	1666.1	314	2751	-0.002	0.007	0.420
14	1831.5	314	2710	−0.004	0.007	0.478
15	2057.5	314	2730	−0.036	0.007	0.000
16	2281.9	314	2727	0.106	0.007	0.000
17	2534.8	314	2737	0.000	0.007	0.303
18	4058.1	314	2724	−0.133	0.007	0.000

Overall correlogram significance (Bonferroni approximation) = 0.000.

Table V. Spatial autocorrelation (Moran's *I*) results for stature.

Spatial lag	Distance (km)	Data Points	No. of pairs	Mean *I*	SD of *I*	*p*
1	203.3	358	3555	0.175	0.006	0.000
2	348.0	358	3549	−0.024	0.006	0.000
3	475.5	358	3569	0.092	0.006	0.000
4	654.4	358	3528	0.047	0.007	0.000
5	818.0	358	3557	0.066	0.007	0.000
6	950.2	358	3550	−0.030	0.006	0.000
7	1067.9	358	3558	0.050	0.006	0.000
8	1164.2	358	3554	−0.029	0.006	0.000
9	1258.2	358	3542	−0.024	0.006	0.000
10	1352.7	358	3552	−0.034	0.006	0.000
11	1455.5	358	3548	−0.042	0.006	0.000
12	1550.5	358	3552	−0.002	0.006	0.440
13	1661.6	358	3550	0.018	0.006	0.005
14	1803.8	358	3552	0.131	0.007	0.000
15	2022.9	358	3560	−0.142	0.006	0.000
16	2263.6	358	3537	−0.082	0.007	0.000
17	2520.7	358	3568	−0.091	0.007	0.000
18	4058.1	358	3532	−0.096	0.009	0.000

Overall correlogram significance (Bonferroni approximation) = 0.000.

of behaviour for each individual variable. In synthesis, all the variables show a gradient spanning over India (i.e. a clinal pattern). This pattern is much more evident for NL

Discussion

There are three major factors that are attributed to the vast diversity of human populations in Indian subcontinent: geography, historical migration, and social structure. A variety of

Table VI. Spatial autocorrelation (Moran's I) results for TFI.

Spatial lag	Distance (km)	Data Points	No. of pairs	Mean I	SD of I	p
1	186.6	312	2741	0.164	0.009	0.000
2	325.6	312	2658	0.137	0.009	0.000
3	444.3	312	2731	−0.033	0.008	0.000
4	566.9	312	2657	0.039	0.009	0.000
5	715.6	312	2689	−0.004	0.008	0.469
6	841.1	312	2697	0.020	0.008	0.003
7	955.6	312	2719	0.010	0.009	0.064
8	1069.9	312	2700	−0.060	0.009	0.000
9	1171.3	312	2698	0.064	0.009	0.000
10	1274.4	312	2663	−0.099	0.009	0.000
11	1370.2	312	2702	0.069	0.009	0.000
12	1473.5	312	2691	−0.050	0.009	0.000
13	1569.9	312	2737	0.007	0.009	0.120
14	1677.4	312	2653	−0.048	0.009	0.000
15	1859.6	312	2703	−0.073	0.008	0.000
16	2074.3	312	2693	−0.105	0.008	0.000
17	2325.6	312	2701	−0.066	0.007	0.000
18	4058.1	312	2683	−0.032	0.000	0.000

Overall correlogram significance (Bonferroni approximation) = 0.000.

Table VII. Regression values of the four anthropometric variables with time[a].

Variable	R	R^2	Adjusted R^2	F
Stature	0.113	0.013	0.011	0.009
NI	0.212	0.045	0.043	0.000
TFI	0.157	0.025	0.021	0.006
CI	0.059	0.003	0.001	0.205

[a]Predictors: (Constant), Time.

natural, geophysical, or topographical regions (with highest mountain ranges, rivers, delta region, vast plateaux, sea-coast, deep jungles) are conducive not only to the rich biodiversity but also for the human settlements. These geophysical settings have acted as durable protective mechanisms and communication barriers for the settlement of several historical migrations of diverse ethnic communities that sustained to exist since prehistoric times. This has lead to the unique stratified population structure consisting of thousands of communities of castes, subcastes, tribes characterized by endogamy, culture and a variety of subsistence practices, dialects, kinship pattern, a variety of food habits, customs and health practices, etc. (Malhotra and Vasulu 1992, Singh et al. 1994). The castes are large groups spread over contiguous geographical regions and practice endogamy with short marital distance. This population structure is akin to the isolation by distance model and, in the absence of other influencing factors, this should show geographic clines in some of the anthropological and genetic characters.

Apart from a variety of tribes spread widely in different parts of the country, the caste system is ubiquitous and a typical characteristic of the majority of Indian populations; however, they are localized groups and are geographically structured and show wide differences in socio-cultural and linguistic factors. The discontinuous distribution and

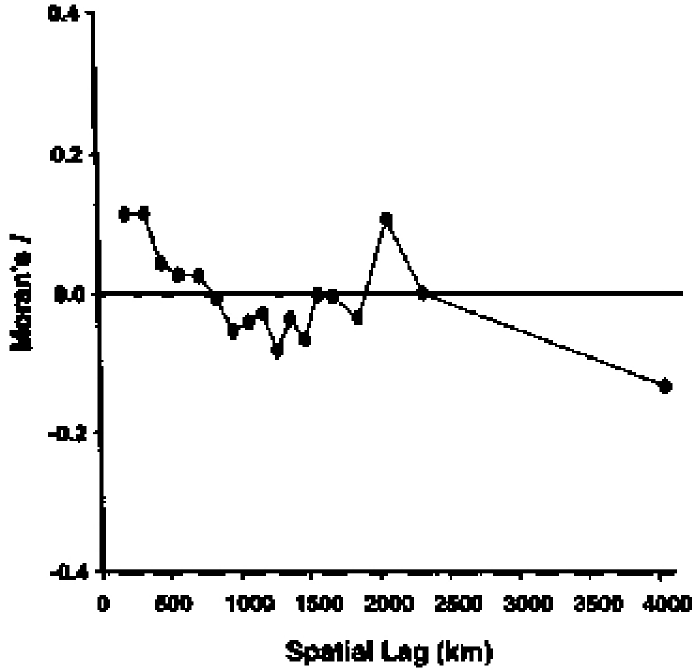

Figure 10. Spatial autocorrelation analysis. Correlogram for CI.

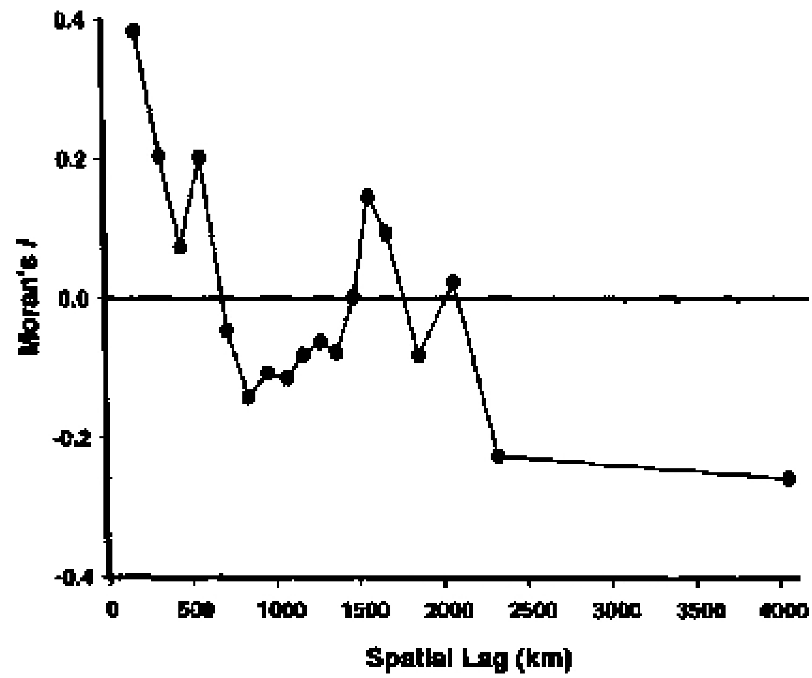

Figure 11. Spatial autocorrelation analysis. Correlogram for NI.

small population size of the majority of the tribes indicate that their genetic fate is guided by genetic drift and show unique frequencies of genetic characters and absence of geographic clines. Both the tribal and caste distribution have a strong bearing in the making of biological diversity of Indian populations, but how exactly that is reflected, and the extent and the magnitude and patterns of variation are the subject of investigation among anthropologists, human biologists and population geneticists. The above expectation or the hypothesis is supported by the results obtained by discriminant and autospatial correlation analysis.

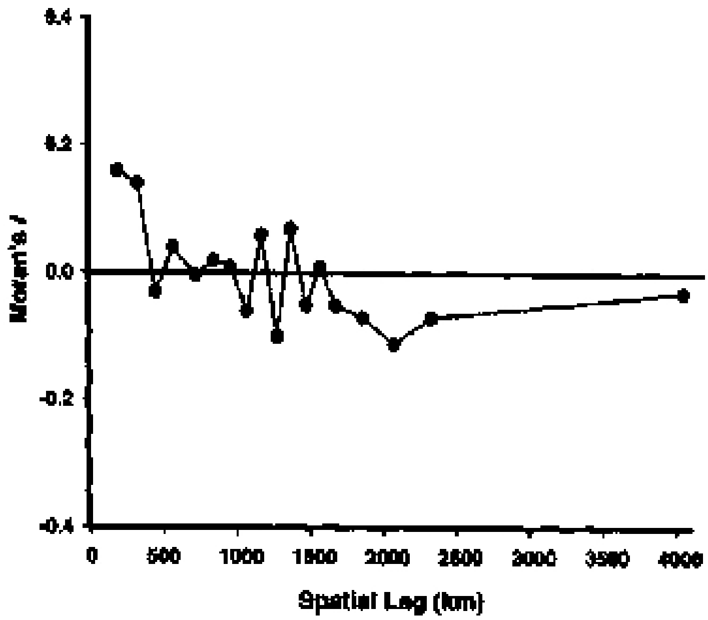

Figure 12. Spatial autocorrelation analysis. Correlogram for facial index.

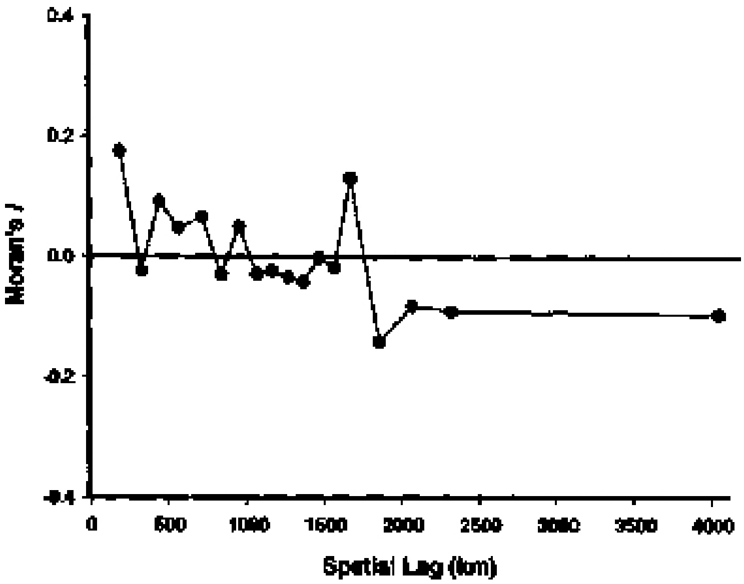

Figure 13. Spatial autocorrelation analysis. Correlogram for stature.

The result of this study reflects the geographic structuring of anthropometric variation. The northern region and, to an extent, the southern region, shows taller stature, broad facial index and longer nose, whereas in the eastern region the people are of comparatively short stature and broad headed. The opposite picture is seen in the western region. The results of the discriminant analysis further clarify the pattern of anthropometric variation with regard to linguistic, geographic, ethnic and climatic factors.

Of the four variables used to discriminate Indian populations—based on linguistic, ethnic, climatic and geographic factors—stature ranked first and then NI and CI shared more or less equal weighting with each other. But in the case of geographical impact, the order of discriminator was NI, CI, TFI and stature. The discriminant analysis for each of the four variables—language, ethnicity, climate and geography—shows variation in facial morphology and cluster together with respect to the above four factors.

The spatial autocorrelation analysis performed reflected the influence of population structure on the geographic patterning of anthropometric variation. This is expected in view of the regional endogamy, resulting in localization of gene pools, thus conserving the local biological diversity. This should be reflected in the discriminant analysis. The analysis denotes significant positive autocorrelation at low-order distances and significant negative correlation at higher distance. The positive values at low-order distances are what are expected because of the endogamous nature of the populations. Intermediate distance results of the analysis suggests some random pattern, possibly owing to the migration and admixture relative to the effect of endogamy. In the case of long-distance differentiation, negative autocorrelation reflects clinal patterns and this is expected from the isolation by distance model of population genetic theory in the case of migrations, where distance populations are expected to show greater diversity than the nearby populations due to localization of the gene pool. The results also indicate east–west or north–south gradients (clinal pattern) of biological variation with respect to stature, CI, NI and TFI. This is in accordance with the regional variation observed in the anthropometric variation in the earlier studies. Thus, the spatial autocorrelation analysis reflects the biological pattern inherent in the population with diverse historical migration and settlement patterns in different regions. The pattern might change with different lag distance values. We have considered 125 km as the upper limit of marital distance as the cut-off point for seeing the geographical patterns of the four anthropometric traits considered. An alternative analysis based on mode or average marital distance would possibly be more desirable and might reflect different patterns. This is because marital distribution of tribal and most of the caste (with the exception of Brahmin) populations in general shows a characteristic pattern of leptokurtic and skewed distribution (Majumder 1977, Malhotra 1980), and as such the upper limit of 125 km distance may not be realistic in the majority of populations in India. The mode or the mean value or some other distance value that satisfies the population structure criteria might show better clarity of geographical patterns or clines. Therefore, accordingly, we have also tested different distance classes criteria (for example, equal number of populations in each lag, or equal distance interval along the whole space), and all the results show the same pattern, which indicates that the pattern is quite robust. This suggests that the variation in marital distance has little effect on the spatial pattern of the studied variables.

The results further reinforce the observations made in some previous regional and national anthropometric studies with regard to ethnic and linguistic criteria. For example, in the case of regional studies on anthropometric variation, Mahalonobis et al. (1949), Karve and Malhotra (1968) and Malhotra et al. (1981) in northern, western and southern regions observed variation of stature along the caste hierarchy. However, such differences with respect to caste hierarchy were least observed in the Bengal anthropometric survey (Majumdar and Rao 1960). Such variance in results observed in Bengal is attributed to the population structure governing marriage regulations and recent migrational history of the populations. In this sense the regional studies are important, so as to detect local patterns and its influencing factors, which might get masked at a national-level study across regions.

There is a dearth of well designed studies on anthropometric variation at the national level. The results of the study support some of the findings by the previous works. For example, Majumder et al. (based on well designed statistical analysis) have found significant differences in anthropometric profiles across geographical zones and ethnic categories but no clinal patterns in head length, head breadth, bizygomatic breadth and stature. Similar results of association between climate, geography and anthropometric variation was also observed by Bhasin et al. (1994). In a recent study, Bharati et al. (2001) observed significant association between CI and stature with ethnicity and climate. The above studies imply geographical clines with respect to anthropometric traits across the caste hierarchy or ethnicity among the Indian populations. North et al. (1999), Sokal and Friedlaender (1982) and Sokal et al. (1989a, b) have studied spatial autocorrelation in European populations; however, in the Indian context, this is perhaps the first direct study based on spatial autocorrelation of anthropometric variation with respect to ethnic and linguistic criteria. Recently, spatial studies in dermatoglyphic variation have been reported by Reddy et al. (2004). This study also showed similar spatial patterns in palmar dermatoglyphic traits (ridge count variation) with respect to geography and ethnicity.

Although there is greater emphasis given to the genomic data for investigating the micro-evolutionary pattern (Cann, 2003), the results based on classical morphological traits and classical genetic traits should help in further understanding the mechanism of variation of the vast biological diversity of Indian populations. The findings of the study should help in further clarification and interpretation of research work in genomic analysis, especially with respect to genetic epidemiological profiles of health and disease.

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Appendix

Mean values of anthropometric variable for 531 populations of Indian subcontinent along with the latitude, longitude and the code for climatic, geographic, linguistic and ethnic classifications.

							Mean				Classification			
No.	Community	Place	Lat. (N)	Long. (E)	Year	*n*	Stature	CI	NI	TFI	Climatic	Geographic	Linguistic	Ethnic
1	Kashmiri	Srinagar	34.18	74.91	1925	50	166	76.2	66.5	90.5	7	1	4	3
2	Pandit	Martand-Kashmir	34.10	72.20	1961	86	163.2	74.61	62.79	90.6	7	1	4	3
3	Pandit	Srinagar	34.18	74.91	1961	120	164.6	74.86	62.11	89.7	7	1	4	3
4	Pandit	Srinagar	34.18	74.91	1971	10	162.45	75.62			7	1	4	3
5	Sarikoli	W & C Himalaya	32.00	80.00	1926	40	163.8	71.9	81.9		8	1	4	3
6	Balti	Ladakh	32.00	80.00	1926	73	161.9	74.9	68.3		8	1	2	1
7	Balti	Ladakh	32.00	80.00	1926	147	162.2	75.07	70		8	1	2	1
8	Bod	Ladakh	32.00	80.00	1979	11	168.8				8	1	2	1
9	Brokpa	W & C Himalaya	32.00	80.00	1926	49	163.4	75.9	70.6		8	1	4	1
10	Changpa	W & C Himalaya	32.00	80.00	1926	47	162	83.1	72.7		8	1	4	1
11	Ladakhi	Ladakh	32.00	80.00	1926	24	163.5		72.8		8	1	2	1
12	Ladakhi	Ladakh	32.00	80.00	1926	47	164.1	77.9	75		8	1	2	1
13	Ladakhi	Ladakh	32.00	80.00	1921	34	163.4	76.76	75.54		8	1	2	1
14	Ladakhi	Ladakh	32.00	80.00	1884	36	163	75			8	1	2	1
15	Burishki	W & C Himalaya	32.00	80.00	1926	18	168.8	73.2	68.2		8	1	4	3
16	Machnopa	W & C Himalaya	32.00	80.00	1926	44	164.4	76.9	72.3		8	1	2	3
17	Mastuji	W & C Himalaya	32.00	80.00	1926	28	166.6	80.6	72.1		8	1	2	3
18	Brahmin	Allahabad	25.28	81.54	1935	50	165.4	72.48	69.56	89.6	7	1	4	3
19	Brahmin	Basti	26.48	82.46	1949	85	164.51	79.92	71.74	88.8	7	1	4	3
20	Garhwali	Garhwal	30.13	79.30	1903	6	164.9	75.9			7	1	4	3
21	Garhwali	Garhwal	30.13	79.30	1926	49	163.3	75.7	66.3		7	1	4	3
22	Jat	Indo-Gangetic plain	29.18	75.13	1903	6	182.3	73			4	1	4	3
23	Jat	Meerut	29.01	77.45	1972	50	174.51				4	1	4	3
24	Nuniya	Mainpuri, Farrukhabad	27.24	79.37	1950	151	166.89	71.88	73.43	86.3	7	1	4	3
25	Rajput	Mainpuri, Farrukhabad	27.24	79.37	1957	70	167.9	70.96	70.03	87.0	7	1	4	3
26	Rajput-Baghel	Mainpuri, Farrukhabad	27.24	79.37	1957	38	166.5	73.35	71.29	85.9	7	1	4	3

(continued)

Appendix continued.

No.	Community	Place	Lat. (N)	Long. (E)	Year	*n*	Mean				Classification			
							Stature	CI	NI	TFI	Climatic	Geographic	Linguistic	Ethnic
27	Rajput-Chauhan	Mainpuri, Farrukhabad	27.24	79.37	1957	148	167.1	74.38	71.42	85.9	7	1	4	3
28	Rajput-Dogra	Indo-Gangetic plain	29.18	75.13	1903	6	175	72.4			4	1	4	3
29	Rajput-Hindu	Indo-Gangetic plain	29.18	75.13	1903	6	178.6	75.4			4	1	4	3
30	Rajput-Marwari	Indo-Gangetic plain	29.18	75.13	1903	10	180.2	75.8			4	1	4	3
31	Rajput-Rathor	Mainpuri, Farrukhab	27.24	79.37	1957	134	167.7	72.66	70.77	82.2	7	1	4	3
32	Rastogi	Lucknow	26.55	80.59	1985	150	148.97	69.42	73.16	86.2	7	1	4	3
33	Vaish	Aligarh	27.30	79.40	1985	386	152.43				7	1	4	3
34	Dom	Kumaon	30.00	81.00	1975	40	158.8	74.51	74.93		7	1	4	2
35	Pasi	Dehradu	30.19	78.04	1990	100	160.58	72.74	73.39	85.8	7	1	4	2
36	Saharaya	Jhansi	25.27	78.37	1969	50	162.4				7	1	4	2
37	Bajgi	Jaunsar	30.19	78.04	1966	23	161.4	75.1	73.19	87.8	4	1	4	1
38	Bajki	Jaunsar	30.19	78.04	1966	27	164.37	71.64	68.07	92.8	4	1	4	1
39	Bhoksa	Nainital	29.23	78.30	1978	250	163.7				7	1	4	1
40	Bhotia	Almora	29.37	79.40	1954	100	160.18	78.89	70.02	86.2	7	1	2	1
41	Bhotia	N.E. Almo	29.37	79.40	1943	90	160.4	77.61	66.07	86.2	7	1	2	1
42	Bhotia-Rajput	ManaBadrinath	30.44	79.32	1980	8	161.4				7	1	2	1
43	Bhotia-rang	Pithoragar	29.50	80.20	1985	166	163.29				7	1	2	1
44	Brahman	Jaunsar Bawar	30.19	78.04	1952	20	164.03	75.5	69.37	87.4	4	1	4	1
45	Jaunsari-Brahman	Jaunsar-Bawar	30.19	78.04	1947	20	163				4	1	4	1
46	Kolta	Jaunsar	30.19	78.04	1966	42	160.91	72.98	72.37	92.2	4	1	4	1
47	Kolta	Jaunsar-Bawar	30.19	78.04	1952	44	160.9	74.86	75.5	88.3	4	1	4	1
48	Kolta	Jaunsar-Bawar	30.19	78.04	1969	50	163.98	73.44	72.32	90.8	4	1	4	1
49	Raji	Pithoragar	29.50	80.20	1959	70	159.42				7	1	4	1
50	Raji	Pithoragar	29.50	80.20	1983	91	162.79				7	1	4	1
51	Rajput	Jaunsar-Bawar	30.19	78.04	1952	95	163.5	73.34	68.87	88.4	4	1	4	1
52	Rajput	Jaunsar	30.19	78.04	1966	32	162.21	72.43	65.97	90.6	4	1	4	1
53	Rajput	Jaunsar	30.19	78.04	1967	65	161.85	72.09	57.55	93.8	4	1	4	1
54	Rana-Tharu	Lakhimpur Kheri	27.57	80.49	1966	75	160.8	72.9			7	1	4	1

55	RanaTharu Thakur	Tarai-Kheri	27.54	80.48	1967	75	146.86	72.87			7	1	4	1
56	Rajput-Mohammedan	Indo-Gangetic plain	29.18	75.13	1903	7	182.5	75.8			4	1	4	3
57	Manchati	Chamba	32.29	76.10	1943	103	162.57	74.37	63.79	90.3	4	1	4	3
58	Rajput	Bareth	30.30	77.20	1969	107	165.67				7	1	4	3
59	Rajput	Mandi	31.43	76.58	1969	83	163				7	1	4	3
60	Rajput	Chamba	32.29	76.10	1986	50	164.65				4	1	4	3
61	Rajput	Manali	32.24	77.03	1968	106	162.3	72.87		90.1	7	1	4	3
62	Rajput	Manali	32.24	77.03	1964	150		74.35		83.6	7	1	4	3
63	Gaddi	Dhauladhar-Hills	32.29	76.10	1968	500	161.5	74.41	65.01	89.3	7	1	4	1
64	Kanet	Kullu	31.52	77.09	1902	60	165.4	74.3	74.1		7	1	4	1
65	Kanet	Lahul	32.60	77.50	1902	30	161.18	77.5	64.4		7	1	4	1
66	Kanet	Pattan-Valley	34.1	72.2	1984	198	164.3	73.89	65.5	88.2		1	4	1
67	Kanet	Kalpa	32.38	78.49	1984	219	164.75	76.5	65.64	88.0	7	1	4	1
68	Kanet	Parvati-Valley-Kullu	32.46	76.48	1984	232	162.67	73.9	63.93	88.9		1	4	1
69	Kanet	Manali	32.12	77.06	1984	136	163.06	75.07	60.63	82.8	7	1	4	1
70	Gorkha	Dhauladhar-Chamba	32.29	76.10	1967	33	163.72	75.93	76.38		4	1	4	3
71	Gorkha-Brahmin	Dhauladhar-Chamba	32.29	76.10	1990	28	161.75	75.12	69.25	87.2	4	1	4	3
72	Gorkha-Chetri	Dhauladhar-Chamba	32.29	76.10	1990	108	161.26	77.09	72.71	86.4	4	1	4	3
73	Gorkha-Gurung	Dhauladhar-Chamba	32.29	76.10	1990	86	161.91	78.8	73.22	84.6	4	1	4	3
74	Gorkha-Magar	Dhauladhar-Chamba	32.29	76.10	1990	176	162.52	78.32	73.47	85.7	4	1	4	3
75	Gorkha-Newar	Dhauladhar-Chamba	32.29	76.10	1990	23	161.06	75.16	71.03	88.5	4	1	4	3
76	Gorkha-Thakur	Dhauladhar-Chamba	32.29	76.10	1990	40	161.65	77.53	71.22	85.0	4	1	4	3
77	Gujjar-Hindu	Roper	30.57	76.32	1983	200	168.05				4	1	4	3
78	Jat	Patiala	30.20	76.25	1978	71	170.5				4	1	4	3
79	Punjabi	Punjab	30.40	75.50	1921	444	168.4	74.2	70.2		4	1	4	3
80	Sikh	Punjab	30.40	75.50	1935	76	171.8	73.74	64.71	90.1	4	1	4	3
81	Sikh	Punjab	30.40	75.50	1921	76	172.1	73.79	64.83	89.9	4	1	4	3
82	Sikh	Punjab	30.40	75.50	1921	97	170.9	72.7	68.8		4	1	4	3
83	Sikh	Punjab	30.40	75.50	1903	16	180	73.1			4	1	4	3
84	Ramdasia	Patiala	30.20	76.25	1978	62	163.5				4	1	4	2
85	Rajput	Bharatpur	27.15	77.30	1957	65	167.87	72.76	73.67	87.0	4	1	4	3
86	Gujar	Delhi	28.38	77.12	1969	69	167.93	73.51			4	1	4	3
87	Khatri	Delhi	28.38	77.12	1968	223	167.95	76.28			4	1	4	3
88	Ahom	Lakhimpu	27.15	94.50	1988	50	162.71	81.16	70.1	85.5	7	2	4	3
89	Ahom	Nowgong	26.20	92.41	1988	50	161.3	81.49	71.6	86.5	7	2	4	3
90	Ahom	Dibrugarh	27.29	94.58	1973	100	163.48	81.32	71.02	85.6	7	2	4	3

(continued)

Appendix continued.

No.	Community	Place	Lat. (N)	Long. (E)	Year	n	Mean				Classification			
							Stature	CI	NI	TFI	Climatic	Geographic	Linguistic	Ethnic
91	Brahmin	Darang	26.45	92.40	1988	50	162.56	79.42	68.49	90.4	7	2	4	3
92	Brahmin	Goalpara	26.11	90.41	1988	50	164.25	76.91	67.89	90.5	7	2	4	3
93	Brahmin	Kamrup	26.11	91.47	1988	50	164.56	76.78	66.65	90.7	7	2	4	3
94	Brahmin	Lakhimpu	27.15	94.50	1988	50	163.6	80.84	69	87.6	7	2	4	3
95	Brahmin	Nowgong	26.20	92.41	1988	50	164.31	79.35	74.16	86.8	7	2	4	3
96	Brahmin	Sibsagar	27.00	95.00	1988	49	163.38	80.29	70.03	86.9	7	2	4	3
97	Jugi	Goalpara	26.11	90.41	1988	50	163.93	77.27	68.48	90.9	7	2	4	3
98	Jugi	Kamrup	26.11	91.47	1988	48	162.45	79.08	66.78	91.8	7	2	4	3
99	Jugi-Darang	Darrang	26.45	92.40	1988	50	164.12	78.04	69.14	91.0	7	2	4	3
100	Kalita	Darrang	26.45	92.40	1988	50	162.16	80.11	68.13	88.3	7	2	4	3
101	Kalita	Goalpara	26.11	90.41	1988	49	160.5	79.15	69.71	86.6	7	2	4	3
102	Kalita	Kamrup	26.11	91.47	1988	50	163.24	80.14	66.67	90.8	7	2	4	3
103	Kalita	Lakhimpu	27.15	94.50	1988	50	161.64	79.71	72.57	84.9	7	2	4	3
104	Kalita	Nowgong	26.20	92.41	1988	50	161.59	80.71	71.82	86	7	2	4	3
105	Kalita	Sibsagar	27.00	95.00	1988	50	163.88	80.87	70.93	86.4	7	2	4	3
106	Moria	Dibrugarh	27.29	94.58	1980	155	162.2	80.29			7	2	4	3
107	Rajbanshi	Goalpara	26.11	90.41	1988	50	161.38	76.02	68.98	88.0	7	2	4	3
108	Rajbanshi	Goalpara	26.11	90.41	1966	100	163.63	76.1	72.39	85.6	7	2	4	3
109	Santhal	Kamrup	26.11	91.47	1980	100	162.26	74.61	84.73	88.0	7	2	1	3
110	Kaiborta	Lakhimpu	27.15	94.50	1988	50	160.22	79.87	72.01	86.0	7	2	4	2
111	Kaiborta	Nowgong	26.20	92.41	1988	50	159.79	79.84	76.09	84.9	7	2	4	2
112	Kaiborta	Sibsagar	27.00	95.00	1988	49	160.61	80.4	73.9	87.1	7	2	4	2
113	Kachari	Darrang	26.45	92.40	1988	48	161.37	78.17	69.27	89.4	7	2	4	1
114	Kachari	Lakhimpu	27.15	94.50	1988	50	163	80.16	72.09	85.5	7	2	4	1
115	Kachari	Kamrup	26.11	91.47	1988	50	162.26	78.14	67.81	87.3	7	2	4	1
116	Kachari-Jharua	Lakhimpu	27.15	94.50	1961	100	163.29	79.22	70.57	87.4	7	2	4	1
117	Kachari-Sonowal	Lakhimpu	27.15	94.50	1961	111	163.46	80.13	75.62	84.9	7	2	2	1
118	Karbi-Hill	Karbi-Anglong	26.00	93.10	1981	140	160.08	78.96	82.95	83.6	7	2	2	1
119	Karbi-Plain	kamrup-Nowgong	26.11	91.47	1981	140	161.06	78.06	80.11	86.4	7	2	2	1
120	Kasia	Bramhaputra valley	27.29	94.58	1935	81	156.92	78.01	87.18		7	2	1	1
121	Khasi	Khasi-hills	25.30	90.16	1943	71	158.12	77.07	73.58	88.8	7	2	1	1
122	Khasi	Khasi & Jayantia hills	2.30	91.30	1935	132	158.44	77.81	76.75	84.7	7	2	1	1
123	Khasi	Khasi-hills	25.30	90.16	1970	400	156.66	77.18	82.2	83.2	7	2	1	1
124	Khasi-Pnar	Khasi & Jayantia hills	2.30	91.30	1988	49	157.6	75.73	74.33	85.6	7	2	1	1

125	Koch	Darrang	26.45	92.40	1988	50	162.58	79.43	70.09	89.8	7	2	4	1
126	Koch	Kamrup	26.11	91.47	1988	50	161.72	78.38	66.72	91.3	7	2	4	1
127	Koch	Sibsagar	27.00	95.00	1988	50	163.4	81.81	71.04	85.8	7	2	4	1
128	Koch	Bramhaputra valley	27.29	94.58	1900	88	156.69	75.66	82.56		7	2	4	1
129	Lalung	Nowging	26.20	92.41	1988	49	160.1	78.37	76.15	85.5	7	2	2	1
130	Lalung	Nowging	26.20	92.41	1980	70	165.29	78.66	80.44		7	2	2	1
131	Mech	Goalpara	26.11	90.41	1988	50	160.34	78.09	69.56	88.2	7	2	2	1
132	Miri	Sibsagar	27.00	95.00	1988	50	159.3	79.46	73.71	85.2	7	2	2	1
133	Mishing	Sibsagar	27.00	95.00	1980	100	161.13	79.5	70.12	88.0	7	2	2	1
134	Munda	Sibsagar	27.00	95.00	1989	100	157.8	75.38	91.03	79.9	7	2	2	1
135	Munda-HO	Jorhat	26.46	94.16	1943	67	159.18	73.47	81.63	87.0	7	2	2	1
136	Naga	Naga-Hills	26.00	94.20	1956	166	159.09	78.25	81.9	79.6	7	2	2	1
137	Naga-Angami	Assam-Naga Hills	26.00	94.20	1921	10	164.85	77.53	73.53	84.0	7	2	2	1
138	Naga-Angami	Naga-Hills	26.00	94.20	1935	100	165.43	76.67	68.93		7	2	2	1
139	Naga-Angami	Naga-Hills	26.00	94.20	1961	85	165.08	76.65	74.59	83.8	7	2	2	1
140	Naga-Ao	Naga-Hills	26.00	94.20	1961	77	158.6	80.26	81.31	81.7	7	2	2	1
141	Naga-Kabui	Naga-Hills	26.00	94.20	1957	100	155.87	77.48	67.95	86.4	7	2	2	1
142	Naga-Lahota	Assam-Naga Hills	26.00	94.20	1961	41	162	79.04	88.48	97.3	7	2	2	1
143	Muslim	Darrang	26.45	92.40	1988	49	162.84	79.06	68.43	90.9	7	2	4	4
144	Muslim	Goalpara	26.11	90.41	1988	50	158.93	77.47	68.26	90.2	7	2	4	4
145	Muslim	Kamrup	26.11	91.47	1988	48	162.66	79.04	69.78	89.6	7	2	4	4
146	Muslim	Lakhimpu	27.15	94.50	1988	50	161.19	78.22	71.4	85.5	7	2	4	4
147	Muslim	Nowgong	26.20	92.41	1988	50	160.77	78.94	73.49	86.6	7	2	4	4
148	Muslim	Sibsagar	27.00	95.00	1988	49	162.75	81.14	70.83	86.5	7	2	4	4
149	Muslim-Garia	Dibrugarh	27.29	94.58	1980	100	162.8	79.51	67.98	87.5	7	2	4	4
150	Muslim-Garia	Dibrugarh	27.29	94.58	1980	100	162.2	80.29	69.96	87.2	7	2	4	4
151	Nepali	Udaipur-Assam	23.13	91.31	1970	100	160.25	80.52			7	2	2	4
152	Chothe-purum	Manipur	24.44	93.58	1966	60	154.9	77.25	70.84		7	2	2	1
153	KukiPurum	Manipur	24.44	93.58	1945	60	154.9	77.21	70.48		7	2	2	1
154	Naga-Kabui	Manipur	24.44	93.58	1957	100	155.87	77.48	67.95	86.4	7	2	2	1
155	Tangkhul	Manipur	24.44	93.58	1986	106	160.41		75.18	87.3	7	2	2	1
156	Thamdou	Manipur	24.44	93.58	1928	60	160.8	76.5	80.7		7	2	2	1
157	Hajong	Meghalay	25.30	91.00	1973	100	159.03	79.96	74.37	80.1	7	2	2	1
158	Naga-Angami	Nagaland	26.00	94.20	1935	100	165.43	76.7	68.93		7	2	2	1
159	Naga-Ao	Kohima	25.40	94.08	1985	100	163.6	78.04			7	2	2	1
160	Naga-Ao	Nagaland	26.00	94.20	1900	17	156.6	80.11	84.52		7	2	2	1
161	Naga-Chakhesang	Nagaland	26.00	94.20	1984	56	164.29	78.63	73.81	79.7	7	2	2	1
162	Naga-Kabui	Nagaland	26.00	94.20	1957	100	155.8	77.48	67.95	86.4	7	2	2	1
163	Naga-Konyak	Nagaland	26.00	94.20	1921	94	158.2	77.6	89.4		7	2	2	1

(continued)

Appendix continued.

No.	Community	Place	Lat. (N)	Long. (E)	Year	n	Mean				Classification			
							Stature	CI	NI	TFI	Climatic	Geographic	Linguistic	Ethnic
164	Kalpeng	Agartala	23.50	91.25	1956	31	157.15	74.98	75.31	89.0	1	2	2	3
165	Riang	Tripura	23.45	91.30	1956	52	160.4	76.66	75.18	87.3	1	2	2	1
166	Riang	Tripura-Belonia	23.45	91.30	1956	41	150.4	76.67	72.71	88.6	1	2	2	1
167	Tipra	Tripura	23.45	91.30	1956	71	160.9	76.85	71.11	90.7	1	2	2	1
168	Abor	Arunachal Prades	28.00	95.00	1900	7	157.9	77.31	90.58		7	2	2	1
169	Abor	Abor hills	28.50n	96.50	1915	84	158.6	76.43	86.28		7	2	2	1
170	Abor Combined	Abor hills	28.50n	96.50	1949	335	158.38	76.15	73.41	86.9	7	2	2	1
171	Abor Padam	Arunachal Prades	28.00	95.00	1950	61	157.51	75.16	78	84.3	7	2	2	1
172	Abor Pangi	Abor hills	28.50n	96.50	1950	30	158.66	75.9	75.98	84.5	7	2	2	1
173	Abor Pangi & Padam	Arunachal Prades	28.00	95.00	1950	91	157.89	75.41	77.44	84.9	7	2	2	1
174	ADI-Ashhing	Siang	29.30	91.20	1966	75	157.32	75.73	73.01	88.1	7	2	2	1
175	Adi Milang	Siang	29.30	91.20	1966	50	158.9	76.43	73.67	86.8	7	2	2	1
176	Adi Minyong	Siang	29.30	91.20	1966	50	158.7	70.5	73.3	87.5	7	2	2	1
177	Adi Padam	Siang	29.30	91.20	1966	60	158	76.2	73.9	85.5	7	2	2	1
178	Adi Pangi	Siang	29.30	91.20	1966	30	158.66	75.9	75.98	84.5	7	2	2	1
179	Adi Pasi	Siang	29.30	91.20	1966	50	160.5	76.21	72.9	87.6	7	2	2	1
180	Adishimong	Siang	29.30	91.20	1966	50	158	76.04	74.13	86.0	7	2	2	1
181	Aka	Kameng	27.33	91.48	1990	109	155.77	79.45	70.11	84.7	7	2	2	1
182	Apatani	Arunachal Prades	28.00	95.00	1983	100	163.77	79.54	68.48		7	2	2	1
183	Apatani-Guchi	Subansiri	29.30	91.30	1990	105	158.85	80.65	74.14		7	2	2	1
184	Apatani-Guth	Subansiri	29.30	91.30	1990	163	162.47	79.51	72.54	85.6	7	2	2	1
185	Galong	Siang	29.30	91.20	1990	114	161.63	73.42	69.04	86.6	7	2	2	1
186	Hill-Miri	Subansiri	29.30	91.30	1990	100	157.74	75.88	72.75	85.7	7	2	2	1
187	Khampti	Lohit	29.30	91.20	1990	101	159.95	78.34	73.44	88.1	7	2	2	1
188	Khowa	Kameng	27.33	91.48	1990	96	157.55	78.14	76.66	80.9	7	2	2	1
189	Miji	Kameng	27.33	91.48	1990	212	157.76	77.63	81.35	79.6	7	2	2	1
190	Minyong	Siang	29.30	91.20	1990	116	156.99	74.42	67.07	85.8	7	2	2	1
191	Mishing-Miri	Arunachal Prades	28.00	95.00	1962	25	160.45	78.71	84.68		7	2	2	1
192	Mishmi Digaru	Lohit	29.30	91.20	1990	140	157.85	77.96	71.48	85.6	7	2	2	1
193	Mishmi Idu	Lohit	29.30	91.20	1990	107	154.42	77.96	77.54	80.6	7	2	2	1
194	Mishmi-Miju	Lohit	29.30	91.20	1990	120	158.12	77.96	72.85	85.3	7	2	2	1
195	Monpa	Diang-Kameng	27.33	91.48	1990	140	160.6	78.73	72.31	84.4	7	2	2	1
196	Monpa	Kalaktang	27.20	92.10	1990	160	158.87	79.98	75.41	86.0	7	2	2	1
197	Monpa	Tewang-kameng	27.33	91.48	1990	143	162.45	79.28	74.56	86.3	7	2	2	1

198	Nishi	Kameng	27.33	91.48	1990	117	156.4	76.36	82.24	80.7	7	2	2	1
199	Nocte	Tirap	29.30	91.30	1990	108	160.83	75.8	69.95	85.4	7	2	2	1
200	Sherdukpen	Kameng	27.33	91.48	1990	125	160.66	77.69	70.97	85.1	7	2	2	1
201	Singpho	Arunachal Prades	28.00	95.00	1973	50	155.03	72.2			7	2	2	1
202	Singpho	Tirap	29.30	91.30	1990	76	158.31	77.88	73.65	86.2	7	2	2	1
203	Tagin	Subansiri	29.30	91.30	1990	130	160.87	77.06	72.85	86.4	7	2	2	1
204	Tangsa	Tirap	29.30	91.30	1990	136	152.21	75.5	75.45	84.8	7	2	2	1
205	Wancho	Tirap	29.30	91.30	1990	127	159.27	77.45	72.16	84.5	7	2	2	1
206	Ahir Goala	Nadia	23.24	88.33	1952	100	164.41	77.53	65.88		1	3	4	3
207	Baidya	Calcutta	22.34	88.24	1948	43	169.17	80.9			1	3	4	3
208	Baidya	Calcutta-Howrah	22.35	88.23	1948	24	164.1	77.2			1	3	4	3
209	Baidya	Calcutta-Howrah	22.35	88.23	1952	100	166.17	79.84	70.76		1	3	4	3
210	Brahmin	24 paragan	22.11	88.14	1950	15	168.13	78.93	67.70	91.68	1	3	4	3
211	Brahman	Calcutta	22.34	88.24	1948	266	167.95	81			1	3	4	3
212	Brahman	24 paragan	22.11	88.14	1952	100	167.51	79.78	67.52	89.6	1	3	4	3
213	Kayastha	24 paragan	22.11	88.14	1935	100	167.07	80.84	68.11	89.3	1	3	4	3
214	Kayastha	Calcutta	22.34	88.24	1948	395	167.65	81.4			1	3	4	3
215	Mahishya	Midnapur	22.25	87.21	1960	17	163.41	75.77	73.07		1	3	4	3
216	Mahishya	24 paragan	22.11	88.14	1950	51	163.32	79.21	72.68	89.0	1	3	4	3
217	Tanti	24 paragan	22.11	88.14	1990	158	162.5	78.2	72.9		1	3	4	3
218	Bagdi	Nadia	23.24	88.33	1952	100	158.05	77.07	76.55		1	3	4	2
219	Muchi	Birbhum	22.54	88.28	1936	100	161.58	79.22	68.98	90.1	1	3	4	2
220	Muchi	Burdwan	23.16	87.54	1960	34	161.39	77.03	73.72		1	3	4	2
221	Muchi	Birbhum	22.54	88.28	1952	100	161.58	79.13	68.98		1	3	4	2
222	Pod	24 paragan	22.11	88.14	1935	50	162.83	77.13	71.81	89.8	1	3	4	2
223	Pod	24 paragan	22.11	88.14	1952	100	161.89	79.23	71.01		1	3	4	2
224	Rajbanshi	Jalpaiguri	26.32	88.46	1975	188	160.07	76.2	72.79	84.2	7	3	4	2
225	Rajbanshi	West Dinajpur	25.14	88.47	1975	123	160	78.6	71.51	86.5	7	3	4	2
226	Rajbanshi	Darjeeling	27.03	88.18	1946	100	160.33	75.78	72.36	85.3	7	3	4	2
227	Rajbanshi	Murshidabad	24.11	88.19	1975	103	160.7	77.7	73.61	86.1	1	3	4	2
228	Rajbanshi	Malda	25.00	87.21	1975	109	159.01	76.8	74.06	85.7	1	3	4	2
229	Lodha	Midnapur	22.25	87.21	1956	200	159.13	76.6	83.5	82.9	1	3	4	1
230	Syed	24 paragan	22.11	88.14	1990	104	161.8	77.9	69.2		1	3	4	3
231	Chinese	Calcutta	22.34	88.24	1944	50	159.3	80.5	80.7		1	3	4	3
232	Agaria	Sundargar	22.00	84.00	1970	50	164.18	73.8	79.1	84.6	1	3	4	3
233	Brahmin	Puri	19.48	85.52	1970	143	164.29	77.3	70.5	89.2	1	3	4	3
234	Brahmin-Arynyak	Sambalpur-Cuttack	21.28	84.01	1936	24	163.53	77	76.7	83.2	1	3	4	3
235	Brahmin-Matan	Orissa	21.1	85.00	1951	40	164.2	77.6	79.3		1	3	4	3

(continued)

Appendix continued.

No.	Community	Place	Lat. (N)	Long. (E)	Year	n	Mean: Stature	Mean: CI	Mean: NI	Mean: TFI	Classification: Climatic	Classification: Geographic	Classification: Linguistic	Classification: Ethnic
236	Brahmin-samavedi Arynyak	Cuttack & Puri	20.28	85.54	1951	53	166.3	77.6	77.3	84.4	1	3	4	3
237	Brahmin-Sashana	Orissa	21.1	85.00	1951	52	163.5	77.1	76.8		1	3	4	3
238	Chasa	Cuttack	20.28	85.54	1951	59	161.5	77.1	79.3		1	3	4	3
239	Dora	Koraput	17.50	81.27	1970	34	160.08	75.3	90.2	83.8	1	3	4	3
240	Dora-Nuka	Koraput	17.50	81.27	1970	103	162.09	74	83	85.6	1	3	4	3
241	Gaura	Cuttack	20.28	85.54	1970	41	162.7	77.7	76.8		1	3	4	3
242	Guria	Puri	19.48	85.52	1970	40	160.6	78.4	79.3		1	3	4	3
243	Gwala-Yadav	Cuttack	20.28	85.54	1970	50	164.13	77.1	79.3	84.4	1	3	4	3
244	Jalari	Puri	19.48	85.52	1951	50	159.13	76.3	77.9	84.2	1	3	4	3
245	Jalari	Puri	19.48	85.52	1975	65	161.82	?	77.3	79.8	1	3	4	3
246	Karan	Orissa	21.1	85.00	1962	30	165.54	76.9	77.4	85.7	1	3	4	3
247	Karan	Puri	19.48	85.52	1963	43	163.8	76.2	81.3		1	3	4	3
248	Keut	Orissa	21.1	85.00	1985	50	161.48	77.7	82.8	83.5	1	3	4	3
249	Kewat	Orissa	21.1	85.00	1949	38	161.1	77.3	78.7		1	3	4	3
250	Khandayat	Cuttack	20.28	85.54	1927	40	164.5	77.3	78.7		1	3	4	3
251	Khandayat	Cuttack	20.28	85.54	1950	30	163.28	76.8	82.5	82.1	1	3	4	3
252	Kulta	Sambalpur	21.28	84.01	1925	51	163.1	75.8	85.2	82.4	1	3	4	3
253	Khumbhar	Puri	19.48	85.52	1927	51	164.69	75.7	81.7	85.1	1	3	4	3
254	Niari	Cuttack	20.28	85.54	1967	150	161.1	76.4	80.4		1	3	4	3
255	Nulia	Puri	19.48	85.52	1940	150	161.47	75.3	75.5	85	1	3	4	3
256	Poroja Parja	Orissa	21.1	85.00	1954	52	157.59	76	85.5	84.5	1	3	4	3
257	Vadabalija of Penti	Puri	19.48	85.52	1936	208	160.3	76.7	78.7		1	3	4	3
258	Vadabalija of Vadapet	Puri	19.48	85.52	1991	200	160.82	77.1	82.6		1	3	4	3
259	Kandra	Cuttack	20.28	85.54	1936	41	162.5	78.4	79.6		1	3	4	2
260	Mehar	Orissa	21.1	85.00	1936	16	161.4	75.6	78	85.6	1	3	4	2
261	Pan	Cuttack	20.28	85.54	1989	40	160.7	77.6	82.1		1	3	4	2
262	Pana	Orissa	21.1	85.00	1933	50	159.88	78	82.2	80.8	1	3	4	2
263	Sweeper	Cuttack	20.28	85.54	1975	39	160.4	77.5	83.9	83.4	1	3	4	2
264	Bathudi	Mayurbhanj	21.56	86.46	1960	109	159.73	73.86	79.89	81.3	1	3	4	1
265	Bhatra	South Orissa	17.50	81.27	1934	52	161.28	74.7	88.2	84.9	1	3	4	1
266	Bhuiya	Mayurbhanj	21.56	86.46	1975	81	157.8	77	77	84	1	3	4	1
267	Bhuiya-Northern	Keonjhar	21.30	85.30	1991	40	158.13	73.5	90.8	84	1	3	4	1
268	Bhuiya-Pauri	Keonjhar	21.30	85.30	1954	100	157.31	73.3	87.9	86.2	1	3	4	1

269	Bhuiya-Southern	Koraput	17.50	81.27	1940	51	160.29	77.2	86.8	84.3	1	3	4	1
270	Binzhal	Orissa	21.1	85.00	1991	50	157.8	75.6	91.7	80.6	1	3	4	1
271	Gadaba	Koraput	17.50	81.27	1958	52	159.47	74.8	87.6	84.1	1	3	4	1
272	Gadaba-bado	Koraput	17.50	81.27	1968	200	159.39	72.2	80.8	84.7	1	3	1	1
273	Gadaba-Ollaro	Koraput	17.50	81.27	1956	199	160.25	73.7	77.8	85.5	1	3	1	1
274	Gadaba-Pareng	Koraput	17.50	81.27	1952	199	159.48	72.2	81	85.8	1	3	1	1
275	Gond	Keonjhar	21.30	85.30	1954	51	160.72	75.3	81.3	83.9	1	3	3	1
276	Juang	Dhenkasu Keonjhar	21.30	85.30	1933	116	157.57	75.36	90	81.3	1	3	1	1
277	Juang	Keonjhar	21.30	85.30	1940	40	153.64	75	87.5	84.2	1	3	1	1
278	Kharia	Orissa	21.1	85.00	1991	28	157.81	73.4	85.3	82.4	1	3	1	1
279	Khond	Phulbani	19.34	80.30	1954	100	159.96	73.6	77.1	86.1	1	3	3	1
280	Khond	Koraput	17.50	81.27	1935	51	156.67	74.8	83.2	83.9	1	3	3	1
281	Khond	Koraput	17.50	81.27	1954	109	158.74	76.1	78.7	85.6	1	3	3	1
282	Khond	Kalahand	19.40	83.00	1903	53	156.5	74.1	84.7	85.4	1	3	3	1
283	Koya	Orissa	21.1	85.00	1954	51	158.87	76.5	91.8	82.4	1	3	3	1
284	Munda	Orissa	21.1	85.00	1903	32	163.27	73.4	89	81.1	1	3	1	1
285	Parja Bareng	Koraput	17.50	81.27	1903	200	158.79	75.8	82.1	84.2	1	3	4	1
286	Proja Bondo	Orissa	21.1	85.00	1954	46	157.35	76.1	89.2	84.5	1	3	4	1
287	Proja Konda	Koraput	17.50	81.27	1975	199	158.21	74	81.2	83.9	1	3	4	1
288	Santhal	Mayurbhanj	21.56	86.46	1903	100	159.23	75.7	79.6	85.6	1	3	1	1
289	Saora	Ganjam	19.22	85.06	1903	100	157.28	74.5	85.2	95.3	1	3	4	1
290	Saora	Bhubaneswar	20.15	85.52	1954	110	161.81	76.2	76.6	87.8	1	3	4	1
291	Saunti	Mayurbhanj	21.56	86.46	1984	106	157.88	74.15	85.11	81.6	1	3	4	1
292	Savara	Orissa	21.1	85.00	1987	29	160.43	73.7	89.9	82.1	1	3	4	1
293	Oraon	N. Orissa	21.56	86.46	1954	39	158.79	75.8	89.1	81.9	1	3	3	1
294	Tibetan	Ganjam	19.22	85.06	1903	100	162.4	74.07	77.4	80.1	4	1	2	1
295	Brahmin-Bhuimar	S.Bihar	25.37	85.13	1954	121	167.14	75.87		89.4	1	3	4	3
296	Brahmin-Bhuimar	S.Bihar	25.37	85.13	1903	58	167.27	77	69	86.8	1	3	4	3
297	Brahmin-Bhuimar	Patna	25.37	85.13	1903	85	164.4	76.6	69		7	3	4	3
298	Brahmin-Bhuimar	Nalanda	25.00	85.00	1954	58	167.2	77.01	69.04	86.7	7	3	4	3
299	Brahmin-Dakshin	S.Bihar	25.37	85.13	1954	57	163.35	75.7	58.8	88.4	1	3	4	3
300	Brahmin-Gayawal	S.Bihar	25.37	85.13	1954	50	165.11	77.5	67.2	87.1	1	3	4	3
301	Brahmin-Krunch-DVIPI	S.Bihar	25.37	85.13	1903	26	161.35	76.4	69.6	86.4	1	3	4	3
302	Brahmin-Kanauja	S.Bihar	25.37	85.13	1984	160	168.9	76.4	67.6	86.7	1	3	4	3
303	Brahmin- Maithili	S.Bihar	25.37	85.13	1954	190	165.06	75.9	68.9	86	1	3	4	3
304	Brahmin-Pancha-Dravi	S.Bihar	25.37	85.13	1987	57	163.35	75.7	68.8	88.4	1	3	4	3
305	Brahmin-Sakadvipi	S.Bihar	25.37	85.13	1987	77	164.05	74.98		89.9	1	3	4	3
306	Chaturi-Kayastha	S.Bihar	25.37	85.13	1903	44	168.9	75			1	3	4	3

(*continued*)

Appendix continued.

No.	Community	Place	Lat. (N)	Long. (E)	Year	n	Mean: Stature	Mean: CI	Mean: NI	Mean: TFI	Classification: Climatic	Classification: Geographic	Classification: Linguistic	Classification: Ethnic
307	Kurmi	S.Bihar	25.37	85.13	1954	75	164.08	76.03	70.52	89.1	1	3	4	3
308	Dusadh	Dharbhanga	26.10	85.57	1903	194	161.3				7	3	4	2
309	Asur	Ranchi	23.23	85.23	1954	10	155.6	73.96			1	3	1	1
310	Asur	Chotanagpur	23.00	85.00	1954	30	158.64	76.68	80.24		1	3	1	1
311	Birhor	Chotanagpur	23.00	85.00	1986	16	164.75	87.13			1	3	1	1
312	HO	Singhbhum	22.12	86.04	1954	104	147.52				1	3	1	1
313	HO	Seraikella	22.42	85.58	1929	165	160	75	82.9		1	3	1	1
314	HO	Kolhan Bihar	22.12	86.04	1954	100	160.97	75.01	79.07	92.0	1	3	1	1
315	HO	Kolhan Bihar	22.12	86.04	1935	121	161.14	74.89	79.55		1	3	1	1
316	HO	Seraikella	22.42	85.58	1954	43	159.4				1	3	1	1
317	HO	Singhbhu	22.12	86.04	1954	100	160.0	75.66	89.63		1	3	1	1
318	Mal-Paharia	Santhal Paraganas	24.30	87.00	1954	60	156.31				1	3	1	1
319	Mal-Paharia	Santhal Paraganas	24.30	87.00	1968	73	155.14				1	3	4	1
320	Mal-Paharia	Raj mahal Hills	25.03	87.53	1936	54	157.36	74.54	79.10	84.94	1	3	4	1
321	Mal-Paharia	Raj mahal Hills	25.03	87.53	1968	50	155.9				1	3	4	1
322	Maler-Hill	Raj mahal Hills	25.03	87.53	1954	189	156.64	74.54	84.3	83.7	1	3	4	1
323	Maler-Plain	Raj mahal Hills	25.03	87.53	1958	54	158.18	74.65	84.62	84.6	1	3	4	1
324	Munda	Ranchi	23.23	85.23	1954	100	161.39	75.15	91.65	81.4	1	3	1	1
325	Munda	Ranchi	23.23	85.23	1954	250	158.15	74.34	83.29	84.9	1	3	1	1
326	Munda	Ranchi	23.23	85.23	1949	100	159.72	74.9	90.68	85.4	1	3	1	1
327	Oraon	Ranchi	23.23	85.23	1954	100	160.4	74.37	84.33	86.3	1	3	3	1
328	Oraon	Ranchi	23.23	85.23	1975	250	161.8	74.32	82.71	88.7	1	3	3	1
329	Oraon	Ranchi	23.23	85.23	1979	105	159.79	75.01	88.11	85.4	1	3	3	1
330	Paharia-Kumarbhag	Raj mahal Hills	25.03	87.53	1954	50	159.7				1	3	4	1
331	Paharia-sauria	Santhal Paraganas	24.30	87.00	1954	76	154				1	3	3	1
332	Paharia-sauria	Santhal Paraganas	24.30	87.00	1968	69	156.23				1	3	3	1
333	Paharia-sauria	Raj mahal Hills	25.03	87.53	1954	50	152.3				1	3	3	1
334	Pahira-	Manbhum	22.12	86.04	1968	80	152.23	75.26	85.11	81.5	1	3	4	1
335	Santhal	Santhal Paraganas	24.30	87.00	1952	168	159.6	73.85	78.46	85.8	1	3	1	1
336	Santhal	Chotanagpur	23.00	85.00	1950	100	159.3	74	80.7	85.0	1	3	1	1
337	Santhal	Dumka	24.30	87.20	1965	100	160.47	75.09	78.51	85.8	1	3	1	1
338	Santhal	Santhal Paraganas	24.30	87.00	1986	265	158.75		0		1	3	1	1
339	Santhal	Santhal Paraganas	24.30	87.00	1954	63	159.4	76.2	82.2		1	3	1	1
340	Santhal	Santhal Paraganas	24.30	87.00	1954	313	159.28				1	3	1	1
341	Santhal	Raj mahal Hills	25.03	87.53	1976	50	161				1	3	1	1

342	Barela	Dewas	22.58	78.06	1959	100	161.55	79.8	81.6	86.2	1	4	4	3
343	Brahmin	Malwa	22.06	79.35	1935	50	164.35	74.3	72.92	88.3	1	4	4	3
344	Bhil	Dhar	22.35	75.20	1935	50	162.24	74.96	80.4		1	4	4	1
345	Bhil	Dhar	22.35	75.20	1960	100	160.09	76.98	76.48	88.3	1	4	4	1
346	Gadaba	Baster	19.10	81.30	1966	52	158.04	74.27	84.37	89.0	1	4	3	1
347	Gond	Mandla	22.43	80.35	1952	49	161.8	71.8			1	4	4	1
348	Gond	Nawagaria	20.30	82.50	1941	50	158.74	75.31	81.49	87.8	1	4	3	1
349	Gond-Dorla	Konta	18.00	81.00	1960	100	160.01	76.42	88.53	80.4	1	4	3	1
350	Gond-Maria	Baster	19.10	81.30	1938	50	161.7	76.21	82.9	84.6	1	4	3	1
351	Gond-Maria	Baster	19.10	81.30	1941	50	159.48	75.96	83.62	89.9	1	4	3	1
352	Halba	Baster	19.10	81.30	1941	51	158.09	77.75	79.28	90.5	1	4	3	1
353	Korku	Melghat	21.30	76.50	1952	51	163.64				1	4	3	1
354	Korwa	Sarguja	23.50	82.10	1973	102	157.6	74.1	86.6	85	1	4	3	1
355	Maria-Hill	Baster	19.10	81.30	1938	100	162.7	76.16	81.51	85.6	1	4	3	1
356	Maria-Hill	Baster	19.10	81.30	1941	51	162.06	74.2	83.03	90.0	1	4	3	1
357	Muria	Baster	19.10	81.30	1966	52	161.7	74.31	86.06	86.1	1	4	3	1
358	Muria	Baster	19.10	81.30	1989	101	159.9	71.55	77.47	85.0	1	4	3	1
359	Muria	Narayanpur-Baster	19.10	81.30	1941	52	160.6	74.42	81.12	90.1	1	4	3	1
360	Muria-Gond	Narayanpur-Baster	19.10	81.30	1961	21	158.2	74.04			1	4	3	1
361	Muria-Kondagaon	Gondi	19.10	81.30	1941	52	157.79	73.04	85.52	89.9	1	4	3	1
362	Parja	Baster	19.10	81.30	1941	50	162.32	77.77	83.79	90.0	1	4	3	1
363	Mala	Guntur	16.18	80.29	1960	50	162.22	77.54	74.35	82.7	1	5	3	2
364	Manne	Chenaur-Talauk	19.07	79.43	1984	56	160.7				1	5	3	2
365	Manne	Chenaur-Talauk	19.07	79.43	1984	49	150.35				1	5	3	2
366	Gond-Raj	Utnoor-Asifabad	19.37	78.30	1984	54	162.8				1	5	3	1
367	Gond-Raj	Utnoor-Asifabad	19.37	78.30	1984	37	151.52				1	5	3	1
368	Kolam	Asifabad	19.37	78.30	1984	52	161.3				1	5	3	1
369	Kolam	Asifabad	19.37	78.30	1984	50	149.05				1	5	3	1
370	Koya	Chinnur-Taluk	19.07	79.43	1984	51	159.03				1	5	3	1
371	Koya	Khammam	17.15	80.11	1984	175	160.65				1	5	3	1
372	Koya	Khammam	17.15	80.11	1984	170	149.26				1	5	3	1
373	Yeruva	Coorg	26.48	82.14	1901	25	158.7	73.6	89.6		2	5	3	1
374	Nair	Cochin	9.58	76.17	1935	60	168.99	74.18	72.37		2	5	3	3
375	Nambudri	Kerala	10.00	76.25	1935	55	163.55	72.28	90.39		2	5	3	3
376	Nayar	Malabar	27.98	80.58	1901	186	165.5	76.8			2	5	3	3
377	Tiyor	Malabar	27.98	80.58	1934	63	160.9	75.6	70.4		2	5	3	3
378	Vishavan	Travancor	9.36	76.34	1939	21	155.81	74	83.81		2	5	3	3
379	Cheruman	S.Malabar	9.36	76.34	1987	101	157.21				2	5	3	2

(*continued*)

Appendix continued.

No.	Community	Place	Lat. (N)	Long. (E)	Year	n	Mean: Stature	CI	NI	TFI	Classification: Climatic	Geographic	Linguistic	Ethnic
380	Malpulayan	Travancor	9.36	76.34	1939	32	158.54	74.38	85.54		2	5	3	2
381	Nayadi	Malabar-Cochin	9.58	76.17	1937	56	159.74	73.73	85.68	82.1	2	5	3	2
382	Nayadi	Travancor	9.36	76.34	1939	16	152.96	77.59	77.22		2	5	3	2
383	Palayan-Thanta	Travancor	9.36	76.34	1939	38	152.53	74.03	77.97		2	5	3	2
384	Paria-Paraya	Malabar	27.98	80.58	1910	28	162.5	77.6	85.5	83	2	5	3	2
385	Paria-Paraya	Malabar	27.98	80.58	1905	23	163.7	67.1	78		2	5	3	2
386	Poraja	Travancor	9.36	76.34	1939	30	153.33	76.95	81.52		2	5	3	2
387	Pulayan	Travancor	9.36	76.34	1939	97	153.47	74.92	84.52		2	5	3	2
388	Irula	Kerala	10.00	76.25	1935	50	159.49	73.38	75.2	89.7	2	5	3	1
389	Kadar	Kerala	10.00	76.25	1959	42	155.75	74.23	83.19	81.7	2	5	3	1
390	Kanikkar	Cochin	9.58	76.17	1910	10	153.6				2	5	3	1
391	Kanikkar	Travancor	9.36	76.34	1939	240	153.42	74	89.91		2	5	3	1
392	Kanikkar	Travancor	9.36	76.34	1952	140	153.17	74.26	80.11	85.3	2	5	3	1
393	Kuruba Betta	Travancor	9.36	76.34	1966	33	153.7	74.5	75.4		2	5	3	1
394	Kuruba Jenu	Travancor	9.36	76.34	1966	72	156.5	75.4	77.8		2	5	3	1
395	Mala-Kuravan	Travancor	9.36	76.34	1939	120	153.62	74.33	90.86		2	5	3	1
396	Malapantra	Travancor	9.36	76.34	1939	57	154.26	75.95	81.72		2	5	3	1
397	Malapantra	Travancor	9.36	76.34	1957	37	155.5	77.08	71.96	86.2	2	5	3	1
398	Malsar	Cochin	9.58	76.17	1923	20	160.5	73.03	86.6		2	5	3	1
399	Malavetan	Travancor	9.36	76.34	1939	63	153.6	73.85	89.77		2	5	3	1
400	Malayaraya	Travancor	9.36	76.34	1939	132	157.83	73.82	85.03		2	5	3	1
401	Mannan	Travancor	9.36	76.34	1939	42	151.9	74.27	84.72		2	5	3	1
402	Mannan	Travancor	9.36	76.34	1957	46	156.56	74.8	78.48		2	5	3	1
403	Mathuvan	Travancor	9.36	76.34	1952	31	157.48	72.95	74.4		2	5	3	1
404	Mathuvan	Travancor	9.36	76.34	1940	20	163.35	76.1	79		2	5	3	1
405	Mathuvan	Travancor	9.36	76.34	1939	90	155.29	72.5	88.71		2	5	3	1
406	Paliyan	Travancor	9.36	76.34	1939	28	157.32	74.46	83.68		2	5	3	1
407	Paliyan	Travancor	9.36	76.34	1957	47	159.74	75.36	74.35	86.3	2	5	3	1
408	Paniyan	Malabar	10.46	76.42	1955	100	154.7	73.4	87.9		2	5	3	1
409	Paniyan	Wynaad	11.45	76.00	1960	15	152.8				2	5	3	1
410	Panyar-Paniyan	Wynaad	11.45	76.00	1933	101	156.5	73.7	84.5		2	5	3	1
411	Ulladin	Travancor	9.36	76.34	1939	88	153.68	74.1	89.11		2	5	3	1
412	Urali	Travancor	9.36	76.34	1939	121	155.69	73.05	86.75		2	5	3	1
413	Urali	Travancor	9.36	76.34	1956	125	154.45	72.09	76.23	110.9	2	5	3	1

414	Muslim	CW Deccan	10.30	76.15	1903	6	175.5	77.5			2	5	3	4
415	Badaga	Nilgiri hills	11.28	76.47	1910	28	163.9	72	80	87	2	5	3	3
416	Kallan	Madurai	9.58	78.10	1981	81	164.6	80.66	83.27	82.1	4	5	3	3
417	Kallan	Tanjavur	10.47	79.10	1981	100	164.8	75.72	71.97	79.2	3	5	3	3
418	Vellalapillai	Tuticorine	8.47	78.11	1923	6	164.33	7.94	67.92		2	5	3	3
419	Vellalan	Tanjavur	10.47	79.10	1981	75	163.5	77.24	75.31	81.7	2	5	3	3
420	Vellalan	Madurai	9.58	78.10	1981	43	160.9	81.6	80.05	82.3	4	5	3	3
421	Irula	Nilgiri Hills	11.28	76.47	1981	99	161.17				2	5	3	1
422	Kota	Nilgiri Hills	11.28	76.47	1968	100	161.3				2	5	3	1
423	Malser	Coimbator	11.00	77.00	1910	27	162.1				2	5	3	1
424	Paleyan	Madurai	9.58	78.10	1923	8	157.8				4	5	3	1
425	Pallar	Tinnevelly	8.44	77.44	1933	52	162.04	76.02	82.02		2	5	3	1
426	Toda	Nilgiri Hills	11.28	76.47	1910	22	169.0				2	5	3	1
427	Toda	Nilgiri Hills	11.28	76.47	1921	115	168.3	73.25	76		2	5	3	1
428	Brahman	Pondichery	11.56	79.53	1961	267	163.47	76.39	70.82	90.7	3	5	3	3
429	Mocovah	Pondichery	11.56	79.53	1961	197	162.46	72.44	81.21	89.0	3	5	3	3
430	Shanar	Pondichery	11.56	79.53	1961	73	159.95	75.52	74.85	86.9	3	5	3	3
431	Vannia	Pondichery	11.56	79.53	1961	104	164.11				3	5	3	3
432	Vellaja	Pondichery	11.56	79.53	1961	12	163.53				3	5	3	3
433	Vellaja	Pondichery	11.56	79.53	1961	60	165.4	79.45	73.7	87.0	3	5	3	3
434	Harijan	Pondichery	11.56	79.53	1961	26	161.68				3	5	3	2
435	Harijan	Pondichery	11.56	79.53	1961	19	161.49	75.01	80.25	87.6	3	5	3	2
436	Musalman	Pondichery	11.56	79.53	1961	121	163.59	80.87	72	89.3	3	5	3	3
437	Brahman-Nagar	Ahmadabad	23.03	72.40	1907	100	164.3				1	6	4	3
438	Kumbhar	Kathiawar	22.00	71.00	1937	53	162.25	78.89	72.89		1	6	4	3
439	Luhana-Ghogasi	Kathiawar	22.00	71.00	1937	51	162.43	80.0	76.4		1	6	4	3
440	Rajput	Kathiawar	22.00	71.00	1937	113	164.38	80.63	72.3		1	6	4	3
441	Satwara	Kathiawar	22.00	71.00	1937	53	162.68	79.49	77.52		1	6	4	3
442	Moochi	Kathiawar	22.00	71.00	1937	54	160.35	79.83	74.2		1	6	4	2
443	Bharwad	Kathiawar	22.00	71.00	1937	117	165.2	79.05	71.4		1	6	4	1
444	Bhil	Kathiawar	22.00	71.00	1942	32		74.9	76.4		1	6	4	1
445	Koli-Talbda	Kathiawar	22.00	71.00	1937	124	160.02	78.48	75.68		1	6	4	1
446	Kunbi Kadw	Kathiawar	22.00	71.00	1937	117	161.84	81.49	73.85		1	6	4	1
447	Kunbi-Leva	Kathiawar	22.00	71.00	1937	101	162.15	81.21	76.21		1	6	4	1
448	Padar	Ranagarh			1984	102	162.5	76.39	80.8	84.2	1	6	4	1
449	Parsi	Surat	21.15	72.52	1990	233	166.5	83.45	63.29	83	1	6	4	1
450	Brahmin-Desastha	Poona	18.31	73.55	1909	24	163.4				1	6	4	3
451	Brahmin-Desastha	Poona	18.31	73.55	1907	100	164.2				1	6	4	3
452	Brahmin-Madhyandina	Amravati	20.56	77.48	1951	72	163.33	76.48	79.7	84.0	1	6	4	3

(continued)

Appendix continued.

No.	Community	Place	Lat. (N)	Long. (E)	Year	n	Mean: Stature	Mean: CI	Mean: NI	Mean: TFI	Classification: Climatic	Classification: Geographic	Classification: Linguistic	Classification: Ethnic
453	Brahmin-Madhyandina	Aurangabad	19.53	75.23	1951	73	162.88	79.25	73.23	82.1	4	6	4	3
454	Brahmin-Madhyandina	Jalgaon	21.05	75.40	1951	75	163.57	77.2	76.36	82.6	1	6	4	3
455	Brahmin-Madhyandina	Barsi	18.13	75.44	1951	62	163.11	79.69	76.48	82.1	4	6	4	3
456	Brahmin-Madhyandina	Jalna	19.51	75.56	1951	29	164.98	80.19	71.8	82.5	4	6	4	3
457	Brahmin-Madhyandina	Nagpur	21.09	79.09	1951	57	163.6	77.15	78.54	82.5	1	6	4	3
458	Brahmin-Madhyandina	Nasik	20.02	73.50	1951	123	161.7	77.61	76.3	82.3	1	6	4	3
459	Brahmin-Madhyandina	Parbhani	19.08	76.50	1951	74	162.2	77.47	75.17	83.5	1	6	4	3
460	Brahmin-Madhyandina	Vidarbha-Nagpur	21.09	79.09	1951	72	163.3	76.48	79.7	84.0	1	6	4	3
461	Brahmin-Madhyandina	Jalna	19.51	75.56	1951	29	164.9	80.19	91.8	82.5	4	6	4	3
462	Brahmin-Madhyandina	Parbhani	19.08	76.50	1951	74	162.2	77.47	75.17	83.5	1	6	4	3
463	Brahmin-Madhyandina	Barsi	18.13	75.44	1951	62	163.1	79.69	76.48	82.1	4	6	4	3
464	CKP	Konkan	18.55	72.54	1951	30	165.19	78.83	74.51	84.2	2	6	4	3
465	CKP	Bombay	18.55	72.54	1907	100	162.7	79.9	75.8		1	6	4	3
466	Ghati-Maratha	Poona	18.31	73.55	1951	100	163.2	78.3	79.9		1	6	4	3
467	Jain-Pancham	Kolhapur	16.42	74.16	1907	30	162.8	76.9	51.4		2	6	4	3
468	Kasar-Tambet	Poona	18.31	73.55	1907	59	161.3	77.4	80.5		1	6	4	3
469	Kasar-Tambat	Poona	18.31	73.55	1907	59	161.3	77.4	80.5		1	6	4	3
470	Maheshwari	Nagpur	21.09	79.09	1985	86	167.86				1	6	4	3
471	Maheshwari	Poona	18.31	73.55	1985	101	165.65				1	6	4	3
472	Marathi	Poona	18.31	73.55	1931	59	151.17	76.88	68.61	85.5	1	6	4	3
473	Maratha	Ahmednagar	19.05	74.48	1951	108	163.07	79.18	76.35	82.5	1	6	4	3
474	Maratha	East-Khandesh	21.54	74.27	1951	113	162.67	78.31	72.68	85.3	1	6	4	3
475	Maratha	Konkan	18.55	72.54	1951	110	165.3	76.53	78.53	86.1	2	6	4	3
476	Maratha	Poona	18.31	73.55	1951	47	165.48	78.08	72.02	84.0	1	6	4	3
477	Maratha	East-Khandesh	21.54	74.27	1951	76	163.84	76.57	74.82	86.2	1	6	4	3
478	Maratha	Konkan	18.55	72.54	1951	63	164.62	75.2	77.77	85.9	2	6	4	3
479	Maratha	Poona	18.31	73.55	1951	80	163.4	79.95	75.65	82.0	1	6	4	3
480	Maratha	Ahmednagar	19.05	74.48	1951	96	163.89	80.15	75.44	82.7	1	6	4	3
481	Maratha	Konkan	18.55	72.54	1951	62	164.75	76	78.79	83.8	2	6	4	3
482	Maratha	Poona	18.31	73.55	1951	55	164.64	80.71	74.81	82.4	1	6	4	3
483	Maratha	East-Kolhapur	16.42	74.16	1951	110	163.97	78.41	74.63	84.9	2	6	4	3

484	Maratha	West-Khandesh	21.54	74.27	1951	121	162.26	79.47	71.69	84.6	1	6	4	3
485	Maratha	Miraj & Sangli	16.52	74.36	1951	143	165.12	79.27	75.11	82.6	1	6	4	3
486	Maratha	Kolhapur	16.42	74.16	1951	64	163.37	76.8	72.06	83.6	2	6	4	3
487	Maratha	West-Satara	17.42	74.02	1951	159	164.04	78.38	74.79	83.9	1	6	4	3
488	Maratha	E-Satara	17.42	74.02	1951	106	164.27	78.9	75.98	83.1	1	6	4	3
489	Maratha	Poona	18.31	73.55	1951	100	163.2	78.3	79.9		1	6	4	3
490	Maratha-High Caste	Kolhapur	16.42	74.16	1907	100	168.1	76.3	71.1	120.6	2	6	4	1
491	Maratha-Lohar	Kolhapur	16.42	74.16	1907	15	159.9	76.4	75.2	120.5	2	6	4	3
492	Namdev-Shimpi	Poona	18.31	73.55	1907	100	162.8	78.1	80		1	6	4	3
493	Prabhu-Pathare	Konkan	18.55	72.54	1951	33	164.28	81.01	71.7	85.1	2	6	4	3
494	Sonar-Ahir	Khandesh	21.54	74.27	1951	41	162.7	77.48	78.95	82.7	1	6	4	3
495	Sonar-Daivadnya	Konkan	18.55	72.54	1951	28	161.23	79.87	76.23	83.2	2	6	4	3
496	Sonkoli	Bombay	18.55	72.54	1907	100	160.1	77.5	76.4		1	6	4	3
497	Sonkoli	Konkan	18.55	72.54	1951	45	160.62	79.61	79.81	83.1	2	6	4	3
498	Thakur	Konkan	18.55	72.54	1951	29	158.66	78.36	82.86	82.0	2	6	4	3
499	Vaidu	Poona	18.31	73.55	1907	12	160.2	78.9	78.2		1	6	4	3
500	Vaisha-Wani	Konkan	18.55	72.54	1951	25	161.95	77.56	74.18	86.4	2	6	4	3
501	Vanjari-Dakhni	Khandesh	21.54	74.27	1907	20	166.8	78.7	79.4		1	6	4	3
502	Mahar	Nagpur-Kampee	21.09	79.09	1961	150	160.69	76.74	77.97	81.4	1	6	4	2
503	Bhil	Panchagani	18.00	74.50	1949	186	162.92	75.62	77.54		2	6	4	1
504	Gond-Mokasi	Nagpur	21.09	79.09	1985	49	162.9	76.55	76.47		1	6	3	1
505	Gond-Raj	Nagpur	21.09	79.09	1985	45	160.81	76.79	73.48		1	6	3	1
506	Korku	Amrawati	20.56	77.48	1970	51	162.0	77.44	83.64	85.6	1	6	3	1
507	Maria-Gond	Chandra	19.57	79.21	1981	54	160.7				2	6	3	1
508	Warli	Konkan	18.55	72.54	1951	31	161.01	76.7	84.76	84.9	2	6	4	1
509	Parsi	Bombay	18.55	72.54	1990	92	168.8	80.21	64.48	87.1	1	6	4	4
510	Parsi	Nagpur	21.09	79.09	1990	50	167.2	82.3	62.68	85.4	1	6	4	4
511	Bene-Israel	Bombay	18.55	72.54	1907	60	166.3	76.6	72.7		1	6	4	4
512	Kharia	Andaman	12.00	92.40	1990	68	160.84				6	7	1	3
513	Munda	Andaman	12.00	92.40	1990	56	160.97				6	7	1	3
514	Oraon	Andaman	12.00	92.40	1990	207	161.66				6	7	1	3
515	Andamanes	Andaman	12.00	92.40	1954	8	151.5	81.18			6	7	Not known	1

(continued)

Appendix continued.

No.	Community	Place	Lat. (N)	Long. (E)	Year	*n*	Mean: Stature	Mean: CI	Mean: NI	Mean: TFI	Classification: Climatic	Classification: Geographic	Classification: Linguistic	Classification: Ethnic
516	Andamanes	Andaman Island	12.00	92.40	1921	115	148.5				6	7	Not known	1
517	Andamanes	Andaman Island	12.00	92.40	1921	42	149.3	82.9			6	7	Not known	1
518	Andamanes North	Andaman Island	12.00	92.40	1893	50	148.56	82	93.01		6	7	Not known	1
519	Andamanes South	Port-Blair	12.00	92.40	1893	50	148.17	83.07	88.6		6	7	Not known	1
520	Car Nicobarese	Nicobar	12.00	92.40	1976	175	158.6	74.33	81.02	88.9	6	7	1	1
521	Jarawa	Middle Andaman	12.00	92.40	1989	19	152.69		80.95		6	7	1	1
522	Jarawa	Middle Andaman	12.00	92.40	1985	16	155.03	83.74			6	7	1	1
523	Nicoberese	Chowra Island	12.00	92.40	1976	111	156.7	76.71	78.24	85.7	6	7	1	1
524	Nicoberese	Teresa Island	12.00	92.40	1976	77	159.1	79.51	73.47	85.7	6	7	1	1
525	Nicoberese	Nicobar Island	12.00	92.40	1935	121	158.92	76.76	83.87	82.0	6	7	1	1
526	Nicoberese	Nicobar Island	12.00	92.40	1966	28	159.12	75.27	78.64	86.3	6	7	1	1
527	Onge	Little Island	12.00	92.40	1934	42	148.1	83.5	73.4		6	7	1	1
528	Onge	Andaman Island	12.00	92.40	1954	14	148.28	82.09	83.64	83.5	6	7	1	1
529	Onge	Andaman Island	12.00	92.40	1955	27	147.78				6	7	1	1
530	Shompen	Great Nicobar	12.00	92.40	1986	11	156.44	79.56	80.99		6	7	1	1
531	Southern Nicoberese	Southern Nicober	12.00	92.40	1976	66	161.04	86.11	69.58	87.6	6	7	1	1

Codes for different classifications: *Climatic*: 1, tropical savannah; 2, monsoon (short dry season); 3, monsoon (dry season in high Sun); 4, semi-arid steppe; 5, hot desert; 6, monsoon (dry winters); 7, cold humid winter; 8, Polar. *Geographical zones*: 1, north; 2, north-east; 3, east; 4, central; 5, south; 6, west; 7, island. *Linguistic*: 1, Austro-Asiatic; 2, Tibeto-Chinese; 3, Dravidian; 4, Aryan. *Ethnic*: 1, scheduled tribe; 2, scheduled caste; 3, general caste; 4, other than caste and tribe.

Résumé. *Arrière plan:* La variation anthropométrique peut être utilisée avec bénéfice pour l'analyse de processus microévolutifs. Les variations anthropométriques du sous-continent indien, fondées sur la stature et trois indices (indice céphalique, indice nasal et indice facial total), sont extrêmement prononcées et discriminent les populations selon les régions géographiques.
But: Les variations anthropométriques de la stature, des indices céphalique (IC), nasal (IN) et facial total (IFT) sont étudiées dans l'ensemble du sous-continent indien, en relation avec les affiliations ethniques, linguistiques et religieuses.
Sujets et méthodes: Les données publiées sur 531 populations indiennes, ont été soumises à l'analyse discriminante et à une analyse d'autocorrélation spatiale.
Résultats: L'analyse discriminante de quatre variables anthropométriques indique que la stature et l'IN sont de bons discriminateurs de populations de langues différentes. La stature, l'IN et l'IC discriminent bien les populations d'origines ethniques distinctes ainsi que les conditions climatiques des différentes régions. L'IFT n'est pas un bon discriminant de populations d'attributs ethniques, linguistiques et climatiques variés. L'autocorrélation spatiale indique des écarts significatifs à une distribution au hasard qui suggèrent une structure géographique. L'estimation I de Moran est positive et statistiquement significative pour les quatre variables et pour de faibles distances, mais présente des associations significatives négatives pour des distances plus élevées.
Conclusion: Les résultats suggèrent l'existence de gradients géographiques pour les quatre variables anthropométriques et indiquent l'influence de la structure de la population sur les variables étudiées.

Zusammenfassung. *Hintergrund:* Anthropometrische Variation kann fruchtbringend verwendet werden, um mikroevolutionäre Prozesse zu untersuchen. Anthropometrische Variationen auf dem Indischen Subkontinent, die auf Körperhöhe und drei Indizes basieren (auf cephalischem Index, nasalem Index und totalem Gesichtsindex), sind sehr variabel und unterscheiden zwischen Völkern verschiedener geographischer Regionen.
Ziel: Es wurde die anthropometrische Variation von Körperhöhe, cephalischem Index (CI), nasalem Index (NI) und totalem Gesichtsindex (Total Facial Index, TFI) hinsichtlich ethnischer, linguistischer, geographischer und klimatischer Aspekte auf dem Indischen Subkontinent untersucht.
Probanden und Methoden: Veröffentlichte Daten betreffend anthropometrische Variationen von 531 Populationen des Indischen Subkontinents wurden mit Diskriminantenanalyse und räumlicher Autokorrelationsanalyse untersucht.
Ergebnisse: Die Diskriminantenanalyse der vier anthropometrischen Variablen zeigt, dass Körperhöhe und NI gute Unterscheidungskriterien für Populationen mit unterschiedlichen Sprachen sind. Körperhöhe, NI und CI unterscheiden gut zwischen Populationen unterschiedlicher ethnischer Herkunft unterschiedlicher klimatischer Bedingungen aus verschiedenen Regionen. TFI ist kein gutes Unterscheidungskriterium für Populationen unterschiedlicher ethnischer, linguistischer und klimatischer Herkunft. Räumliche Autokorrelationsanalysen zeigten eine signifikante Abweichung von Zufallsmustern, was auf besondere geographische Strukturierung hinweist. Die Moran's I Schätzung ist positiv und auf kleine Entfernung für die vier Variablen statistisch signifikant, aber zeigt bei größeren Werten eine signifikante negative Beziehung.
Zusammenfassung: Die Ergebnisse legen geographische Abhängigkeiten für die vier Variablen nahe und zeigen den Einfluss der Bevölkerungsstruktur auf die untersuchten Variablen.

Resumen. *Antecedentes:* La variación antropométrica puede utilizarse provechosamente para investigar sobre procesos microevolutivos. En el subcontinente Indio, las variaciones antropométricas de la estatura y tres índices (índice cefálico, índice nasal e índice facial total) son altamente variables y discriminantes entre poblaciones a través de diferentes regiones geográficas.
Objetivos: Se investigó la variación antropométrica de la estatura, el índice cefálico (IC), el índice nasal (IN) y el índice facial total (IFT) respecto a la filiación étnica, lingüística, geográfica y climática, a través del subcontinente Indio.
Sujetos y Métodos: Se analizaron los datos publicados sobre las variaciones antropométricas de 531 poblaciones del subcontinente Indio, utilizando un análisis discriminante y un análisis de autocorrelación espacial.
Resultados: El análisis discriminante de las cuatro variables antropométricas muestra que la estatura y el IN son buenos discriminantes para las poblaciones de lenguas diferentes. La estatura, el IN y el IC discriminan bien entre poblaciones de distinto origen étnico y condiciones climáticas diversas, en diferentes regiones. El IFT no es un buen discriminante entre poblaciones con atributos étnicos, lingüísticos y climáticos diversos. El análisis de autocorrelación espacial mostró una separación significativa del azar, lo que sugiere una estructuración geográfica. La estimación del índice I de Moran es positiva y estadísticamente significativa en las cuatro variables a cortas distancias, pero muestra una asociación negativa y significativa a valores más altos.
Conclusión: Los resultados sugieren la existencia de clinas geográficas para las cuatro variables antropométricas e indican la influencia de la estructura poblacional sobre las variables estudiadas.