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Human Development Index Calculations for Social Groups in India with Extensions to Include Living Conditions and Social Networks

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Foreword

The Indian Institute of Dalit Studies (IIDS) is among the pioneer research organizations in India to focus exclusively on development concerns of marginalized groups and socially excluded communities. During the last 12 years, IIDS has carried out several studies on different aspects of social exclusion and discrimination of the historically marginalized social groups, such as Scheduled Castes, Scheduled Tribes and Religious Minorities in India and other parts of the sub-continent. The Working Paper Series disseminates empirical findings of on-going research and conceptual development on issues pertaining to the forms and nature of social exclusion and discrimination. Some of our papers also critically examine inclusive policies for marginalized social groups.

The working paper 'Human Development Index Calculations for Social Groups in India with Extensions to Include Living Conditions and Social Networks' attempts to construct a human development index for India by taking account of difference in achievement in each of the components of HDI between five social groups in India- Brahmins and high castes, scheduled caste, scheduled tribes, Muslims and other backward classes. Two additional components of human development i.e. living conditions and social networks have also been incorporated in the paper. The findings of the paper reveal that inter-group inequality is high in three indicators: education, life expectancy and income. Social networks further modify these three indicators. The paper also provides a theoretical base to the concept of human development index.

We hope this working paper will be helpful to academicians, students, activists, civil society organisations and policymakers.

Nidhi S. Sabharwal
Director

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Abstract

The term "human development" is widely used by the media, politicians, NGOs, and governments all over the world to mean the capacity of people to fulfil their potential in all the variety of domains in which they function– health, education, and income. This concept of development – based on an expansion of capabilities to function in life, in all its variety and richness–is arguably a more productive and more expressive view than that of economic growth based solely on economic expansion. However, a neglected area in the study of human development has been differences in human development between social groups in a country. In this paper we construct a HDI for India taking account of:

1. Differences in achievement in each of the components of the HDI between five social groups in India – Brahmins and High Castes (B&HC), Scheduled Castes (SC), Scheduled Tribes (ST); Muslims; Other Backward Classes (OBC).
2. Two additional components of human development – living conditions and social networks.

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1. Introduction

The term "human development" is widely used by the media, politicians, NGOs, and governments all over the world to mean the capacity of people to fulfil their potential in all the variety of domains in which they function – health, education, and income. This concept of development – based on an expansion of capabilities to function in life, in all its variety and richness – is arguably a more productive and more expressive view than that of economic growth based solely on economic expansion. This is a concept which owes much to the work of, among others, Anand and Sen (1994, 1997), Haq (1994), and Sen (1992). The computation of the Human Development Index (HDI), and the ranking of countries on the basis of their HDI values, has become are a regular feature of public debate since the HDI was first published by the United Nations Development Programme (UNDP, 1995). Another regular feature of HDI is its calculation on a national (and indeed, sub-national basis), in which different regions of a country are ranked on the basis of their human development. (for examples Shariff, 1999).

However, a neglected area in the study of human development has been differences in human development between social groups in a country. The theory of the measurement of human development in the presence of inter-group differences in achievement has been set out in Anand and Sen (2003). In this paper we construct an HDI for India taking account of:

1. Differences in achievement in each of the components of the HDI between five social groups in India – Brahmins and High Castes (B&HC), Scheduled Castes (SC), Scheduled Tribes (ST); Muslims; Other Backward Classes (OBC).
2. Two additional components of human development – living conditions and social networks.

2. Equity Sensitive Indicators of Living Standards

Suppose that $\overline{X}$ is a measure of the average "living standard" in a country. If there are K, mutually exclusive and collectively exhaustive groups, (indexed, $k=1...K$), suppose $\overline{X}_k$ measures the average living standard of persons in group k. Furthermore, if there are N_k persons in each group, then suppose $\overline{X}_{ik}$ is the standard of living of person i in group k ($i=1...N_k$).

We know that the average living standard of a country is not achieved by all its groups. Similarly, the average living standard of a group is not achieved by all its members. In other words, there is inequality in the distribution of living standards between groups and between individuals within groups. Therefore, in assessing the standard of living achievement of a country or of a group, by how much should we reduce its average living standard to take account of inequality in living standards?

The answer to this question depends on how *averse we are to inequality*. In his seminal paper on income inequality, Atkinson (1970) argued that we (society) would be prepared to accept a reduction in average income, provided *the lower income was equally distributed*, from a higher average income which was unequally distributed[1]. The size of this reduction depended upon our degree of "inequality aversion" which Atkinson (1970) measured by the value of a (inequality aversion) parameter, $\varepsilon \geq 0$. When $\varepsilon = 0$, we are *not at all* averse to inequality implying that we would not be prepared to accept even the smallest reduction in average income in order to secure an equitable distribution. The degree of inequality aversion increased with the value of ε: the higher the value of ε, the more averse we would be to inequality and, in order to secure an equitable distribution of income, the greater the reduction in average income we would find acceptable.

These ideas can, equally well, be applied to the measurement of living standards. Suppose that there are *N* households in a country – with measured living standards, $X_1, X_2, ..., X_N$ – which can be separated into *K* mutually exclusive social groups ($k = 1...K$) with N_k households ($i = 1...N_k$) in each group, each household with a living standard, $X_{ik}, i = 1...N_k, k = 1...K$. We can reduce the average living standard, $\overline{X} = \sum_{i=1}^{N} X_i$, of a country by the amount of *inter-group* inequality in living standards to arrive at X^e, a "group-equity sensitive" living standard for the country, $X^e \leq \overline{X}$. Similarly, we can reduce the average living standard, $\overline{X}_k$, of a group by the amount of *intra-group* inequality in living standards to arrive at X_k^e, a "person-equity sensitive" living standard for the group, $X_k^e \leq \overline{X}_k$. We refer to X^e and X_k^e as *equally distributed equivalent living standards*: X^e, when it is the living standard of each of the groups (equally distributed between the groups), is *welfare equivalent* to $\overline{X}$; and X_k^e, when it is the living standard of every member

of group *k* (equally distributed between individuals in a group), is *welfare equivalent* to $\bar{X}_k$.

The size of these reductions (as given by the differences: $\bar{X} - X^e$ and $\bar{X}_k - X_k^e$) depends upon our aversion to inequality: the lower our aversion to inequality, the smaller will be the difference; in the extreme case in which there is no aversion to inequality, there will be no difference between the average, and the equity sensitive, living standards.

More formally, social welfare, *W*, is defined as the sum of the concave group utility functions $F(\bar{X}_k)$ so that:

$$W = \sum_{k=1}^{K} N_k F(\bar{X}_k) \qquad (1)$$

The change in welfare following a change in the $\bar{X}_k$ is:

$$\Delta W = \sum_{k=1}^{K} a_k N_k \Delta X_k \qquad (2)$$

Where: $a_k = \frac{\partial F(\bar{X}_k)}{\partial \bar{X}_k} > 0,$ is the marginal change in social welfare consequent upon changes in group living standards (ΔX_k) and also termed the "welfare weight" associated with group *k*. Since it is assumed that the functions *F(.)* are strictly concave, marginal gain decreases with increasing living standards: consequently, social welfare is maximised when living standards equal across groups ($\bar{X}_1 = \bar{X}_2 = ... = \bar{X}_K$)

The social welfare function, *W*, in equation (1) has *constant elasticity* if, for ε>0, *F(.)* can be written as:

$$F(\bar{X}_k) = \frac{\bar{X}_k^{1-\varepsilon} - 1}{1-\varepsilon},\ \varepsilon \neq 1,\ \varepsilon > 0;\ F(\bar{X}_k) = \alpha + \beta \log(\bar{X}_k),\ \varepsilon = 1 \qquad (3)$$

since then: $a_k = \frac{\partial F(\bar{X}_k)}{\partial \bar{X}_k} = (\bar{X}_k)^{1-\varepsilon} \Rightarrow \frac{\partial a_k}{\partial \bar{X}_k} \frac{\bar{X}_k}{a_k} = -\varepsilon \bar{X}^{-(1+\varepsilon)} \frac{\bar{X}_k}{\bar{X}_k^{-\varepsilon}} = -\varepsilon$.

Consequently, the *percentage change* in the welfare weight associated with a group, a_k, following an increase in its living standard, $\bar{X}_k$ is *constant* and *negative*. The greater the value of the parameter $\varepsilon > 0$, the greater the fall in the welfare weight.

Similarly, the social welfare of a group $W_k, k = 1...K$ is defined as the sum of the concave utility functions of the group's members, $F(\bar{X})$ so that:

$$W_k = \sum_{i=1}^{N_k} F(X_{ik}) \tag{4}$$

Implying: $\Delta W_k = \sum_{i=1}^{N_K} a_{ik} \Delta X_{ik}$ where the welfare weights, a_{ik} are defined as: $a_{ik} = \frac{\partial F(X_{ik})}{\partial X_{ik}} > 0$.

The social welfare function, W_k, in equation (4) has *constant elasticity* if, for

ε>0, $F(.)$ can be written as: $F(X_{ik}) = \frac{X_k^{1-\varepsilon} - 1}{1-\varepsilon}, \varepsilon \neq 1, \varepsilon > 0;$

$$F(X_{ik}) = \alpha + \beta \log(X_k), \tag{5}$$

$$F(X_{ik}) = \frac{X_{ik}^{1-\varepsilon} - 1}{1-\varepsilon},\ \varepsilon \neq 1,\ \varepsilon > 0;\ F(X_{ik}) = \alpha + \beta \log(X_{ik}),\ \varepsilon = 1 \tag{5}$$

Since X^e is welfare equivalent to $\bar{X}$ and since X_k^e is welfare equivalent to $\bar{X}_k^e$ we have Atkinson's inequality index, I, derived as[2]:

$$I = 1 - \left(\frac{X^e}{\bar{X}}\right) = 1 - \left[\sum_{k=1}^{K} n_k \left(\frac{\bar{X}_k}{\bar{X}}\right)^{1-\varepsilon}\right]^{1/1-\varepsilon} \text{ and } I_k = 1 - \left(\frac{X_k^e}{\bar{X}_k}\right) = 1 - \left[\frac{1}{N_k}\sum_{i=1}^{N_k}\left(\frac{X_{ik}}{\bar{X}_k}\right)^{1-\varepsilon}\right]^{1/1-\varepsilon} \tag{6}$$

where, in equation (3), I represents the overall index and I_k represents the inequality index for group k.

From equation (3):

$$(X^e)^{1-\varepsilon} = \sum_{k=1}^{N_k} n_k (\bar{X}_k)^{1-\varepsilon} \text{ and } (X_k^e)^{1-\varepsilon} = \sum_{i=1}^{N_k} \frac{1}{N_k} X_{ik}^{1-\varepsilon} \tag{7}$$

From equation (7):

$$(X^e)^{1-\varepsilon} = \sum_{i=1}^{N} \frac{1}{N}(X_{ik})^{1-\varepsilon} = \frac{N_1}{N}\sum_{i=1}^{N_1}\frac{1}{N_1}(X_{i1})^{1-\varepsilon} + \frac{N_2}{N}\sum_{i=1}^{N_2}\frac{1}{N_2}(X_{i2})^{1-\varepsilon} + .. + \frac{N_K}{N}\sum_{i=1}^{N_K}\frac{1}{N_K}(X_{iK})^{1-\varepsilon} \tag{8}$$
$$= n_1 (X_1^e)^{1-\varepsilon} + n_2 (X_2^e)^{1-\varepsilon} + ... + n_K (X_K^e)^{1-\varepsilon} = \sum_{k=1}^{K} n_k (X_k^e)^{1-\varepsilon}$$

Equation (8) represents what Anand and Sen (1995) refer to as "(1-ε) averaging)": the overall equally distributed equivalent living standard, X^e is a weighted average, with exponent $1-\varepsilon$, of the group equally distributed equivalent living standards, X_k^e $(k=1...K)$.

A special case occurs when (no inequality aversion). In that situation, X^e and X_k^e are the *arithmetic means* of, respectively, the group living standards and of the living standards of persons in group *k*: $X^e = \bar{X}$ and $X_k^e = \bar{X}_k$. When $\varepsilon > 0$ (there is positive inequality aversion), $X^e < \bar{X}$ and $X_k^e < \bar{X}_k$.

The Welfare Effects of Redistribution

To examine the welfare effects of an inter-group redistribution of living standards, consider two social groups – Upper Caste Hindus *(k=C)* and Dalits *(k=D)* and suppose that, within the context of a fixed overall living standard $\bar{X}$, there is a redistribution of living standards (say, income) from upper caste Hindus towards Dalits. Then this implies that

$$\Delta\bar{X} = n_C\Delta\bar{X}_C + n_D\Delta\bar{X}_D = 0 \Rightarrow -\Delta\bar{X}_C = (n_C / n_D)\bar{X}_D = \theta\Delta\bar{X}_D,\ where: \Delta\bar{X}_C < 0, \Delta\bar{X}_D > 0 \quad (9)$$

The change in social welfare that results from this redistribution is:

$$\Delta W = \frac{\partial F(\bar{X}_C)}{\partial\bar{X}_C} N_C\Delta\bar{X}_C + \frac{\partial F(\bar{X}_D)}{\partial\bar{X}_D} N_D\Delta\bar{X}_D = a_C N_C\Delta\bar{X}_C + a_D N_D\Delta\bar{X}_D \qquad (10)$$

$$= \bar{X}_C^{-\varepsilon} N_C\Delta\bar{X}_C + \bar{X}_L^{-\varepsilon} N_L\Delta\bar{X}_L$$

Setting $\Delta W = 0$ in equation (9) yields:

$$\left(\frac{\bar{X}_C}{\bar{X}_D}\right)^{-\varepsilon}\left(\frac{N_C}{N_D}\right)\Delta\bar{X}_C = \Delta\bar{X}_D \Rightarrow \Delta\bar{X}_C = \lambda^{\varepsilon}\theta\Delta\bar{X}_D \qquad (11)$$

where: $\lambda = \frac{\bar{X}_C}{\bar{X}_D} > 1$ and $\theta = \frac{N_D}{N_C}$.

Suppose that through appropriate redistribution policies, the living standard (income) of Dalits is *increased* by one unit. From equation (8), in order to keep the *overall* living standard, $\bar{X}$, unchanged, the living standard (income) of upper-caste Hindus must fall by $\Delta\bar{X}_C = \theta$. From equation (10), if $\varepsilon = 0$,

then the condition $\Delta\bar{X}_C = \theta \Rightarrow \Delta W = 0$ or that welfare will remain unchanged: a greater fall in the living standard of upper caste Hindus would lower the overall living standard $\bar{X}$ and also overall welfare, *W*.

However, if $\varepsilon > 0$ the living standard of upper-caste Hindus can fall by more than θ ($\Delta\bar{X}_C = \lambda^{\varepsilon}\theta > \theta$) – the amount required to keep $\bar{X}$ unchanged - *and still keep welfare unchanged*. In other words, for $\varepsilon > 0$, society would be prepared to *tolerate a fall in the overall living standard* ($\Delta\bar{X} < 0$)in order to redistribute from upper-caste Hindus to Dalits , *leaving overall welfare unchanged*. The greater the value of ε, the greater will be this tolerance.

3. Equity Sensitive Attainment Indicators by Social Groups in India

The HDI has been formulated in terms of a country's shortfall in respect of three dimensions: life expectancy, education, and income. Thus, the attainment indicators are defined, in respect of each of the dimensions, as:

$$A_{ik} = \frac{X_{ik} - \underset{k}{Min}\{X_{ik}\}}{\underset{k}{Max}\{X_{ik}\} - \underset{k}{Min}\{X_{ik}\}} \times 100 \qquad (12)$$

Where A_{ij} is the attainment indicator of country *k* in respect of indicator *i (i=1,2, 3)*, X_{ik} is the value of indicator *i* for country *k*, and $\underset{k}{Max}\{X_{ik}\}$ and $\underset{k}{Min}\{X_{ik}\}$ are, respectively, the maximum and minimum values of the indicator over *all* countries, *k=1...K*.

Equation (12) implies that $0 \le A_{ik} \le 100,\ i = 1,2,3;\ k = 1,2,...K$ such that A_{ik} represents the percentage attainment of country *k* with respect to the i^{th} indicator. The overall attainment for country *k* is then its HDI value and it is defined as:

$$HDI_k = \frac{1}{3}\sum_{i=1}^{3} A_{ik} \qquad (13)$$

In this paper we apply the idea of the HDI to a situation where the population of a country is subdivided into *J* mutually exclusive social groups indexed *j=1...J*. In particular, we apply it to the following social groups in India:

1. Brahmins and high caste Hindus (B&HC)

2. Scheduled Castes (SC)
3. Scheduled Tribes (ST)
4. Other Backward Classes (Hindu)
5. Muslims

For every household in each group, we compute the value of its attainment indicator in respect of life expectancy, highest educational attainment, and income: A_{ijh}, $i=1,2,3;\ j=1,2,3,4,5;\ and\ h=1...H_j$ where H_j is the number of households in social group *j*. So, for any group *j (j=1...5)* and attainment dimension *i (i=1,2,3)*, the components of the vector $\mathbf{A_{ij}}=(A_{ij1},A_{ij2},...A_{ijH_j})$ represents the distribution of attainments with respect to attainment indicator *i* over the H_j household in social group *j*. We can then define by A_{ij}^e the **equally distributed equivalent attainment** of group *j* with respect to attainment *i* as the (1-ε) average – as defined in equation (8) –of the household attainments:

$$(A_{ij}^e)^{1-\varepsilon}=\frac{1}{H_j}\sum_{h=1}^{H_j}(A_{ijh})^{1-\varepsilon} \qquad (14)$$

When ε=*0*, A_{ij}^e is the *arithmetic mean* of household achievements; when ε >*0* A_{ij}^e is less than the arithmetic mean of household achievements.

The equally distributed equivalent attainment, *aggregated over all the groups*, with respect to attainment *i*, *taking account of both within group and between group inequality*, is denoted A_i^e where:

$$\left(A_i^e\right)^{1-\varepsilon}=\frac{1}{H}\sum_{j=1}^{5}\sum_{h=1}^{H_j}\left(A_{ijh}^e\right)^{1-\varepsilon} \qquad (15)$$

If within-group inequalities are ignored, then in each every group, each household is assumed to have the mean attainment of that group: $A_{ihj}=\overline{A}_{ij}$, *h=1...*H_j, (for *i=1...3* and *j=1,...5*). The only inequality is *between group inequality* resulting from the fact that mean attainments of the groups are different: $\overline{A}_{i1}\neq\overline{A}_{i2}\neq\overline{A}_{i3}\neq\overline{A}_{i4}\neq\overline{A}_{i5}$ The equally distributed equivalent attainment, *aggregated over all the groups*, with respect to attainment *i*, *taking account of between group inequalities only*, is denoted B_i^e where:

$$\left(B_i^e\right)^{1-\varepsilon}=\sum_{j=1}^{5}n_j\left(\overline{A}_{ij}\right)^{1-\varepsilon} \qquad (16)$$

Where: n_j is the proportion of households in social group *j, j=1..5*.

Then the **overall** equally distributed equivalent attainment index over *all* the social groups, *taking account of both inter and intra group inequality* is:

$$A^e = \frac{1}{3}A_1^e + \frac{1}{3}A_2^e + \frac{1}{3}A_3^e \quad (17)$$

Then the **overall** equally distributed equivalent attainment index over *all* the social groups, *taking account of only inter-group inequality* is:

$$B^e = \frac{1}{3}B_1^e + \frac{1}{3}B_2^e + \frac{1}{3}B_3^e \quad (18)$$

And the **overall** equally distributed equivalent attainment index *for social group j, j=1..5* is:

$$A_j^e = \frac{1}{3}A_{1j}^e + \frac{1}{3}A_{2j}^e + \frac{1}{3}A_{3j}^e \quad (19)$$

4. Data and Analysis: the component indices

The data for the analysis was provided by the household file of the Indian Human Development Survey (IHDS) which provided information, pertaining to 2004, on over 41,000 households spread over India. We began the exercise by computing *each household's* achievement in respect to (i) education; (ii) life expectancy, and (iii) income.

Education

The indicator of a household's educational achievement was taken as the *highest* educational level of an adult in the household. The values of this variable, HEL_h, for household *h*, were coded between: 15 (highest value) for a graduate and 0 (lowest value) for "no education" and Table 1 shows its values for different social groups in both rural and urban contexts. The average value of this variable was 7.7 for all households with the highest value of 10.2 being recorded for Brahmin and High Caste (B&HC) households and lowest values being recorded for SC (6.1), ST (5.4), and Muslim (6.3) households. The household's highest education index, HEI_h was defined as:

$$HEI_h = \frac{HEL_h - 0}{15 - 0} \times 100 \quad (20)$$

and this can be interpreted as its *achievement rate* with respect to education: it is the percentage distance which a household has travelled in fulfilling its "educational potential". The values of this index (achievement rate) are shown in Table 2 for different social groups, in both rural and urban contexts.

The row titled "HEI (ε=0)", in Table 2, shows the mean value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to zero. On this calculation, households in India, considered in their entirety, realised 50.4% of their "educational potential" in the context of which B&HC households realised 67.5% of their potential while the SC, ST and Muslim households were able to realise only 39.5%, 34.8%, and 41.6%, respectively, of their educational potential.

The row titled "HEI (ε=0.5)" in Table 2 shows the *equity-sensitive* value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to 0.5. The values alongside this row are the *equally distributed equivalent attainments* (EDEA) taking into account inequality in the distribution of the *HEI* values between the relevant households. When inequality aversion is measured by ε=0.5, we regard an achievement rate of 38.2% - *with every household having this achievement rate* - as being "welfare equivalent" to a mean rate of 50.4% (see above) *with the highest education level of a household adult being different for the different households*.

The row titled "μ×(1-Gini)" in Table 2 is Sen's measure of social welfare (SSW). This measure says that the social welfare emanating from a given mean outcome (μ) should be adjusted downwards by the amount of inequality in the distribution of outcomes between households/individuals to reflect the fact that inequality is welfare reducing. Sen's measure is the result of measuring inequality using the Gini coefficient.

Because intra-group inequality in the distribution of the *HEI* values is larger among the SC, ST, and Muslim households, compared to B&HC households, the fall from the mean achievement rate ($EDEA_{\varepsilon=0}$)[3] to the equity-sensitive rate ($EDEA_{\varepsilon=0.5}$) is greatest for the SC (39.5%→26.2%), ST (34.8% →20.7%), and Muslim households (41.7%→28.5%) and relatively small for B&HC households (67.5%→60.4%). Similarly, because the degree of inequality

as measured by the Gini coefficient is greater than the degree of inequality as measured by Atkinson's index (with ε=0.5), the SSW is smaller than $EDEA_{\varepsilon=0.5}$. The mean achievement of 50.4% is, in terms of social welfare, worth an achievement rate of only 31.1%, *if inequality in the distribution of achievements between households is measured by the Gini coefficient*.

Life Expectancy

In order to determine life expectancy, we focused on the 1,603 households in which a death had occurred in the 12 months prior to the survey. Table 3 shows that the mean age at death, across all these 1,603 households in which a death had occurred in the past 12 months, was 52 years. The highest age at death was 56 years for B&HC households, with SC, ST, and Muslim households recording the lowest ages at death of 49, 44, and 48 years, respectively.

The household's life expectancy index, LEI_h was defined as:

$$LEI_h = \frac{LEL_h - 0}{100 - 0} \times 100 \qquad (21)$$

and this can be interpreted as its *achievement rate* with respect to life expectancy: it is the percentage distance which a household has travelled in fulfilling its "life expectancy(LE)" potential. The values of this index (achievement rate) are shown in Table 4 for different social groups, in both rural and urban contexts.

As in Table 2, The row titled "LEI (ε=0)", in Table 4, shows the mean value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to zero. On this calculation, households in India, considered in their entirety, realised 51.8% of their "life expectancy potential" in the context of which B&HC households realised 56.6% of their potential while the SC, ST and Muslim households were able to realise only 49.4%,45.3 %, and 48.6%, respectively, of their LE potential.

The row titled "HEI (ε=0.5)" in Table 4 shows the *equity-sensitive* value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to 0.5. The values alongside this row are the *equally distributed equivalent attainments* (EDEA) taking into

account inequality in the distribution of the *HEI* values between the relevant households. When inequality aversion is measured by ε=0.5, we regard an age at death of 43.9 years- *with this being the age at death in every household which experienced the death of one of its members in the past 12 months* - as being "welfare equivalent" to a mean age at death of 51.8 years, *with the age at death of a household member being different between the different households*.

The row titled "μ×(1-Gini)" in Table 4 is Sen's measure of social welfare (SSW). This measure says that the social welfare emanating from a given mean outcome (μ) should be adjusted downwards by the amount of inequality in the distribution of outcomes between households/individuals to reflect the fact that inequality is welfare reducing. Sen's measure is the result of measuring inequality using the Gini coefficient. The mean achievement of an age at death of 51.8 years is, in terms of social welfare, worth an age at death of only 35.8 years *if inequality in the distribution of age at death of household member, between households which experienced the death of one of its members in the past 12 months, is measured by the Gini coefficient*.

Income

The IHDS reported the total income of each of the households in the survey with the mean and median monthly household incomes being, respectively, Rs. 53,922 and Rs. 31,6126. From this income data, the IHDS constructed income quintiles and reported each household according to the income quintile to which it belonged: INQ_h=5, if household *h* belonged to quintile 5 (richest), INQ_h=4, if household *h* belonged to quintile 4, and so on till INQ_h=1, if household *h* belonged to quintile 1 (poorest). As Table 5 shows, the mean value of INQ_h over all households was 3.2 with Brahmin and ST households having the highest and lowest INQ values: respectively, 3.7 and 2.6.

The household's income quintile index, IQI_h was defined as:

$$IQI_h = \frac{INQ_h - 0}{5 - 0} \times 100 \qquad (22)$$

and this can be interpreted as its *achievement rate* with respect to income: it is the percentage distance which a household has travelled in fulfilling its

"income" potential. The values of this index (achievement rate) are shown in Table 6 for different social groups, in both rural and urban contexts.

The row titled "HEI (ε=0)", in Table 6, shows the mean value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to zero. On this calculation, households in India, considered in their entirety, realised 62% of their "income potential" in the context of which B&HC households realised 73.4% of their potential while the SC, ST and Muslim households were able to realise only 55.8%, 52%, and 62%, respectively, of their income potential.

The row titled "HEI (ε=0.5)" in Table 6 shows the *equity-sensitive* value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to 0.5. The values alongside this row are the *equally distributed equivalent attainments* (EDEA) taking into account inequality in the distribution of the *IQI* values between the relevant households. When inequality aversion is measured by ε=0.5, we regard an achievement rate of 57.1% - *with every household having this achievement rate* - as being "welfare equivalent" to a mean rate of 62% (see above) *with the IQL values being distributed unequally between the households.*

The row titled "μ×(1-Gini)" in Table 6 is Sen's measure of social welfare (SSW). This measure says that the social welfare emanating from a given mean outcome (μ) should be adjusted downwards by the amount of inequality in the distribution of outcomes between households/individuals to reflect the fact that inequality is welfare reducing. Sen's measure is the result of measuring inequality using the Gini coefficient.

Because intra-group inequality in the distribution of the *IQI* values was not very different among the SC, ST, and Muslim households, compared to B&HC households, the *reduction* from the mean achievement rate ($EDEA_{\varepsilon=0}$)[4] to the equity-sensitive rate ($EDEA_{\varepsilon=0.5}$) was not very different for the four household groups: SC households (55.8%→51.5%); ST households (52% →47.3%), Muslim households (62%→57.8%); and B&HC households (73.4%→68.8%). Similarly, because the degree of inequality as measured by the Gini coefficient is greater than the degree of inequality as measured by Atkinson's index (with ε=0.5), the SSW is smaller than $EDEA_{\varepsilon=0.5}$. The mean

achievement of 62% is, in terms of social welfare, worth an achievement rate of only 45.3%, *if inequality in the distribution of achievements between households is measured by the Gini coefficient*.

Living Conditions Index

The IHDS reported on the living conditions of the households with respect to a number of indicators from which we chose three:

1. The proportion of households who defecated in the open.
2. The proportion of households who did not have piped water.
3. The proportion of households who did not have a vent in the cooking place.

As Table 7 shows, 53.7% of households defecated in the open on an all-India basis (69.8% in rural area), 53.9% did not have piped water (68% in rural areas), and 31.4% of households did not have a vent in the cooking place (37.1% of households in rural areas). The Living Conditions Index (LCI) of a household was defined as:

$$LCI_h = [0.7 \times \text{toilet} + 0.15 \times \text{piped water} + 0.15 \times \text{vent}] \qquad (23)$$

where the relevant variable took the value 1 if the condition was present, 0 if it was not. Consequently, for every household, $0 \leq LCH_h \leq 100$.

The row titled "HEI (ε=0)", in Table 8, shows the mean value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to zero. On this calculation, households in India, considered in their entirety, realised 51.5% of their "living conditions (LC) potential" in the context of which B&HC households realised 67.1% of their potential while the SC and ST households were able to realise only 39.2% and 32.9%, respectively, of their LC potential.

The row titled "HEI (ε=0.5)" in Table 8 shows the *equity-sensitive* value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to 0.5. The values alongside this row are the *equally distributed equivalent attainments* (EDEA) taking into account inequality in the distribution of the *LCI* values between the relevant households. When inequality aversion is measured by ε=0.5, we regard an

achievement rate of 38.5% - *with every household having this achievement rate* - as being "welfare equivalent" to a mean rate of 51.5% (see above) *with the LCI values being distributed unequally between the households.*

The row titled "μ×(1-Gini)" in Table 8 is Sen's measure of social welfare (SSW) with respect to living conditions. This measure says that the social welfare emanating from a given mean outcome (μ) should be adjusted downwards by the amount of inequality in the distribution of outcomes between households/individuals to reflect the fact that inequality is welfare reducing. Sen's measure is the result of measuring inequality using the Gini coefficient.

Because intra-group inequality in the distribution of the *LCI* values was different among the B&HC, SC, ST, and Muslim households, the *reduction* from the mean achievement rate ($EDEA_{\varepsilon=0}$)[5] to the equity-sensitive rate ($EDEA_{\varepsilon=0.5}$) was different for the household groups: B&HC households (67.1%→57.2%), SC households (39.2%→26.8%); ST households (32.9% →18.8%), Muslim households (66%→56.5). Similarly, because the degree of inequality as measured by the Gini coefficient is greater than the degree of inequality as measured by Atkinson's index (with ε=0.5), the SSW is smaller than $EDEA_{\varepsilon=0.5}$. The mean achievement of 51.5%% is, in terms of social welfare, worth an achievement rate of only 29.4%, *if inequality in the distribution of achievements between households is measured by the Gini coefficient*.

Social Networks Index

The IHDS reported on the social networks of each household with respect to a number of indicators designed to measure the range, quality, and the closeness of social contacts:

1. Whether the household knew someone connected with medicine or education or government.
2. If so, was the person a doctor/teacher/officer?
3. If the person knew a person connected with the above areas, was the person concerned from the same or a different *jati* to the household.

As Table 9 shows, 32.7% of households knew someone associated with medicine, 43% knew someone connected with education, and 35.6% knew

someone in government. Of those households who knew someone connected with medicine or education or government, 24.7% knew a doctor, 36% knew a teacher, and 15.9% knew an officer. Of those households who knew someone connected with medicine or education or government, the proportions of acquaintances from the same *jati* were: 12.4% for medicine, 20.4% for education, and 22% for government.

Using this information, we defined the Jaan-Pehchaan (*JPI*) index with respect to the k^{th} contact type (k=medicine, education, government), in terms of the three dimensions of existence, quality, and proximity as:

$$JPI_k = \left[0.5 \times \text{existence}_k + 0.3 \times \text{quality}_k + 0.2 \times \text{proximity}_k\right] \quad (24)$$

The relevant variables in equation (23) take the value 1 if the social network condition is present: has a contact; the contact is a high quality contact (doctor, teacher, officer); the contact is of the same *jati*. It takes the value 0 if it is not. Consequently, $0 \leq JPI_k \leq 100$. The overall index is:

$$JPI = (1/3)\,JPI_1 + (1/3)\,JPI_2 + (1/3)\,JPI_3 \quad (25)$$

where, by construction, $0 \leq JPI \leq 100$.

Table 10 shows the values of this index for different groups on an all-India, rural India, and urban India basis. The row titled "HEI (ε=0)", in Table 10, shows the mean value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to zero. On this calculation, households in India, considered in their entirety, realised 28.7% of their "Jaan-Pehchaan (J-P) potential" in the context of which B&HC households realised 39.7% of their potential while the SC, ST, and Muslim households were able to realise only 23.5%, 21.6% and 23.8%, respectively, of their J-P potential.

The row titled "HEI (ε=0.5)" in Table 8 shows the *equity-sensitive* value of this index: this is the empirical counterpart of equation (14) with the value of the inequality aversion parameter, ε, set to 0.5. The values alongside this row are the *equally distributed equivalent attainments* (EDEA) taking into account inequality in the distribution of the *JPI* values between the relevant households. When inequality aversion is measured by ε=0.5, we regard an

achievement rate of 14.9% - *with every household having this achievement rate* - as being "welfare equivalent" to a mean rate of 28.7% (see above) *with the JPI values being distributed unequally between the households.*

The row titled "μ×(1-Gini)" in Table 8 is Sen's measure of social welfare (SSW) with respect to living conditions. This measure says that the social welfare emanating from a given mean outcome (μ) should be adjusted downwards by the amount of inequality in the distribution of outcomes between households/individuals to reflect the fact that inequality is welfare reducing. Sen's measure is the result of measuring inequality using the Gini coefficient.

Because intra-group inequality in the distribution of the *JPI* values was different among the B&HC, SC, ST, and Muslim households, the *reduction* from the mean achievement rate ($EDEA_{\varepsilon=0}$)[6] to the equity-sensitive rate ($EDEA_{\varepsilon=0.5}$) was different for the household groups: B&HC households (39.7%→20.3%), SC households (23.5%→8.2%); ST households (21.6% →6.6%), Muslim households (23.8%→8.3). Similarly, because the degree of inequality as measured by the Gini coefficient is greater than the degree of inequality as measured by Atkinson's index (with ε=0.5), the SSW is smaller than $EDEA_{\varepsilon=0.5}$. The mean achievement of 28.7%% is, in terms of social welfare, worth an achievement rate of only 11.5%, *if inequality in the distribution of achievements between households is measured by the Gini coefficient.*

5. Data and Analysis: Aggregation over Social Groups

In order to obtain the group achievements in respect of the five components– education, life expectancy, income, living conditions, and social networks (*jaan-pehchaan)* – we aggregated over *all* the households in *each* group, using the method of "1-ε averaging" as shown in equation (14), to obtain the achievement rate of each group in respect of that component. So, Tables 2, 4, and 6 showed the achievement rate of each of the five social groups –B&HC, SC, ST, OBC, and Muslims – in respect of education (Table 2), life expectancy (Table 4), and income quintile (Table 6). Tables 8 and 10 showed the achievement rate of each of the five social groups in respect of living conditions (Table 8) and social networks (*jaan-pehchaan)* (Table 10).

The task in this section is to aggregate over the social groups to obtain a "national" achievement in respect of the three components of education, life expectancy, and income. *Since we have already taken account of intra-group inequality* – either by ignoring it, by assuming ε=0, or by acknowledging it, by assuming ε=0.5 – in computing the group achievement rates, we aggregate from groups to national *by only taking account of between group inequality*. The method for doing so is provided by equation (18) which computes equally distributed equivalent attainment (EDEA), *aggregated over all the groups*, with respect to each attainment, *taking account of only between group inequalities*. The weights for the aggregation are the proportionate shares of each group in the total of households.

Table 11 shows that taking account of just three indicators – life expectancy, education, and income – households in India, considered in its entirety, fulfilled 54.3% of their potential which could be broken down into: 51.7% for life expectancy; 49.6% for Education; and 61.4% for Income. When between group inequality was taken into account, with Atkinson's measure of inequality (ε=0.5), the overall level of achievement fell to 46.5% and the individual components fell from 51.7%→44.3% (life expectancy); 49.6%→38.5% (education); and 61.4%→45.4% (income).

When an additional two indicators – living conditions and social networks – were added to the three original indicators of life expectancy, education, and income, Table 12 households in India, considered in its entirety, fulfilled 48.6% of their potential which could be broken down into: 51.7% for life expectancy; 49.6% for Education; 61.4% for Income; *51.6% for living conditions; and 28.7% for social networks* . When between group inequality was taken into account, with Atkinson's measure of inequality (ε=0.5), the overall level of achievement fell to 38.9% and the individual components fell from 51.6%→39.8% (living conditions); 28.7%→15.4% (social networks).

Endnotes

1. In the language of economics, the two situations would yield the same level of social welfare, i.e. be 'welfare equivalent'.

2. Since, by welfare equivalence of X^e and $\overline{X}$

$NF(X^e) = \sum_{k=1}^{K} N_k F(X_k) \Rightarrow (X^e)^{1-\varepsilon} - 1 = \sum_{k=1}^{K} n_k (X_k^{1-\varepsilon} - 1) \Rightarrow (X^e)^{1-\varepsilon} = \sum_{k=1}^{K} n_k X_k^{1-\varepsilon}$. Dividing both sides by $\overline{X}^{1-\varepsilon}$,

$\left(\frac{X^e}{\overline{X}}\right)^{1-\varepsilon} = \sum_{k=1}^{K} n_k \left(\frac{X_k}{\overline{X}}\right)^{1-\varepsilon} \Rightarrow 1 - \left(\frac{X^e}{\overline{X}}\right) = 1 - \left[\sum_{k=1}^{K} n_k \left(\frac{X_k}{\overline{X}}\right)^{1-\varepsilon}\right]^{1/1-\varepsilon}$

3. Note that the mean achievement rate is the EDEA for ε=0, that is, when there is no aversion to inequality.

4. Note that the mean achievement rate is the EDEA for ε=0, that is, when there is no aversion to inequality.

5. Note that the mean achievement rate is the EDEA for ε=0, that is, when there is no aversion to inequality.

6. Note that the mean achievement rate is the EDEA for ε=0, that is, when there is no aversion to inequality.

References

Anand, S. and A. K. Sen (1994), *Human Development Index: Methodology and Measurement*, Human Development Report Office Occasional Paper 12, New York: UNDP.

Anand, S. and A. K. Sen (1997). *Concepts of Human Development and Poverty: A Multidimensional Perspective*, Human Development Report 1997 Papers, New York, UNDP.

Anand, S. and Sen, A.K. (2003), "Gender Inequality in Human Development: Theories and Measurement", in S. Fukuda-Parr and A.K. Shiv Kumar (ed), *Readings in Human Development*, Oxford: Oxford University Press.

Haq, M. (1994), *The Birth of the Human Development Index*, Human Development Report Office Occasional Paper 1, New York: UNDP.

Sen, A.K. (1992), *Inequality Re-Examined*, Oxford: Clarendon Press.

Shariff, A. (1999), *India Human Development Report*, New Delhi: Oxford University Press.

UNDP(1995), *Human Development Report*, New York: UNDP.

Table 1: Highest Level of Education of Households' Adults for India, by Social Group*

	All house-holds	Brahmins and High Caste Hindus	Sched-uled Castes	Sched-uled Tribes	Other Backward Class Hindus	Muslims
			All-India			
Number of Households	33,443	7,595	6,836	2,610	11,239	3,903
Education Level	7.7	10.2	6.1	5.4	7.7	6.3
			Rural			
Number of Households	21,634	4,011	4,902	2,231	7,654	2,088
Education Level	6.6	8.9	5.4	4.6	6.8	5.4
			Urban			
Number of Households	11.809	3,584	1,934	379	3,585	1,815
Education Level	9.7	11.7	7.9	9.5	9.6	7.4

*Defined as years of education: 0 (none), 1, 2, 3, 4, 5 (5th standard), 6, 7, 8, 9, 10 (Matric), 11, 12 (Higher Secondary), 13, 14, 15 (Graduate or above).

Table 2: Highest Education Index Values for India, by Social Groups*

	All house-holds	Brahmins and High Caste Hindus	Sched-uled Castes	Sched-uled Tribes	Other Back-ward Class Hindus	Muslims
			All-India			
Number of Households	39,895	9,540	8,333	3,439	13,875	4,708
HEI (ε=0)	49.7	67.5	39.5	34.8	49.9	41.6
HEI (ε=0.5)	37.3	60.4	26.2	20.7	38.5	28.5
μ×(1-Gini)	30.3	51.1	21.0	16.3	31.4	22.8
			Rural			
Number of Households	26,043	5,022	6,011	2,940	9,543	2,527
HEI (ε=0)	41.9	57.2	34.5	30.1	43.8	35.3
HEI (ε=0.5)	29.0	48.5	21.0	16.8	31.8	22.0
μ×(1-Gini)	23.3	40.3	16.8	13.2	25.7	17.4
			Urban			
Number of Households	13,852	4,518	2,322	499	4,332	2,181
HEI (ε=0)	64.3	78.9	52.7	62.2	63.2	48.9
HEI (ε=0.5)	55.8	75.1	42.4	51.9	55.7	37.2
μ×(1-Gini)	46.8	66.0	34.6	43.9	46.6	30.2

* For *every household*, its HEI = [(Highest Education Level of Adult – Minimum Possible Education Level)/(Maximum Possible Education of Household Adult – Minimum Possible Education Level)]×100. The maximum and minimum possible education levels were, respectively, 15 and 0. Consequently, for every household, $0 \leq HEI \leq 100$.

ε is the degree of inequality aversion: ε=0 implies no aversion to inequality; ε>0 implies aversion to inequality.

μ is the mean level of attainment (HEI: ε=0) and μ×(1-Gini) is Sen's measure of social welfare.

Table 3: Average Age at Death in India, by Social Group*

	All house-holds	Brahmins and High Caste Hindus	Sched-uled Castes	Sched-uled Tribes	Other Back-ward Class Hindus	Muslims
			All-India			
Number of Households	1,288	249	280	105	475	144
Age at Death	52	57	49	45	53	49
			Rural			
Number of Households	928	148	225	91	365	76
Age at Death	51	53	49	44	54	48
			Urban			
Number of Households	360	101	55	14	110	68
Age at Death	53	60	51	40	50	47

*For households in which a death had occurred in the past year.

Table 4: Life Expectancy Index Values for India, by Social Group *

	All house-holds	Brahmins and High Caste Hindus	Sched-uled Castes	Sched-uled Tribes	Other Back-ward Class Hindus	Mus-lims
			All-India			
Number of Households	1,620	328	371	137	594	190
HEI (ε=0)	51.8	57.1	49.8	45.3	52.7	48.4
HEI (ε=0.5)	44.3	52.1	42.3	37.0	45.1	38.9
μ×(1-Gini)	36.1	43.0	34.0	29.7	37.0	31.5
			Rural			
Number of Households	1,172	199	291	120	456	106
HEI (ε=0)	51.5	54.6	49.8	45.4	53.6	48.5
HEI (ε=0.5)	43.8	48.9	42.1	37.0	45.9	38.7
μ×(1-Gini)	35.5	39.7	33.7	29.5	37.8	31.4
			Urban			
Number of Households	448	129	80	17	138	84
HEI (ε=0)	52.6	60.7	49.8	45.1	50.1	48.3
HEI (ε=0.5)	45.7	57.2	43.3	36.4	42.6	39.1
μ×(1-Gini)	37.7	48.4	35.1	32.0	34.8	31.8

* For each household the LEI = [(Age at Death – Minimum Age of Death)/ (Maximum Age at Death – Minimum Age of Death)]×100. The maximum age at death in the sample was 100 years.

Consequently, $0 \leq LEI \leq 100$.

ε is the degree of inequality aversion: ε=0 implies no aversion to inequality; ε>0 implies aversion to inequality.

μ is the mean level of attainment (LEI: ε=0) and μ×(1-Gini) is Sen's measure of social welfare.

Table 5: Average Quintile of Total Household Income for India, by Social Groups*

	All house-holds	Brahmins and High Caste Hindus	Sched-uled Castes	Sched-uled Tribes	Other Back-ward Class Hindus	Muslims
All-India						
Number of Households	33,482	7,600	6,850	2,611	11,249	3,911
Income Level	3.2	3.7	2.9	2.6	3.0	3.1
Rural						
Number of Households	21,663	4,015	4,913	2,232	7,662	2,092
Income Level	2.80	3.3	2.6	2.4	2.7	2.8
Urban						
Number of Households	11.819	3,585	1,937	379	3,587	1,819
Income Level	3.8	4.2	3.6	3.9	3.7	3.5

*The income quintiles of household income were: 0 (negative income); 1 (poorest); 2nd ; 3rd (middle); 4th ; 5th (affluent)

Table 6: Income Quintile Index Values for India, by Social Groups*

	All house-holds	Brahmins and High Caste Hindus	Sched-uled Castes	Sched-uled Tribes	Other Back-ward Class Hindus	Muslims
All-India						
Number of Households	39,895	9,540	8,333	3,439	13,875	4,708
IQI (ε=0)	61.4	73.4	55.8	52.0	58.7	62.0
IQI (ε=0.5)	56.5	68.8	51.5	47.3	53.6	57.8
μ×(1-Gini)	44.7	57.9	40.1	35.9	42.0	46.4
Rural						
Number of Households	26,043	5,022	6,011	2,940	9,543	2,527
IQI (ε=0)	53.9	64.4	50.1	47.7	52.3	55.8
IQI (ε=0.5)	49.0	59.0	46.0	43.5	47.0	51.3
μ×(1-Gini)	37.7	47.4	35.5	33.0	36.0	40.0
Urban						
Number of Households	13,852	4,518	2,322	499	4,332	2,181
IQI (ε=0)	75.4	83.3	70.3	77.1	72.9	69.2
IQI (ε=0.5)	72.1	80.5	66.8	73.4	69.6	65.8
μ×(1-Gini)	61.6	72.0	55.8	62.8	58.8	55.0

*For every household, its IQI = [(Household Income Quintile – Minimum Possible Income Quintile)/ (Maximum Possible Income Quintile – Minimum Possible Income Quintile)]×100. The maximum and minimum possible income quintiles were, respectively, 5 and 0.

Consequently, for every household, $0 \leq IQI \leq 100$.

ε is the degree of inequality aversion: ε=0 implies no aversion to inequality; ε>0 implies aversion to inequality.

μ is the mean level of attainment (IQI: ε=0) and μ×(1-Gini) is Sen's measure of social welfare.

Table 7: Living Conditions in India, by Social Groups

	All households	Brahmins and High Caste Hindus	Scheduled Castes	Scheduled Tribes	Other Backward Class Hindus	Muslims
Proportion of households who defecate in the open:						
All-India	53.7	38.2	69.6	74.1	58.9	37.6
Rural	69.8	59.8	80.4	81.4	74.3	49.5
Urban	24.0	13.9	42.2	31.3	25.7	23.9
Proportion of households who don't have piped water:						
All-India	53.9	42.4	57.2	68.0	54.3	59.2
Rural	68.0	59.1	69.1	75.7	66.1	78.6
Urban	27.9	23.7	27.0	22.7	29.1	36.9
Proportion of households who don't have vent in cooking place:						
All-India	31.4	21.8	40.8	48.5	32.5	24.7
Rural	37.1	27.2	45.2	51.5	37.0	26.7
Urban	22.2	16.4	31.1	30.5	23.6	22.7

Table 8: Living Conditions Index Values for India, by Social Groups*

	All households	Brahmins and High Caste Hindus	Scheduled Castes	Scheduled Tribes	Other Backward Class Hindus	Muslims
			All-India			
Number of Households	30,663	7,442	5,959	2,866	11,030	3,366
LCI (ε=0)	51.5	67.1	39.2	32.9	48.0	66.0
LCI (ε=0.5)	38.5	57.2	26.8	18.8	35.1	56.5
μ×(1-Gini)	29.4	47.3	19.0	13.3	26.2	47.0
			Rural			
Number of Households	19,382	3,712	4,140	2,445	7,383	1,702
LCI (ε=0)	36.6	48.0	28.3	26.6	34.6	55.2
LCI (ε=0.5)	24.1	36.4	17.4	13.9	22.6	44.0
μ×(1-Gini)	17.1	27.0	12.0	9.7	15.8	35.0
			Urban			
Number of Households	11,281	3,730	1,819	421	3,647	1,664
LCI (ε=0)	77.0	85.9	64.2	69.3	75.1	77.1
LCI (ε=0.5)	70.8	82.5	55.5	61.1	68.5	71.0
μ×(1-Gini)	61.4	75.3	44.1	50.3	58.7	61.9

*For every household, its LCI = [0.7×Use of Toilet+0.15×Piped Water×0.15×Vent in Cooking Place] ×100. The relevant variable takes the value 1 if the condition is present, 0 if it is not. Consequently, for every household, $0 \leq LCI \leq 100$.

ε is the degree of inequality aversion: ε=0 implies no aversion to inequality; ε>0 implies aversion to inequality.

μ is the mean level of attainment (IQI: ε=0) and μ×(1-Gini) is Sen's measure of social welfare.

Table 9: Social Networks in India, by Social Groups

	All house-holds	Brahmins and High Caste Hindus	Scheduled Castes	Scheduled Tribes	Other Backward Class Hin-dus	Muslims
Proportion of households who know a person associated with medicine						
All-India	32.7	41.6	27.6	22.6	32.6	26.9
Rural	30.8	40.9	26.3	19.5	31.6	26.2
Urban	36.2	42.3	30.9	40.7	34.7	27.7
If yes, from the same jati						
All-India	12.4	18.1	7.2	10.2	11.1	13.2
Rural	10.9	17.4	6.6	8.1	9.6	12.1
Urban	15.4	18.9	8.8	22.4	14.1	14.4
If yes, the person is a doctor						
All-India	24.7	32.5	20.9	14.9	24.7	20.4
Rural	23.2	32.0	19.9	12.7	23.9	20.0
Urban	27.6	33.2	23.3	27.4	26.2	20.9
Proportion of households who know a person associated with education						
All-India	41.3	52.7	34.1	32.6	41.9	33.0
Rural	40.5	53.8	33.9	29.8	42.1	34.2
Urban	42.6	51.4	34.8	48.8	41.5	31.5
If yes, from the same jati						
All-India	20.4	29.7	12.7	17.0	19.6	18.8
Rural	19.2	30.9	11.9	15.0	18.6	19.3
Urban	22.6	28.3	14.7	28.5	21.7	18.4
If yes, the person is a teacher						
All-India	36.0	45.9	29.8	28.6	36.7	28.3
Rural	35.8	48.2	30.0	26.7	37.0	29.4
Urban	36.4	43.4	29.3	39.8	36.1	26.9
Proportion of households who know a person associated with government						
All-India	35.6	49.3	30.5	23.8	33.6	28.4
Rural	30.6	44.6	26.7	19.1	29.4	24.9
Urban	44.8	54.6	40.0	51.2	42.6	32.5
If yes, from the same jati						
All-India	22.0	30.8	17.8	17.5	20.4	19.5
Rural	19.0	27.9	15.2	14.4	18.0	17.4
Urban	27.6	34.1	24.0	35.9	25.5	21.9
If yes, the person is an officer						
All-India	15.9	26.2	12.0	10.7	13.6	10.3
Rural	13.1	23.4	10.6	8.2	10.9	10.0
Urban	21.1	29.3	15.5	25.6	19.2	10.4

Table 10: Social Network *(Jaan-Pehchaan)* Index Values for India, by Social Groups*

	All households	Brahmins and High Caste Hindus	Scheduled Castes	Scheduled Tribes	Other Backward Class Hindus	Muslims
			All-India			
Number of Households	39,116	9,365	8,202	3,344	13,604	4,601
LCI (ε=0)	28.7	39.7	23.5	21.6	27.8	23.8
LCI (ε=0.5)	14.9	25.8	10.7	8.7	14.4	10.7
μ×(1-Gini)	11.5	20.3	8.2	6.6	11.2	8.3
			Rural			
Number of Households	25,508	4,945	5,919	2,849	9,344	2,451
LCI (ε=0)	26.4	38.2	22.0	18.5	26.1	23.0
LCI (ε=0.5)	12.9	24.1	9.5	6.7	13.1	10.1
μ×(1-Gini)	10.0	19.0	7.4	5.1	10.2	7.8
			Urban			
Number of Households	13,608	4,420	2,283	495	4,260	2,150
LCI (ε=0)	33.2	41.3	27.4	39.2	31.5	24.7
LCI (ε=0.5)	19.1	27.9	14.1	24.3	17.5	11.5
μ×(1-Gini)	14.8	21.9	10.8	19.1	13.5	8.8

* Each household's JPI_k =[0.5×existence of contact+0.20×proximity of contact +0.30× quality of contact]×100 of the k^{th} contact type. The relevant variables take the value 1 if the social network condition is present: knows a contact; the contact is of the same *jati*; is a high quality contact and 0 if it is not. The JPI_k values were computed with respect to three different types of contacts: medical, educational, and government. The quality value of a contact was 1 if the contact was a doctor (medical), teacher (educational), or officer (government). Consequently, $0 \leq JPI_k \leq 100$. The overall index $JPI=(1/3)JPI_1+(1/3)JPI_2+(1/3)JPI_3$ where, by construction, $0 \leq JPI \leq 100$.

ε is the degree of inequality aversion: ε=0 implies no aversion to inequality; ε>0 implies aversion to inequality.

μ is the mean level of attainment (IQI: ε=0) and μ×(1-Gini) is Sen's measure of social welfare.

Table 11: Human Development Index Values for India, by Social Groups: Three Indicators*

	Human Development Index Value	Human Development Index Value (B&HC)	Human Development Index Value (SC)	Human Development Index Value (ST)	Human Development Index Value (OBC)	Human Development Index Value (Muslims)	Human Development Index Value (Between Group only)
				All-India			
ε=0	54.3	65.8	48.2	44.0	53.7	50.7	54.3
ε=0.5	46.1	60.2	39.8	35.0	45.6	41.8	54.1
μ×(1-Gini)	37.0	50.5	31.5	27.3	36.7	33.7	50.5
				Rural			
ε=0	49.1	58.7	44.7	41.1	49.8	46.5	49.1
ε=0.5	43.8	52.1	36.1	32.4	41.5	37.3	48.9
μ×(1-Gini)	32.2	42.4	28.5	25.2	33.1	29.6	46.0
				Urban			
ε=0	64.1	74.0	67.6	61.4	61.8	55.6	64.1
ε=0.5	57.9	70.3	50.8	53.9	55.6	47.5	64.0
μ×(1-Gini)	48.7	61.6	41.8	46.2	46.4	39.1	60.2

*Life Expectancy, Education, Income. Each household's HDI= (1/3)×LEI+(1/3)×HEI+(1/3)×IQI

Table 12: Human Development Index Values for India, by Social Groups: Five Indicators*

	Human Development Index Value	Human Development Index Value (B&HC)	Human Development Index Value (SC)	Human Development Index Value (ST)	Human Development Index Value (OBC)	Human Development Index Value (Muslims)	Human Development Index Value (Between Group only)
				All-India			
ε=0	48.6	60.8	41.5	37.3	47.4	48.4	48.7
ε=0.5	38.3	52.7	31.4	26.5	37.3	38.5	48.3
μ×(1-Gini)	30.4	43.8	24.4	20.4	29.5	31.2	44.3
				Rural			
ε=0	42.1	52.5	36.8	33.7	42.1	43.6	
ε=0.5	31.8	43.4	27.1	23.6	32.1	32.1	
μ×(1-Gini)	24.7	34.7	20.9	18.1	25.1	26.3	
				Urban			
ε=0	60.5	69.8	52.9	58.6	58.4	53.7	
ε=0.5	52.7	64.3	44.4	49.4	50.5	45.0	
μ×(1-Gini)	44.5	56.4	36.1	41.6	42.3	37.6	

*Life Expectancy, Education, Income, Living Conditions, Social Networks.

Each household's HDI= (1/5)×LEI+(1/5)×HEI+(1/5)×IQI+(1/5)×LCI+(1/5)×JPI

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