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Gross National Happiness and Poverty in Bhutan: Applying the GNH Index Methodology to explore Poverty

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Abstract: Bhutan has made great strides in poverty reduction in recent years, meeting key Millennium Development Goals, improving human development outcomes, and moving to the status of a Middle Income Country. In the 10th Plan, Poverty Reduction remains the top priority, as part of a Gross National Happiness Strategy. Poverty is measured mainly by income and MDG indicators. How should measures of poverty relate to Bhutan's Gross National Happiness (GNH) Index? Poverty measures might replicate the GNH Index, or contain a sub-set of its dimensions and indicators, or draw on different indicators altogether. Where should the focus lie? This paper explores that issue using the following structure. First, we present the methodology used to calculate the GNH Index released November 2008. Using data from the pilot survey of the GNH indicators, we first match the indicators and re-calculate the GNH Index using this data. We then calculate a multidimensional poverty measure that replicates the GNH Index exactly in terms of indicators and dimensions, but applies lower thresholds to most indicators. This paper presents a measure of poverty that is exactly parallel to the GNH in order to stimulate discussion and reflection on how a poverty measure should relate to the GNH, and how it should diverge from it.

I Poverty in Bhutan

Reports on Poverty in Bhutan identify strong recent advances in poverty reduction. Unlike other countries in the region, Bhutan is on track to meet most of the MDGs,[2] and has already met several of MDGs, such as halving children who are wasting, as well as those who do not have access to clean drinking water or to sanitation. The areas of special concern are youth employment, women's participation in higher education and senior positions of responsibility, and HIV/AIDS. According to the *Bhutan Living Standard Survey 2007 Report*, income poverty levels have been reduced from 31.7 % in 2003 to 23.2 % in 2006. Economic growth has been strong and stable over 25 years, and has accelerated in recent times. Real growth in 2006/07 was 8.5% and per capita GDP was US$1,414.[3] These are not recent gains; rather attention to poverty has been sustained across time. Bhutan's Human Development Index (HDI) increased from 0.325 in 1984 to 0.581 in 1995, which is a phenomenal increase and not matched by other least developed countries.[4]

Bhutan's 10th Five Year Plan (2008-2013) sets out a series of significant goals. The plan reflects the historic changes in 2008, when the first democratic elections were held, and will be implemented under a new Monarch. In concert with previous plans, it articulates long term development objectives in terms of Bhutan's overarching goal of Gross National Happiness: "the **single unifying idea** that guides the nations long term development is … maximizinig GNH" The goal of GNH was articulated in the *Bhutan Vision 2020 document* as

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[2] Royal_Government_of_Bhutan, 'Bhutan Millennium Development Goals: Needs Assessment and Costing Report (2006-2015)', (November: Planning Commission, 2007a).
[3] Undp, 'Annual Report 2007-08 Undp Bhutan ', (2008).
[4]

"Maximise the happiness of all Bhutanese and to enable them to **achieve their full and innate potential** as human beings."[5] It is also enshrined as principle under *Article 9 of the Constitution.*

As well as happiness, poverty receives significant political attention. The 10th plan "adopted poverty reduction as the overarching theme and primary goal."[6] Reflecting upon the success of past government initiatives, as well as the ongoing aspects of poverty, the 10th plan focuses on *targeted* poverty reduction programmes, which would be implemented "based on a good understanding of localized poverty and development conditions in the various Dzongkhags and Gewogs"[7] These programmes are to be informed by poverty *mapping*, which give an overview of the deprivations faced in different parts of the country.

The Honorable Prime Minister of Bhutan, Lyonpo Kinzang Dorji, articulated the ongoing priority of poverty reduction "Like in the past, the 10th Year Five Plan will continue to be guided by the long term development objective of Gross National Happiness (GNH). Poverty Reduction will remain the immediate objective of the Plan."[8]

Given the close relationship between the overarching objective of Gross National Happiness, and Bhutan's commitment to poverty reduction, we begin with an overview of the Gross National Happiness objective and the GNH index before turning to focus on multidimensional poverty more directly.

II Gross National Happiness Index

IIA Motivation and Dimensions

In the past few years, steps have been taken towards calculating a GNH Index which would draw as fully as possible on the holistic and deliberate vision of development as it has evolved in Bhutan. In a 2007 Government Round Table, Dasho Karma Ura proposed that a GNH index would be used in:
  1. Setting an alternative framework of development
  2. Providing indicators to sector to guide development
  3. Allocating resources in accordance with targets and GNH screening tools
  4. Measuring people's happiness and well being
  5. Measuring progress over time
  6. Comparing progress across the country.[9]

1. Setting an alternative framework of development Bhutan's vision of development is more holistic than western concepts, and incorporates culture and spirituality, ecology, governance, emotional well-being and community, alongside material living standards, health, and

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[5] Royal_Government_of_Bhutan, 'Tenth Five Year Plan [2008-2013]', (1: Gross National Happiness Commission, 2008a) at 16 both quotes.
[6] Ibid. at 22.
[7] Ibid.
[8] Royal_Government_of_Bhutan, 'Bhutan Tenth Round Table Meeting Report ', in Gross Naitonal Happiness Commission (ed.), (Thimphu, 2008b), February 17-18 at 27.
[9] Ibid. at 16.

education. By incorporating non-standard dimensions, GNH acts as an overarching framework and the 10ᵗʰ plan explicitly seeks "to address a more meaningful purpose for development than just the mere fulfillment of material satisfaction."[10] Some of the nine dimensions of the GNH index are not direct objectives of government policy, but are included precisely because if these dimensions contract, or would be crowded out by progress in other areas, the measure would explicitly convey such information, and catalyze a deliberate and public conversation regarding the situation.

2. Providing indicators to sector to guide development Although not all GNH index indicators are direct objectives of government policy, certain indicators form the objectives of particular sectors. For example 'electricity', a component of the GNH index, is a priority in the 10ᵗʰ five year plan. An advance in such indicators will, thus, improve the GNH Index.

3. Allocating resources in accordance with targets and GNH screening tools While the decomposition of the GNH index is not a sufficient guide for policy, a clear understanding of how the *achievements and shortfalls* in different dimensions vary over time provides key information for an analysis that would guide resource allocation.

4. Measuring people's happiness and well being The GNH index and its component indicators seek to capture human well-being in a fuller and more profound way than traditional socio-economic measures of economic development, human development or social progress have done. Unlike the measures of happiness and well-being most widely used in economics – which use data on subjective and emotional well-being alone – in Bhutan all nine dimensions are seen as integral to happiness and well-being. Emotional well-being is only one aspect.

5. Measuring progress over time The component indicators of the GNH were selected such that they will be sensitive to changes over time (flow vs stock). Some but not all indicators are to be directly responsive to relevant changes in policy as indicated in point 2. above.

6. Comparing progress across the country. Insofar as is possible, the component indicators were selected so as to be comparable across the 20 districts in Bhutan, which vary widely in terms of climate, culture, access to services, and livelihoods.

IIB Dimensions of the GNH Index

The nine dimensions used in the 2008 GNH emerged over time. The 10ᵗʰ plan explained the first stage of implementation: "In order to translate the **multi-dimensional concept** of GNH into core objectives … **four strategic areas** were initially defined" (p.16)
    1. Sustainable & equitable socio-economic development
    2. Environmental conservation
    3. Preservation and promotion of culture
    4. Good governance

Subsequently, these four areas were elaborated by the identification of the nine dimensions that comprises the GNH Index. The nine dimensions were selected on *normative* grounds,

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[10] Royal_Government_of_Bhutan, 'Tenth Five Year Plan [2008-2013]', at 15.

and are equally *weighted*, because each dimension is considered to be relatively equal in terms of intrinsic importance as a component of GNH. Within each dimension, several *indicators* were selected that seemed likely to remain informative across time, had high response rates, and were relatively uncorrelated. The dimensions of the GNH index are:

Dimension 1: Psychological Well-being
Dimension 2: Culture
Dimension 3: Time Use
Dimension 4: Governance
Dimension 5: Community Vitality
Dimension 6: Living Standard
Dimension 7: Ecological Diversity
Dimension 8: Health
Dimension 9: Education

IIC Methodology for Calculating the GNH Index

The Gross National Happiness Index released 26 November 2008 is constructed in 2 steps, one of which pertains to identification and one to aggregation.[11] We describe the approach intuitively, then provide the notation and methodology.

Identification: Overview

The *first* step is to define who is happy. This is referred to as identification in the measurement literature, and determined whether each person has sufficient achievements in each of the nine dimensions to be considered 'happy'. For the GNH, identification is accomplished in two steps.

First, a sufficiency cutoff is applied to each dimension. This is a novel step. In poverty measurement, it is quite common to apply a poverty line to distinguish poor from non-poor people or households. Of course poverty lines are imperfect for a number of reasons,[12] but the concept of separating out the poor from the non-poor is well-understood. A *sufficiency cutoff* distinguishes those who have attained a level of achievement that is 'sufficient' for well-being or happiness, from those whose attainments fall short of sufficiency. To construct the GNH we apply a 'sufficiency' cutoff to each indicator. The sufficiency cutoff is set, naturally, at a higher level than a poverty line, and may be set at the top level of achievement, or at some other level that is deemed 'sufficient' for most people.[13] In this paper, a person is identified as having a *sufficient* quality of life if his or her achievements in that indicator meet or exceed the cutoff.

For example, consider a person who is very inquisitive and possibly a bit indecisive, and spends 30 years in various forms of full time education. Let us imagine that the sufficiency cut-off were 21 years. In this case, the perpetual student would be treated as if they had 21 years of education. The achievements *above* the sufficiency cutoff do not *further* increase the GNH index.

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[11] For a detailed justification of this methodology of multidimensional poverty measurement please see Alkire, Sabina and James Foster. 2007. Counting and Multidimensional Poverty. *OPHI Working Paper 7*. www.ophi.org.uk

[12] For example, if the cutoff is set for a *resource* such as income, then any cutoff in that space will be insensitive to the fact that people differ greatly in their ability to convert resources into well-being (Sen 1992); also, the level of attainment that people consider to be sufficient will vary considerably among people and change over time.

[13] For descriptions of the indicators and thresholds please see the Appendix.

The sufficiency cutoffs are applied as follows: the value of each indicator in which a person attains sufficiency is given a 0. All achievements that are less than sufficient are replaced by the 'normalized gap'. The level at which the sufficiency cutoff is set is a value judgment, which can be a topic for public discussion, but the fact that it may be difficult to set an exact cutoff should not obscure the reasonableness of setting *some* sufficiency cutoff.

In terms of the second cut-off that completes identification in multidimensional space (Alkire and Foster 2007), the GNH Index adopts what is known as the 'union' approach to identification in the literature on multidimensional measurement. According to the union approach, *any* shortfall from sufficiency that any person experiences in any indicator within any dimension is considered to depress Gross National Happiness. A person who has achieved sufficiency in all nine dimensions is considered happy.

Aggregation

To calculate the GNH Index, the data of the population are aggregated into three decomposable measures. The first of these is the 'Adjusted Headcount' M_0. It is constructed by multiplying *HA,* where *H* is the *headcount* and represents the *percentage* of people who have not achieved sufficiency. *A* is the average proportion of dimensions in which people do not achieve sufficiency.

The Adjusted Headcount is subtracted from 1 to obtain the GNH_0

$$GNH_0 = 1 - HA \qquad (1)$$

The second of these is the 'Adjusted Sufficiency Gap' M_1. It is constructed by multiplying M_0 by *G* where *G* is the average 'depth' or normalized gap from sufficiency people experience.

The Adjusted Sufficiency Gap is subtracted from 1 to obtain the GNH_1

$$GNH_1 = 1 - HAG \qquad (2)$$

The third measure is the 'Adjusted Squared Gap M_2' measure that is sensitive to the 'depth' as well as 'breadth' of achievements (Alkire and Foster 2007). It is constructed by multiplying *HA* times *S,* where *S* is the severity, or average squared proportionate 'depth' of shortfall from sufficiency people experience.

The Adjusted Squared Gap is subtracted from 1 to obtain the GNH_2. *GNH = 1-HAS*.

$$GNH_2 = 1 - HAS \qquad (3)$$

<mark>*Insert summary of the GNH Index*</mark>

We now present the methodology with the notation.

Methodology

Let $M^{n,d}$ denote the set of all $n \times d$ matrices, and interpret a typical element $y \in M^{n,d}$ as the matrix of achievements of n people in *d* different dimensions. For every $i = 1,2,...,n$ and $j = 1,2,...,d$, the typical entry y_{ij} of *y* is individual *i*'s achievement in dimension *j*. The row

vector $y_i = (y_{i1}, y_{i2},....,y_{id})$ contains individual i's achievements in the different dimensions; the column vector $y._j = (y_{1j}, y_{2j},....,y_{nj})'$ gives the distribution of ssachievements in dimension j across individuals. Let $z_j > 0$ be the deprivation cutoff value (or poverty line) in dimension j. The sum of entries in any given vector or matrix v is denoted by $|v|$, while $\mu(v)$ is used to represent the mean of v (or $|v|$ divided by the number of entries in v).

For any matrix y, it is possible to define a matrix of deprivations $g^0 = [g_{ij}^0]$, whose typical element g_{ij}^0 is defined by $g_{ij}^0 = 1$ when $y_{ij} < z_j$, and $g_{ij}^0 = 0$ when $y_{ij} \geq z_j$. That is, the ij^{th} entry of the matrix is 1 when person i is deprived in dimension j, and 0 when he/she is not. It is also possible to define a matrix of normalised gaps $g^1 = [g_{ij}^1]$, where the typical element $g_{ij}^1 = (z_j - y_{ij})/z_j$ when $y_{ij} < z_j$, and $g_{ij}^1 = 0$ otherwise. The entries of this matrix are non-negative numbers between 0 and 1, and each non-zero entry gives the extent of the insufficiency experienced by person i in dimension j. That is, the ij^{th} entry of the matrix is $(z_j - y_{ij})/z_j$ when person i has insufficient achievements in dimension j, and 0 when the person has reached the level that is set as sufficient for happiness.[14]

Following the methodology to identify the multidimensionally poor proposed by Alkire and Foster (2007), let ρ_k be the identification method such that $\rho_k(y_i, z) = 1$ when $c_i \geq k$, and $\rho_k(y_i, z) = 0$ when $c_i < k$. That means that a respondent is identified as not having achieved happiness if he or she does not have sufficiency in at least k dimensions. This methodology is said to be a *dual cutoff* method, because it uses the *within dimension* cutoffs z_j to determine whether a person has achieved sufficiency or not in each dimension, and the *across dimensions* cutoff k to determine who is to be considered as having insufficient happiness overall. This identification criterion defines the set of people who have not achieved sufficiency as $Z_k = \{i : \rho_k(y_i; z) = 1\}$. Once identification is applied, a censored matrix $g^1(k)$ can be obtained from g^1 by replacing the ith row with a vector of zeros whenever $\rho_k(y_i, z) = 0$. In this case, we use the union method of identification, which means that any shortfalls that any person experiences from sufficiency in any indicator of any dimension diminishes the person's measured happiness. In a union situation of identification, no censoring is required, because all people who have achieved happiness, already have zero entries.

In terms of aggregation, we first construct an Adjusted Sufficiency Gap, given by $M_1 = \mu(g^1(k)) = HAG$, which is the sum of the normalised gaps of those people who do not enjoy sufficiency in any indicator ($|g^1(k)|$) divided by the highest possible sum of normalised gaps (nd). It can also be expressed as HAG where H is the Headcount Ratio

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[14] Matrix $g^\alpha(k)$ could be defined analogously for $\alpha > 0$, with its typical entry $g_{ij}^\alpha(k) = g_{ij}^\alpha$ if i is such that $c_i \geq k$, while $g_{ij}^\alpha(k) = 0$ if i is such that $c_i < k$.

$H = H(y;z)$ defined by $H = q/n$, where q is the number of people in set Z_k. A is the average deprivation share across the poor, which is given by $A = |c(k)|/(qd)$. In words, A provides the fraction of possible dimensions d in which the average multidimensionally poor individual is deprived. G is the average poverty gap, which is given by $G = |g^1(k)|/|g^0(k)|$. M_1 summarises information on the incidence of insufficiency, the average proportion of dimensions in which a person has not achieved sufficiency and the average depth of shortfall houses who are not fully happy. It satisfies not only *dimension monotonicity*[15] but also *monotonicity*: if an individual becomes more deprived in a certain dimension, M_1 will increase.

In terms of aggregation, we next construct an Adjusted Sufficiency Gap, given by $M_2 = \mu(g^2(k)) = HAS$, which is the sum of the squared normalised gaps of those people who do not enjoy sufficiency in any indicator ($|g^2(k)|$) divided by the highest possible sum of normalised gaps (nd). It can also be expressed as HAS where H is the Headcount Ratio $H = H(y;z)$ defined by $H = q/n$, where q is the number of people in set Z_k. A is the average deprivation share across the poor, which is given by $A = |c(k)|/(qd)$. In words, A provides the fraction of possible dimensions d in which the average multidimensionally poor individual is deprived. S is the average severity, which is given by $S = |g^2(k)|/|g^0(k)|$.

As M_1 and M_2 both focus on shortfalls from sufficiency, or happiness, the GNH is constructed by subtracting these from unity; that is, it is 1- M_1 and 1-M_2.

Both measures, M_1 and M_2, like all members of the $M_\alpha(y;z)$ family, are decomposable by population subgroups. Given two distributions x and y, corresponding to two population subgroups of size $n(x)$ and $n(y)$ correspondingly, the weighted average of sum of the subgroup poverty levels (weights being the population shares) equals the overall poverty level obtained when the two subgroups are merged:

$$M(x, y; z) = \frac{n(x)}{n(x, y)} M(x;z) + \frac{n(y)}{n(x, y)} M(y;z)$$

Clearly, this can be extended to any number of subgroups.

Additionally, once the identification step has been completed, all members of the $M_\alpha(y;z)$ family can be broken down into dimension subgroups. To see this, note that the measures can be expressed in the following way: $M_\alpha(y;z) = \sum_{i=1}^{n} \mu(g_{*j}^\alpha(k))/d$, where g_{*j}^α is the jth column of the censored matrix $g^\alpha(k)$. In our case, because we have used the union approach to identification, this second stage also represents full decomposability in terms of dimensions. Thus $(\mu(g_{*j}^\alpha(k))/d)/M_\alpha(y;z)$ is the contribution of dimension j to the overall shortfalls in gross national happiness. Itemizing these shortfalls clearly provides information that can be useful for government policy.

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[15] Alkire and Foster (2007) define the axiom formally and explains the intuition thus: *Dimensional monotonicity* specifies that poverty should fall when the improvement removes the deprivation entirely." In other words, if a person who was deprived in 4 dimensions is now deprived in 3 dimensions only, by dimensional monotonicity, poverty should fall.

III Multidimensional poverty: rationale and contribution

Given the clarity and consideration that has been given to the GNH Index, and given that the current priorities of poverty reduction are also to occur under the overarching objective of maximising GNH, it seemed worth considering the relationship between poverty measurement and GNH.

In 2000, the National Statistics Bureau (NSB) undertook a Household Income and Expenditure Survey, and in 2003 and 2007, the NSB it implemented a Bhutan Living Standards Survey (BLSS). The BLSS 2007 has a stronger sampling frame, as it was based on the first Population and Housing Census of Bhutan in 2005. The NSB has published two *Poverty Analysis Reports*, which present analyses of each BLSS, the first in 2004 and the second in 2007.

The 2007 *Poverty Analysis Report* defines poverty as 'a multi-dimensional phenomenon'. Poverty is "a deprivation of the basics of life… This deprivation includes not just insufficient consumption (and income) but also lack of opportunities and assets, inadequate education, poor health and nutrition, lack of sanitation, insecurity, and powerlessness".[16] The report thus covers both consumption and non-consumption poverty (including education, health, economic activities, and physical infrastructure). The 2007 report selected per capita consumption as an overall welfare indicator, and set a total poverty line, comprising a food poverty line and some basic non-food items, and prices were adjusted for the cost of living in different districts. The poverty incidence, depth, and severity were all calculated by the standard Foster Greer Thorbecke methods,[17] as were indices of inequality. For the non-consumption data, descriptive statistics were presented, disaggregated by rural and urban areas. This report, and other studies on Bhutan's progress on the MDGs, provide an overview of the different components of poverty across the country.

The current poverty analysis in Bhutan raises two questions:
1. Would there be additional value in generating a multidimensional poverty measure?
2. How does Bhutan's poverty reduction activity relate to GNH?

On the first question, the potential advantages of moving to a multidimensional poverty measure are the following. First, the data on each individual dimension is retained and may be descriptively presented, thus no information is lost. Second, descriptive data are unable to reveal the *multiplicity* of deprivations that people suffer. Suppose we have six dimensions, in which 5% of the population are deprived in each dimension. How are these deprivations distributed? A situation in which 30% of people suffer two deprivations each is very different from one in which 10% of the population suffer six deprivations each. Yet the aggregate data for each indicator are not necessarily able to distinguish these two situations. Third, a decomposable multidimensional measure will be able to show how the components of poverty vary in different districts or for different population subgroups, and also to track changes in the composition of poverty over time. For this reason, in an earlier paper two of the authors explored the insights that emerge from the construction of an exploratory

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[16] Royal_Government_of_Bhutan, 'Poverty Analysis Report 2007', (National Statistics Bureau, 2007b) at 4.
[17] James Foster, Joel Greer, and Erik Thorbecke, 'A Class of Decomposable Poverty Measures', *Econometrica,* 52/3 (1984), 761-66.

multidimensional poverty measure using the 2007 BLSS data set.[18] That paper established that there did seem to be additional value in undertaking a multidimensional analysis, precisely because the constituents of poverty in Bhutan did vary significantly by district.

The second question is how Bhutan's poverty reduction activities relate to the GNH. One plausible interpretation would be to say that Bhutan's poverty reduction activities focus on a subset of the GNH dimensions, namely Health, Education, and Living Standard (including infrastructure and economic activities). Such an approach has the advantages of clarity, as fewer dimensions and indicators are involved. It retains the ethical and normative momentum of the GNH, as each dimension has already been defended in the GNH. Also, it is not necessary to incorporate other dimensions into the *measure* in order to take them into account in poverty reduction processes. Further, each of the dimensions is a policy goal, and thus advances would be expected to affect the poverty measure directly. Finally, as each dimension is a part of the GNH, an advance in poverty reduction would advance GNH.

However there are a few difficulties with the argument above. First, as is well known internationally, many poverty projects have failed directly because they have not taken into consideration the cultural and relational characteristics of the communities concerned. Thus although culture may not be the direct objective of poverty reduction strategies, addressing cultural practices *is* instrumentally key to cost-effective responses to poverty.[19] Second, it is just possible that in some situation, a minor *advance* in health, education, or living standard could be accompanied by a very significant *decline* in community vitality, or culture, or psychological well-being, and thus an advance in poverty reduction would go alongside a *reduction* in GNH. Hence it might be useful to maintain a few indicators that are wider than direct poverty objectives, and very sensitive to *contractions* in other dimensions, so that such divergences could be noted early and addressed directly. A third plausible position might hold that if GNH is the overarching objective of Bhutan's development strategy, then in the interests of coherence, the measurement of poverty should mirror the GNH exactly, and simply set a lower poverty threshold in each dimension. In this way any changes in any of the GNH dimensions would be tracked alongside changes in poverty outcomes. Given that many of the GNH dimensions such as psychological well-being, culture, and community vitality, might be expected to be rather stable, then including them would not obscure advances from poverty reduction.

In the interest of engaging with these four plausible responses, and clarifying other considerations, this paper develops a multidimensional poverty index that uses all of the GNH indicators, but sets a poverty-cutoff rather than a sufficiency-cutoff for each dimension. The reason for doing so is to clarify the strengths and weaknesses of having a multidimensional poverty measure of such breadth, in comparison with an measure that is confined exactly to the domains and variables of interest.

IV Data, Indicators and Cutoffs

The dataset used is the pilot data for the Gross National Household Survey. It was completed in 2007 for 350 persons. Of these 303 persons provided sufficient data on our

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[18] Santos & Ura 2008.
[19] Vijayendra Rao and Michael Walton, *Culture and Public Action* (Stanford: Stanford University Press, Stanford Social Sciences, 2004).

questions to be included in this study. The survey was conducted in nine *Dzongkhag* (districts): Paro, Punakha, Thimphu, Trongsa, Bumthang, Mongar, Lhuentse, Chhukha (Phuentsholing) and Sarpang. The data are not representative and all of the analysis is for illustrative purposes only.

The unit of analysis is the person. Most of the indicators do indeed pertain to the person; however some pertain to the household and thus would be expected to be common across all respondents in the household.

Insofar as was possible, the indicators match exactly the indicators of the Gross National Happiness Index. In some cases the exact indicator was not available, and so a substitution was made. The GNH index and poverty index in this paper are computed using 57 indicators in 9 dimensions available from the pilot data. For each *indicator*, a cutoff is set. The level of this cutoff is set lower, in most variables, to demarcate not sufficiency but poverty with respect to each indicator. It is the different level of cutoff that distinguishes this poverty index from the GNH, as well as the fact that the poverty index is presented directly, and not subtracted from unity.

The GNH index, as was mentioned above, used the union approach. That is, it set $k = 1$. As this is an exploratory analysis, we instead report the full range of k values rather than selecting just one.

The definition of what is 'enough', and what constitutes 'poverty' is an ethical or normative judgement. Thus the cutoffs are to be set according to moral or ethical assessments. In this paper the poverty cutoffs are presented clearly precisely so that they may be critically scrutinized in terms of their normative adequacy and, where appropriate, improved in future analyses.

Appendix 1 gives the indicators used, as well as both the sufficiency and the poverty cutoffs, and also identifies the indicators that could not be matched exactly, and what approximations were substituted instead.

There is one important nuance in the interpretation of this multidimensional poverty measure which is important to keep in mind in interpreting the charts below. Recall that there are 57 indicators grouped into nine dimensions, with each indicator within a dimension being equally weighted. The number of indicators per dimension range from two (ecology) to 13 (culture). One possible way to apply the k cutoff would be to identify a person as deprived in *each* dimension if, for example, they were poor in all, or in a given percentage, or in at least one indicator of that dimension. The other possible method, which we have chosen, is to calculate the measures using all weighted indicators. This has the positive effect of not introducing any particular weighting structure within a dimension. It also means that if a person is described as being deprived in at least one dimension, what this in fact means is that they are deprived in a set of indicators that adds up to 1/9 of the total indicator weights. In matter of fact, *these indicators may be drawn from a range of dimensions*, rather than any single dimension. For that reason rather than presenting headcount by dimension, we present headcounts by indicator. This ambiguity is solved when we scrutinize the components of multidimensional poverty, as we can easily break the measure down by dimension and see transparently which indicators contribute most to multidimensional poverty.

V Results

We begin by exploring the deprivations in each indicator and in each of the nine dimensions. Using the poverty lines, we find that 14% of people are poor in *all* of the time use indicators, and 17% are poor in *all* of the education indicators; no person is poor in all indicators in any other dimensions. However as the number of indicators varies across dimensions, the analysis of specific deprivational headcounts is clearer if we investigate the indicators directly, rather than focus only on the dimensions.

Table 1, below, provides the headcount of deprivation for each indicator using each of the two cutoffs: the GNH 'sufficiency' cutoff, and the poverty cutoffs. In some cases both cutoffs are identical. This occurred either when a variable was dichotomous (literacy), or when a national standard was used (income poverty line). The indicators are ranking in decreasing headcount according to the sufficiency cutoff. As is apparent, income, culture, and educational indicators in particular have significant headcounts.

Table 1

% of Deprived People in Each Indicator with Happiness and Poverty Thresholds

Traditional Sports
Meditation
Social & Cultural Activities
Feeling enough time
Health Status
Knowledge of Local Legends
Knowledge of Traditional Dances
Household Income
Money Donated
Neighbours help each Other
Socializing with friends
Trust your Neighbour
Years of Education
Ecological Issues
Understand Lozey Exchange
Religious influence on values
Gov Perf Gap Rich-Poor
Relatives in the Community
Emotions
Safety in Neighbourhood
Literacy
Minutes to Health Centre
Consider Karma
Prayer Recitation
Help on daily Chores
Family Harmony
Healthy Days
AIDS Knowledge
Knowledge of Traditional Arts
Gov Perf Fight Corruption
Free from Discrimination
Not enough money for house maintenance
Freedom of Speech
Justification of Lying
People per Room
Justification of Killing
Enough Income for everyday needs
Disability
Mental Distress
Not enough money for clothes
House Tenure
Reciprocity
Trust District Administration
Community Tensions
Not enough money for festivals
Justification of Stealing
Waste Disposal
BMI
Children learn Impartiality
Knowledge of first language
Sucidal Thoughts
Trust Media
Not enough money for food
Trust Central Ministries
Victim of Crime
Children learn Discipline

Indicator

0.00   20.00   40.00   60.00   80.00   100.00   120.00

% of Deprived People

■ Deprivation Headcount (Happiness Lines) ■ Deprivation Headcount (Poverty Lines)
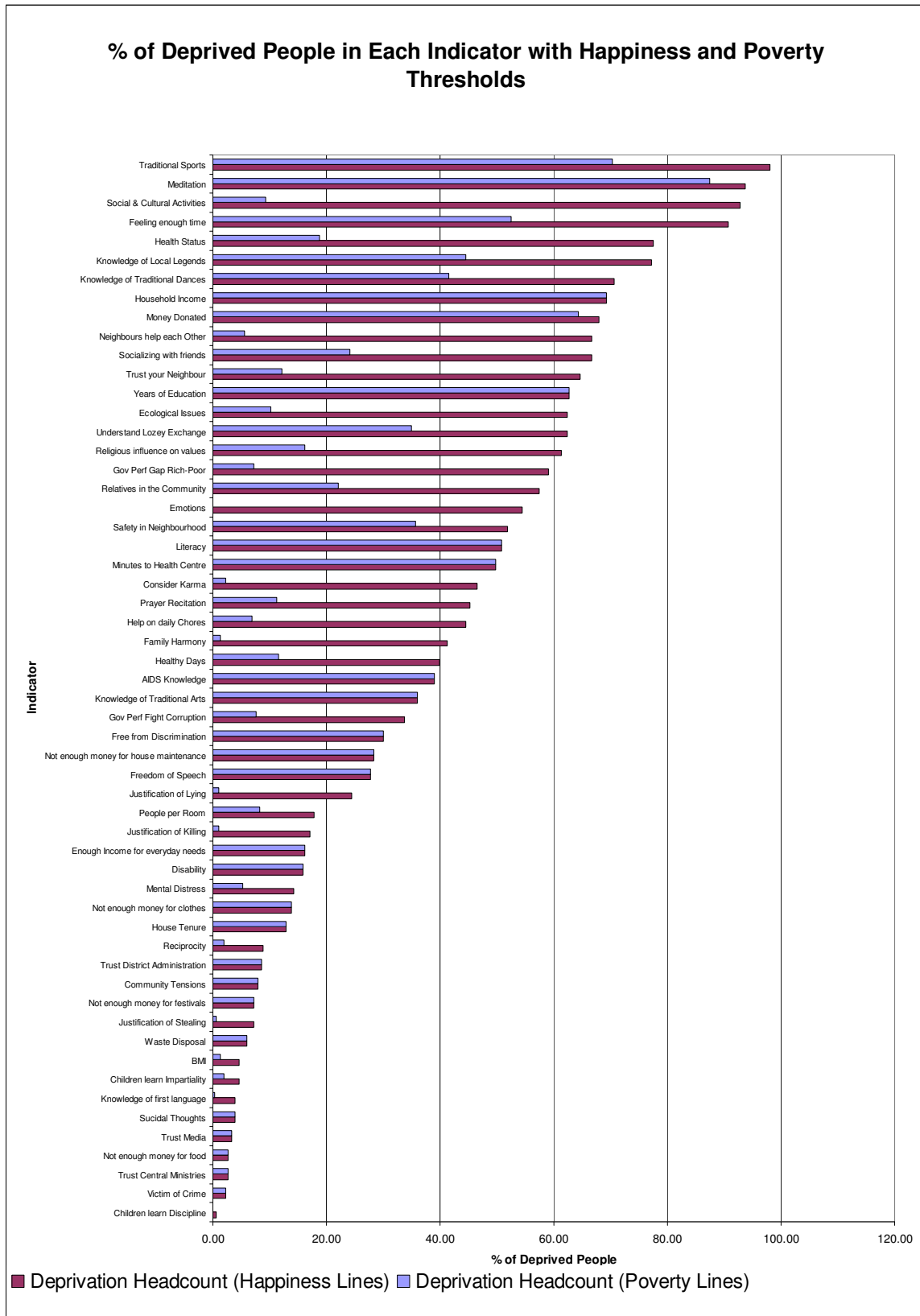
Table 2 presents the headcount H of multidimensional poverty, and of multidimensional insufficiency, across different breadths of poverty. On the horizontal axis we have plotted the minimum number of dimensions in which a person must be deprived in order to be considered as poor, or having insufficient happiness. That is, when $k = 1$, any person that is deprived in one dimension is considered to be poor, and we see that over 85% of the respondents are poor according to this standard. In fact, such high levels of apparent poverty using a union approach are not uncommon. In an Indian study with 10 dimensions, 97% of the rural population was deprived in at least one dimension (Alkire and Seth 2008). However when $k = 2$, we are now focusing only on those people who are deprived in at least two dimensions, and the headcount drops dramatically to 50%. When we consider only those people who are deprived in at least three dimensions, multidimensional headcount poverty is only 10%. Unusually, no person is deprived in five or more dimensions - a fact that requires further study. Thus we can see that although using $k=1$, the headcount appears quite high, in fact the *density* of poverty deprivations in Bhutan is unusually low. In contract, we can see that 100% of the population have not achieved sufficiency in at least 1.5 dimensions, hence the density or average number of shortfalls from sufficiency is higher for all people, although when it does decline, the decline roughly parallels that for poverty.

Table 2
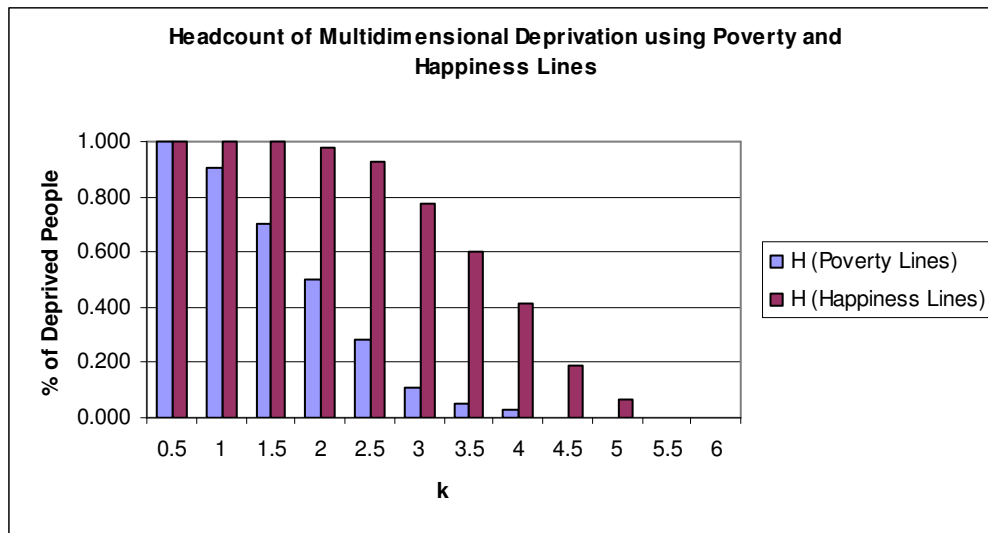
Tables 3, 4 and 5 present the M_0, M_1, and M_2 measures respectively. In policy work, only one of these will be reported. However the distinction between them is quite interesting. As is expected, the *values* of the measures decrease monotonically, with $M_0 > M_1 > M_2$ (note that the scale of the left hand axis changes in the graphics). The happiness measures decline at a higher k level than the poverty measures. This indicates the fact that the *number* of shortfalls from sufficiency is higher, as noted above. Also, the distance between the happiness measure and the poverty measure is progressively reduced.
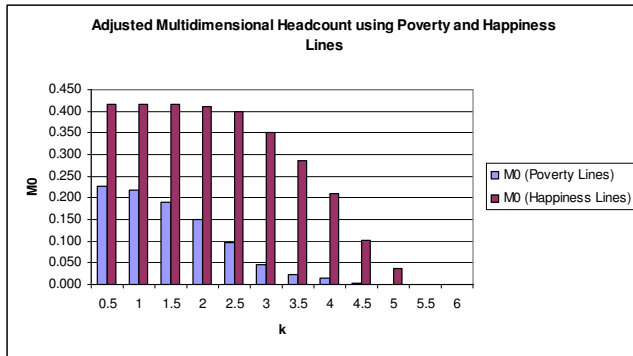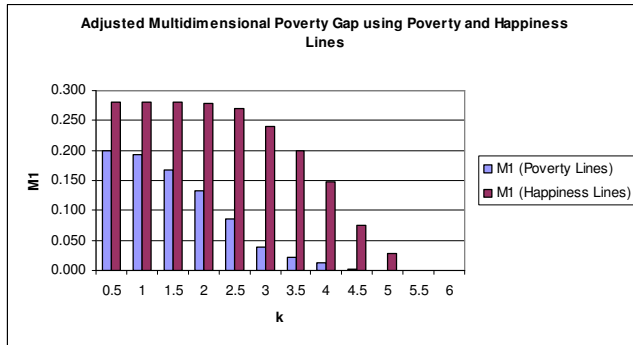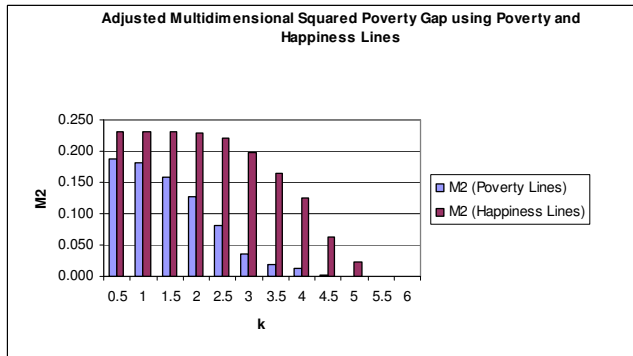
Table 3

Adjusted Multidimensional Headcount using Poverty and Happiness Lines

Table 4

Adjusted Multidimensional Poverty Gap using Poverty and Happiness Lines

Table 5

Adjusted Multidimensional Squared Poverty Gap using Poverty and Happiness Lines

The next step is to decompose the poverty measure by dimension. As this is a research exercise, we do not at the moment choose a value of *k* but rather decompose the measure across the entire range of poverty cutoffs. The insights that obtain from doing so are that we can understand the core deprivations among the most multiply deprived. As the value of *k* rises, it is as if we are focusing a magnifying glass upon the people who are most deprived in the sense that they are deprived in many dimensions, and caught in poverty traps.

What is clear from the decompositions is that education poverty and time use poverty, contribute significantly to multidimensional poverty. Their impact is relatively largest both among the first two columns (those who are deprived in at most one dimension), and in the later columns (those who are deprived in 3 or 4 dimensions). Among the poorest poor, the relative contribution of ecological deprivation, and community deprivations, is slightly higher

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than among those who are less deprived. Recall that M_1 adds in the *depth* of deprivations, and M_2 adds in also a consideration of equality, in that it gives added emphasis to those who are most deeply deprived within a dimension. What we can notice is that education deprivations sharpen considerably in M_1 and M_2 progressively, at different cutoff levels, whereas the contribution of time use deprivation decreases. Among the other dimension, psychological well-being, culture and governance increase slightly, and the contribution of deprivations in living standards and health decrease slightly. The relative contribution of dimensions is more or less consistent across different levels of k cutoff, demonstrating once again the relative robustness of that second cutoff point.

Tables 6-8
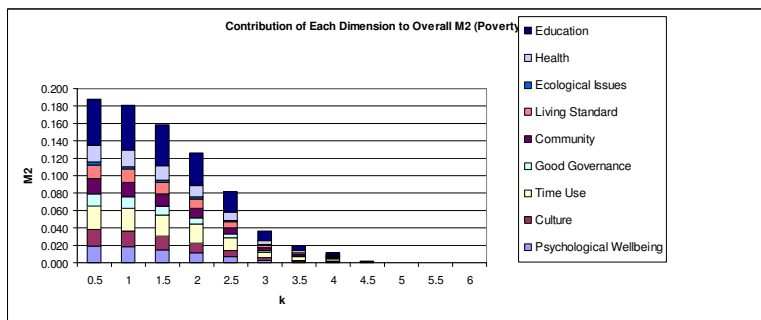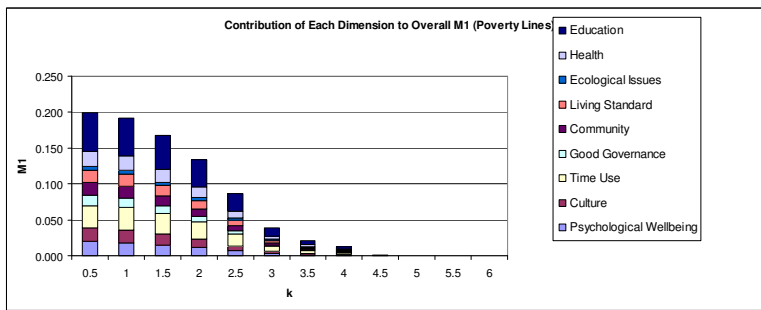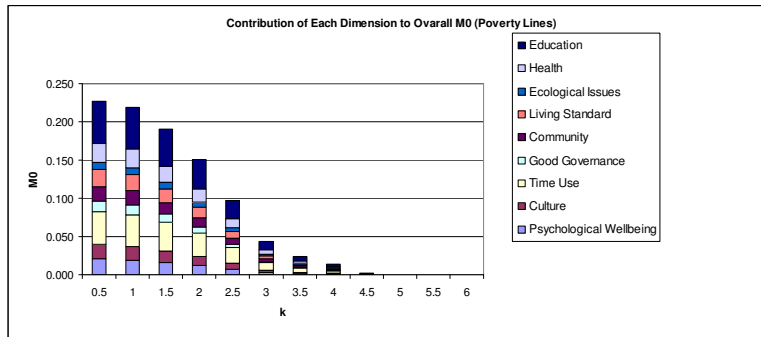
The final analysis is to compare multidimensional poverty by gender. The results are striking. We find that female poverty is higher than male poverty both in terms of headcount and for all the multidimensional poverty measures. Furthermore, women's poverty is increasingly strong in M_2 and also as the value of k increases. For example, 73% of those who suffer at least three deprivations are women, as compared with 27% men. Furthermore, whereas among the headcount of those with 1 deprivation, 53% were women and 47% were men. Among the corresponding M_2 figure, 58% are women, and 42% are men. The increasing

relative contribution of female poverty indicates that even when the *number* of deprivations is the same for men and women, the *depth* of women's poverty is greater than that of men.

VI Conclusion

In sum, this paper has explored a methodology for measuring and tracking poverty in Bhutan that is consistent with Bhutan's objective of gross national happiness. The dataset used in this paper was the pilot data for the GNH survey, and is not nationally representative, thus the results presented here are for illustrative purposes only. However they demonstrate that the decomposition of the GNH poverty data are of interest, and that core priorities such as education are emphasised. They also draw attention to the higher deprivation of women, and the specific characteristics of women's poverty. Further, the variables for some dimensions, such as health, will be improved in the future. The main innovation of this paper is not its results, but rather its methodology. Were such an approach adopted, we suggested that it might be worth considering a slightly narrower set of variables, and a method of identification that is more stringent than the union method.

Alkire, Sabina and Foster, James (2007), 'Counting and Multidimensional Poverty Measures', *OPHI working paper series,* (7).

Foster, James, Greer, Joel, and Thorbecke, Erik (1984), 'A class of decomposable poverty measures', *Econometrica,* 52 (3), 761-66.

Rao, Vijayendra and Walton, Michael (2004), *Culture and public action* (Stanford: Stanford University Press, Stanford Social Sciences).

Royal_Government_of_Bhutan (2007a), 'Bhutan Millennium Development Goals: Needs Assessment and Costing Report (2006-2015)', (November: Planning Commission).

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Appendix 1. **SUMMARY OF INDICATORS AND THRESHOLDS**

(Note that two variables that have a reverse scale meaning that 'more is worse'. In those cases the reciprocal of the variable has been used: x'=1/x, as well as the reciprocal of the poverty line: z'=1/z.[20] The variables are: people per room and minutes away from the health centre)

Indicator	Range	GNH Threshold	Poverty Thres.
Dimension 1: Psychological Wellbeing		**Deprived if Variable<Threshold**	
1. n_hhq (Index of Mental Distress)	1 (worst)-37(best). Categories: 22-37 Normal 17-21 Some distress 1-16 Severe distress	22	17
2. Suic1 (Consider commiting suicide)	1(worst)-2 (best)	2	2
3. n_emotions (frequency with which they experience good and bad emotions, 6 in total-recoded in the same direction)	1(worst)-13 (best)	10	4
4. Spirit4 (recite prayers)	1 (worst)-3 (best)	3 (occasionally)	2
5. Spirit5 (meditation)	1 (worst)-3 (best)	3 (occasionally)	2
6. Spirit11 (consider Karma)	1 (worst)-3 (best)	3 (occasionally)	2
Dimension 2: Culture			
7. Know1 (knowledge about traditional dances)	1 (worst)-3 (best)	3	2
8. Know10 (knowledge about local legends)	1 (worst)-3 (best)	3	2
9. Lozey2 (understand lozey exchange)	1(worst)-4 (best)	3	2
10. Value8 (Importance of reciprocity)	1 (worst)-4(best)	3	2
11. Cvalue21 (if killing can be justified)	1(always) – 3(never)	3	3
12. Cvalue25 (if stealing can be justified)	1(always) – 3(never)	3	3
13. Cvalue26 (if lying can be justified)	1(always) – 3(never)	3 (never)	3
14. Cvalue37 (how important it is that children are encouraged to learn discipline at home)	1 (not imp)-4(very imp)	3 (important)	2
15. Cvalue 45: (how important it is that children learn impartiality towards rich, poor, different status at home)	1 (not imp)-4(very imp)	3 (important)	2
16. Cvalue60 (if religious figures influenced your values)	1 (no influence)-3(major influence)	3 (major influence)	2
17. Sport1 (how often played traditional sports). Built with variables Local22-28	1(never)-4(more than once a week)	4	2
18. Local29 (days spent in a year attending social and cultural activities)	1 (none)-5(+20 days)	5 (+20 days!)	2
19. Primla4 (how well can you speak your first language)	1 (not at all)-4(very well)	4 (Very well)	3
Dimension 3: Time Use			
20. Tusoc2 (how often socialize with friends)	1 (never)-4(few times a week)	4 (few times/week)	2
21. Enough Time (Number of "No" answers to questions on feeling that they do not have enough time). Variable different to the ones used in the national survey. In the survey they use 'tothou' and 'sleep'.	0 (worst, equivalent to feeling in many ways that time is not enough)-7(best outcome: never having that feeling)	7 (never feeling short of time)	4 (feeling short of time in 3+ questions)
Dimension 4: Governance			
22. Centra2 (Government performance at reducing the gap betw rich and poor)	1 (poor)-3(excellent)	3	2
23. Centra6 (Government performance at fighting corruption)	1 (poor)-3(excellent)	3	2
24. Rights2 (Do you feel freedom of speech and opinion)	1 (no)-2(Yes)	2	2
25. Rights9 (Do you feel free from discrimination based on race, sex, religion, language, politics or other status?)	1 (no)-2(Yes)	2	2
26. Govtr6 (trust central ministries)	1(distrust), 2(trust)	2	2
27. Govtr9 (trust districts admin)	1(distrust), 2(trust)	2	2
28. Govtr16 (trust Media)	1(distrust), 2(trust)	2	2

[20] It would also be possible, and perhaps more desirable, to set a maximum level that would endure across time, and undertake reverse scaling by subtracting each value from the maximum. This would not introduce the under-emphasis on higher values of deprivation that the reciprocal introduces.

Indicator	Range	Threshold. used by GNH Index	Poverty Threshd
Dimension 5: Community			
29. Safety1 (how safe do you feel walking alone at night in your neighbourhood after dark?)	1 (rarely), 2(usually), 3(always)	3	2
30. ss2: (how often do you have support to do the daily chores?)	1 (none), 2(sometimes), 3(most of the time)	3	2
31. Comm11 (how many relatives live in the same community?)	1 (none)-5(all)	4 (most)	2
32. Comm7 (is this a neighbourhood where people help each other?)	1 (never)-4 (always)	4 (always)	2
33. n_don (Amount of money donated to different institutions). (Adapted to be similar to the one used with the national survey)	Continuous-money	10% if household income	5% of hh inc.
34. Voldays (number of days spent in volunteer work per year). *This variable was dropped due to missing data.*	Continuous-days	11.62	4
35. Crime1 (have you been a victim of crime in the last 12 months)	1:yes, 2: No	2	2
36. n_fam (level of agreement with different types of assertions on family. Coded in the same direction, from worst to best).	1 (worst)-11(best)	11	6
37. trust4 (how much do you trust your neighbour?)	1 (none)-4(most of them)	4 (most of them)	2
38. Enmity1 (Are there tensions in your community between different groups, or dispute between different neighbours?) (Adapted to be similar to the one used with the national survey)	1: yes 2: no	2	2
Dimension 6: Living Standard			
39. Finsec2 (How well does your total income meet your everyday needs for food, shelter and clothing?	1 (not enough)-3(more than enough)	2	2
40. n_income (household income including in kind transfers)	continous	13,163 Nu per capita per year	13,163 Nu per capita per year
41. n_room_ratio (people per room) The reciprocal of this variable is used (number of rooms per people) to calculate the gaps.	Continuous 1 to 9 people per room.	2 people per room	3 people per room
42. htenure (household tenure)	1: rented 2: owned	2	2
43. fs1 (in the last 12 months, did you cut the size of your meals or skip them because there wasn't enough food or money for food?)	1: Yes 2: No	2	2
44. Finsec31 (in the last 12 months bought 2nd hand clothes to keep costs down)	1: Yes 2: No	2	2
45. Finsec 35 (could not contribute to community festivals)	1: Yes 2: No	2	2
46. Finsec40 (postponed urgent repairs and maintenance of your house)	1: Yes 2: No	2	2
Dimension 7: Ecology			
47. Ecoissues: Number of issues (from1 to 5) that are NOT ecological problems in the area. Covers land degradation, quality of water, air pollution, climate change and lost of biodiversity. Variable was included in place of 'envissues' in the national survey.	0 (worst outcome, the 5 issues are ecological problems)-5 (best outcome, none of the issues is an ecological problem)	5 (equivalent to none issue being a problem)	3 (equivalent to 2 out of 5 issues being a problem)
48. Waste4 (How do you dispose your household waste?) (Adapted to be similar to the one used with the national survey)	1: 'dump on land open' (worst outcome), 2:dump in forest, 3:dump in rivers/streams, 4: municipal garbage pick up, 5:composting and burning	4 (municipal pick up)	4

Indicator	Range	Thres. used by GNH	Pov. Thres.
Dimension 8: Health			
49. hstatus (self reported health)	1: fair poor – 3: excellent	3	2
50. n_healthydays (30-sickdays) Number of healthy days in a month	0-30	30	15
51. BMI	5-40 (sample variability)	Low bound:18.5	17 For <19 see above
52. Aids1 (Do you know how HIV/AIDS is transmitted?) The question is slightly different in the pilot survey: STD: During the past 12 months, have you received any education or read any material about how to prevent AIDS/HIV or other sexually transmitted diseases?1: No 2: Yes	1: No 2: Yes	2	2
53. Disability (Do you have any long term disability, health problems or mental problems?	1: Yes 2: No	2	2
54. Barrier6: (How long does it take you to walk to the nearest health centre?) (in minutes). We use the reciprocal to calculate the gaps.	Continuous: 0-900 minutes	30	30
Dimension 9: Education			
55. n_literacy	1: Illiterate 2: Literate	2	2
56. n_edu (years of education)	Continuous 0-20	6	6
57. n_zorig (number of traditional arts the person knows) (goes here or in education?	0-13	1	1