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An index to Measure Socio Economic Status: Asset Approach

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Abstract

Objective: To develop an index to measure socio economic status using information on household assets.

Methodology: A set of standardized asset item weights, which would be finally summed up to generate an asset index for each household was computed. These standardized asset item weights were calculated by multiplying the factor score coefficients corresponding to each asset item by the standadized values (Z scores) of those asset items measured in the binary scale. Household asset data collected in the DHS survey 2000 was used in the calculations.

Results: The standardized asset item weights corresponding to different asset items, quintile cut off points of the asset index that could be used to measure socio economic status were presented.

Conclusion: The asset index could be viewed as a valid, reliable, and more feasible method of measuring socio economic status using only five simple questions.

Introduction

Socio economic status is an important background variable in health research. The traditional approach for measuring socio economic status, such as measuring income and expenditure patterns needs a high degree of expertise, and complex survey instruments. Further, the declared information used in traditional approach is frequently criticised for accuracy and reliability. A relatively new methodology, the asset approach, which considers the assets (possessions) of a household as proxies of it's socio economic status is considered to be simple and free from above problems. Household assets are shown to relate quite closely with income and expenditure. Assessing these variables is much easier, quicker, more objective and reliable than assessing income or expenditure[1].

The objective of this article is to describe the procedure of adapting the asset approach and identifying the standardized asset item weights to suit the current Sri Lankan context. As will be described in the text, the asset item weights identified in this study could be directly applied on the asset characteristics of households identified in other sample surveys to measure their socio economic status.

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Methodology

The asset approach uses an asset index (a composite score) to measure the socio economic status. The asset index was computed by summing up a number of standardized asset item weights which reflect the presence or absence of each asset item in a particular household. This index was considered as a proxy reflecting the socio economic status of that household.

Development of the asset index required following actions. 1) Identifying a representative data base which contains information on the distribution of assets, 2) Determining the factor score coefficients (weights) corresponding to different assets, 3) Calculating standardized asset item scores, 4) Identification of cut off points for the classification of socio economic status.

1) Identifying a representative data base with asset information:

Estimation of standardized asset item weights corresponding to different asset variables required asset information from a larger representative sample. The DHS survey 2000 [2] collected data on the possession of large number of asset items in 8765 randomly selected households. This data base was examined for the consistency of data on household possessions and material used for the construction of the house. The asset items for which complete information was available were considered for inclusion in developing the asset index. The items considered included; consumer items ranging from radio, televisions, and car; dwelling characteristics such as flooring materials, type of drinking water, toilet facilities etc...(Appendix 1).The materials used to build wall, floor and roof were found to be highly correlated with each other. Hence, of these, only floor material which has shown the highest variation across the sample was selected.

2) Determining the factor score coefficients corresponding to different assets using principal component analysis:

The first step in identifying a standardized asset item weights for a variable was to estimate the factor score coefficient corresponding to that

variable. These factor score coefficients were obtained through principal component analysis of all selected asset variables of the DHS 2000 data base. The principal component analysis was conducted as follows. Each variable was coded in binary scale ("1' to the presence and "0 "to the absence). It should be noted that for the questions with multiple responses (the questions referring to type of latrine, type of flooring and sources of drinking water) each response was considered as a separate variable. For example data on type of latrine was originally collected as water seal, pour flush, pit latrine, bucket latrine, other types and no latrine. During recoding each response was considered as separate variables with binary out come ("1' to the presence and "0 "to the absence). For example having water seal latrine or not, having pit latrine or not, etc...
SPSS 11 software was used to identify the factor score coefficients corresponding to each asset. The factor score coefficient (1st factor) corresponding to a particular variable was considered as the relative weight corresponding to that variable. These factor score coefficients were used in the calculation of standardized asset item weights.

3) Calculating the standardized asset item weights

Each asset item was assigned standardized asset item weights depending on its presence or absence. These standardized asset item weights were calculated by multiplying the factor score coefficient of that variable by the standardized values (Z scores) of the variable measured in the binary scale using following formula[1].

$$\left(\frac{\text{value of asset variable} - \text{unweighted mean of asset variable}}{\text{unweighted standard deviation of asset variable}}\right) \times \text{raw asset factor score coefficient}$$

4) Identification of cut off points and measuring economic status applying asset weights

The purpose of asset approach is to compile an asset index that represents socio economic level of a particular individual. The asset index is the sum of all standardized asset item weights for an individual household. This asset index is considered to reflect the socio economic level of the household. Above described procedure was applied on the data obtained from DHS survey 2000 and an asset index was generated for each household included in the survey. Then quintile cut off points that separate the different socio economic strata were identified using those asset indices (Table 3).

Results

1) Standardized asset item weights

Table 1 presents the mean, standard deviation, factor score coefficient related to a particular asset variable and the two standardized asset item weights corresponding to the variable depending on its presence or absence.

For example, if a particular household is supplied with electricity the corresponding asset score would be 0.1291 where as if the household is not supplied with electricity the corresponding asset score will be - 0.2392 (Table 1). As described earlier in the case of variables such as water supply and type of latrine, where more than one response was considered, each response was assigned separate standardized asset item weight. For example, the question inquiring the type of water source could have the answer, "Yes" to one more of 9 responses while for others the answer would be "No". Each of these answers has to be assigned a separate standardized asset item weight. For example, if a particular household obtains water from an unprotected well only, then this household would be assigned the weights as described in Table 2. In this manner the household would be assigned the standardized asset weights corresponding to all the asset items.

2) Quintile cut off points of the asset index

Table 3 presents the quintile cut off points that separate the different socio economic strata.

As the standardized asset item weights and cut off points were obtained using a nationally representative sample, the same standardized asset item weights and cut offs could be applied on the data obtained from other samples. The asset indexes that are computed using standardized asset item weights could be used to classify the individuals' in to different socio economic quintiles relative to the national cut off levels.

Validation of the Asset Index

The validity of the asset index as a proxy to the socio economic status was assessed through two approaches. 1) Assessment of the internal coherence [3] of the asset index by reviewing the degree of separation of the poorest through second, middle and fourth to richest strata in terms of the average ownership of individual assets by households. 2) Evaluation of the constructs; a) the asset index as a proxy to socio economic status should correlate with the factors

Table 1. List of asset items, and the statistics used in developing the asset index

Item	Mean	S.D.	Factor score coefficient	Score if the item is present	Score if the item is absent
Source of water supply					
protected well within premises	0.2540	0.4354	0.0837	0.1434	-0.0488
protected well out side premises	0.2117	0.4086	-0.0617	-0.1189	0.0320
unprotected well	0.1078	0.3101	-0.0450	-0.1295	0.0156
tube well	0.0601	0.2378	-0.0131	-0.0519	0.0033
public street taps (mainline)	0.1391	0.3461	0.0393	0.0978	-0.0158
Tap line within premises	0.0907	0.2872	0.0628	0.1988	-0.0198
from a distributing vehicle	0.0027	0.0515	-0.0070	-0.1357	0.0004
From a river tank stream etc.	0.1093	0.3121	-0.0737	-0.2102	0.0258
other water sources	0.0243	0.1539	-0.0136	-0.0864	0.0021
Household assets					
Available electricity	0.6495	0.4772	0.1758	0.1291	-0.2392
possess a radio	0.8028	0.3979	0.1133	0.0561	-0.2285
Possess a television	0.6294	0.4830	0.1669	0.1281	-0.2175
Possess a refrigerator	0.2190	0.4136	0.1418	0.2678	-0.0751
possess a bicycle	0.4915	0.5000	0.0274	0.0279	-0.0270
Possess a motorcycle	0.1598	0.3665	0.0938	0.2151	-0.0409
Possess a car	0.0245	0.1547	0.0555	0.3498	-0.0088
possess a van	0.0323	0.1769	0.0580	0.3172	-0.0106
Possess a tractor	0.0362	0.1868	0.0351	0.1811	-0.0068
any other kind of vehicle	0.0367	0.1881	0.0456	0.2335	-0.0089
Dwelling characteristics					
Terrazzo or floor tiles	0.0428	0.2023	0.0411	0.1943	-0.0087
Cement floor	0.7419	0.4376	0.1490	0.0879	-0.2526
Wooden floor	0.0023	0.0484	-0.0130	-0.2681	0.0006
dung or mud	0.2025	0.4019	-0.1756	-0.3485	0.0885
Sand	0.0027	0.0515	-0.0268	-0.5190	0.0014
other types of flooring	0.0027	0.0515	-0.0268	-0.5190	0.0014
Type of latrine					
water sealed	0.7048	0.4562	0.1670	0.1081	-0.2580
pour flushed	0.0869	0.2817	-0.0420	-0.1360	0.0130
pit latrine	0.1320	0.3385	-0.1085	-0.2782	0.0423
bucket latrine	0.0005	0.0217	-0.0015	-0.0715	0.0000
other types of latrine	0.0022	0.0468	-0.0122	-0.2599	0.0006
no latrine available	0.0728	0.2599	-0.1034	-0.3688	0.0290

known to associate with socio economic status. The factors, so correlated, included the risk of having a child with low birth weight , the risk of having a stunted child in a household, and risk of dying before the age of 1 years (IMR) b) distribution pattern of households from different socio economic quintiles across geographical strata should confirm to the patterns known by other means.

Table 2. Allocation pattern of standardized asset item weights for a house hold that obtains drinking water only from an unprotected well.

Response	Answer	Standadized asset item weight corresponding to response
Protected well within the premises	Absent	-0.0488
Protected well out side the premises	Absent	0.0320
Unprotected well	Present	- 0. 1295
Tube well	Absent	0.0033
Public street tap	Absent	-0.0158
Tap line within the premises	Absent	-0.0198
Water obtained from distributing vehicle	Absent	0.0004
Water obtained from river , Tank , Stream etc.	Absent	0.0258
other type of water sources	Absent	0.0021

1) Internal coherence [3]

If the asset index is internally coherent, the individual items used in computing it should produce a clean separation of the poorest to the richest socio economic levels in terms of the asset ownerships. Stating this fact in a different manner; the percentage of households with a particular asset should show a clear differences or gradients across the socio economic quintiles. Table 4 presents the compares the average asset ownership across socio economic quintiles.

Table 3. Quintile cut off points of the socio economic status.

Quintile	Asset Index Value
Poorest	Less than -0.79175
Second	More than or equal to -0.79175 to 0.012215
Middle	More than 0.012215 to 0.468608
Fourth	More than 0.468608 to 0.878639
Richest	More than 0.878639 to highest

Table 4 shows a gradual concentration of different items from one end of the socio economic spectrum to the other. The concentrations seemed to conform to the socio economic standards. For example in the case of sources of water supply, sources, such as protected well with in the premises or tap line with in the premises seemed to concentrate towards the richest quintile where as the protected well out side premises and those who take water from rivers tanks, and other sources were concentrated towards the poorest quintile.

2) Association of the asset index with the factors such as law birth weight, underweight, and child mortality

The DHS survey 2000 data was used to identify the associations of asset indices of individual households with having a low birth weight baby, stunted child and an infant dying before completing one year to a mother in the household. Binary logistic regression procedure was carried out considering these three conditions as dependant variables and socio economic status measured by asset index as the independent variable. Educational level of the mother was also included in the models to control for the potential confounding effects. Regression analysis showed that all these three conditions were significantly associated with the socio-economic status. Figure 1 depicts the distribution of risks (Odd ratios) of having above conditions across the socio economic quintiles. Table 5 present the regression coefficients, odd ratios, and significances of these associations. Risk of experiencing any of these conditions show a declining trend from the poorest to the richest quintile

Figure 1 Distribution of Risk (OR) of having LBW baby, being underweight child and dying with in first year of life by socio economic quintile

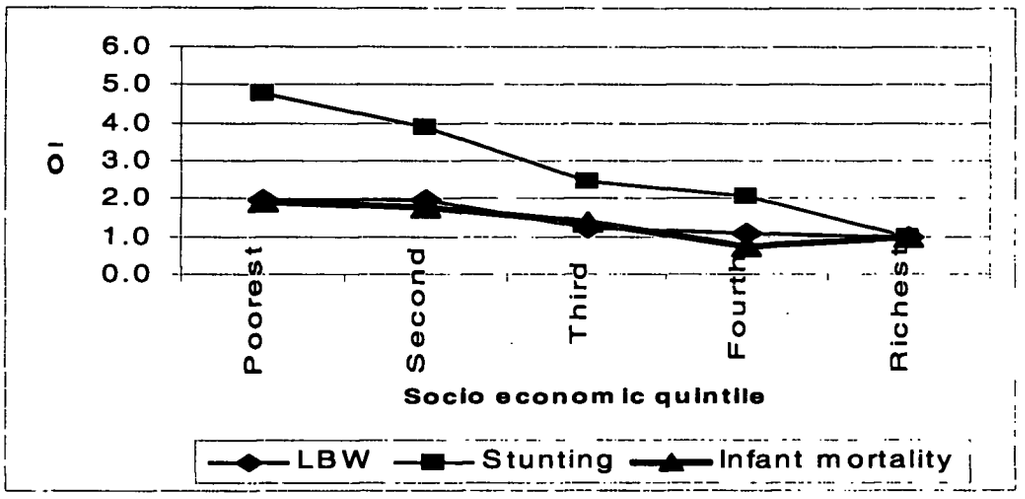


Table 4 .Comparison of average asset ownership across socio economic quintiles

Asset	% of households with the asset				
	Poorest	Second	Middle	Fourth	Richest
Source of water supply					
protected well with in premises	7.3	14.1	17.9	42.0	50.4
protected well out side premises	32.7	29.4	29.1	8.4	3.1
unprotected well	18.2	14.9	15.7	4.0	1.1
tube well	5.5	5.4	4.5	9.6	1.2
public street taps	6.1	14.0	12.8	18.7	19.8
Tap line with in the premises	1.2	2.5	3.9	13.3	23.0
From a distributing vehicle	0.5	0.4	0.4	0.0	0.0
From a river tank stream etc.	23.6	15.9	10.6	2.8	0.4
Other water sources	4.7	3.5	5.1	1.2	1.0
Household commoditise & facilities					
has electricity	11.6	43.1	81.7	98.6	99.9
has a radio	49.0	71.3	85.1	94.2	99.0
has a television	13.2	39.1	71.0	90.4	99.3
has a refrigerator	0.2	0.5	3.8	21.7	86.7
has a bicycle	29.0	41.4	40.5	50.1	47.3
has a motorcycle	0.9	3.3	6.8	14.4	48.1
has a car	0.0	0.1	0.1	0.3	12.5
has a van		0.1	0.4	1.7	15.1
has a tractor		1.6	1.0	3.9	4.8
has a other kind of vehicle	0.2	0.7	1.6	5.1	10.5
Floor material of the house					
terrazzo or floor tiles	0.6	1.5	1.7	8.3	10.1
cement floor	16.7	79.2	96.1	91.3	89.7
wooden floor	0.3	0.2	0.3	0.0	0.0
Dung or mud	80.2	17.8	1.0	0.0	0.0
Sand	1.7	0.0	0.0	0.0	0.0
other types of flooring	1.7	0.0	0.0	0.0	0.0
Type of latrine					
water sealed	22.5	50.8	87.1	95.4	99.2
pour flushed	9.2	20.5	8.9	4.2	0.7
pit latrine	43.9	20.6	3.6	0.3	0.0
other types of latrine	0.4	0.5	0.0	0.0	0.0
no latrine available	23.9	7.1	0.3	0.0	0.0

Table 5 Summery of Regression statistics showing association between Socio economic quintiles and having a low birth weight child, being an underweight child and dying before age of 5 years

Variables	Socio economic quintiles	B	S.E.	Wald	d.f.	Sig.	Exp(B)/OR
Low birth weight	All			11.032	4	0.026	
	Poorest	0.669	0.295	5.133	1	0.023	1.952
	Second	0.686	0.292	5.539	1	0.019	1.986
	Middle	0.210	0.320	0.428	1	0.513	1.233
	Fourth	0.071	0.319	0.049	1	0.825	1.073
	Richest						1.000
	Constant	-2.230	0.235	89.803	1	0.000	0.108
Stunting	All			45.768	4.000	0.000	
	Poorest	1.561	0.267	34.311	1.000	0.000	4.764
	Second	1.356	0.264	26.338	1.000	0.000	3.881
	Middle	0.890	0.272	10.666	1.000	0.001	2.435
	Fourth	0.717	0.272	6.957	1.000	0.008	2.048
	Richest						1.000
	Constant	-7.573	5.664	1.788	1.000	0.181	0.001
Infant death	All			12.072	4.000	0.017	
	Poorest	0.649	0.333	3.805	1.000	0.051	1.913
	Second	0.575	0.331	3.021	1.000	0.082	1.777
	Middle	0.327	0.339	0.930	1.000	0.335	1.387
	Fourth	-0.302	0.390	0.598	1.000	0.439	0.740
	Richest						1.000
	Constant	-9.203	8.173	1.268	1.000	0.260	0.000

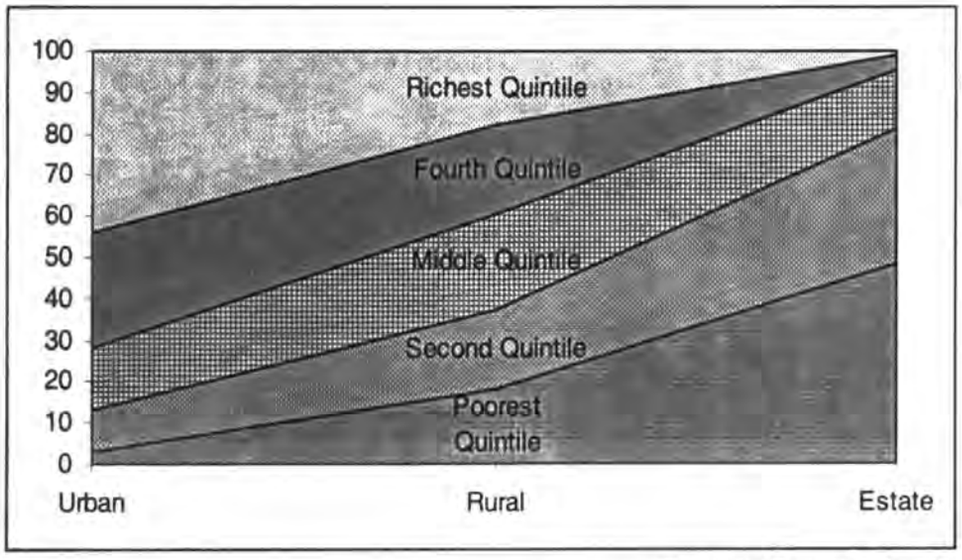
3) Distribution of households from different socio economic quintiles across geographical strata

Table 6 & figure 2 shows that distribution of households with different socio economic standards as measured by asset index across the geographical strata.

Table 6 Percentage of households from different socio economic quintiles across geographical strata

Sector	Poorest Quintile	Second Quintile	Middle Quintile	Fourth Quintile	Richest Quintile	Total
Urban	2.8	10.4	15.2	27.5	44.1	100.0
Rural	18.2	19.1	23.3	21.6	17.9	100.0
Estate	48.6	32.8	13.9	3.5	1.2	100.0

Figure 2 Area graph showing the distribution of households from different socio economic quintiles by geographical strata



The distribution shows that the largest proportion of richest households is seen in the urban areas where as the largest proportion of poorest households are seen in the estate sector. This pattern confirms the distribution of socio

economic standards identified in the other sources such as socio economic survey [4], and the vulnerability map [5].

Finally, it can be concluded that the asset approach is a valid, easier and feasible method to measure socio economic status using only five simple questions (Appendix 1). However, it should be noted that the standardized asset item weights are relative to the current socio economic status of the country and therefore should be updated with time.

References

1. Gawatkin RD, Rustein S, Johnson K., Pande R, and Wagstaff A. Socio economic differences in health, nutrition, and population in the Philippines. HNP/Poverty Thematic Group of the World Bank; 2000. Available from; www.worldbank.org/hnp

2. DCS (Department of Census and Statistics), Sri Lanka demographic and health survey 2000. Colombo, Sri Lanka :Department of Census and Statistics;2002.

3. Filmer D, Pritchett L. Estimating Wealth Effects without Expenditure Data - or Tears: An Application to Educational Enrollments in States of India; [Modified September 1, 1998]. Available from http://www.worldbank.org/resea ... edattain/edtears.pdf.

4. DCS (Department of Census and Statistics), Household income and Expenditure Survey 2002. Colombo, Sri Lanka: Department of Census and Statistics; 2002.

5. Satharasinghe A. Identification of DS divisions vulnerable to food insecurity and poverty. Colombo, Sri Lanka: Vulnerability analysis and mapping unit, World Food Programme; 2003.

Appendix- 1 asset questionnaire
Household assets

1. What is the major source of drinking water for members of your household?

Protected well within premises.....	☐ 1
Protected well outside premises.....	☐ 2
Unprotected well..... ..	☐ 3
Tube well..... .	☐ 4
Public taps/Street taps (main line)...	☐ 5
Tap within unit/Premises (main line)...	☐ 6
Bowser..... ...	☐ 7
River/Tanks/Streams.....	☐ 8
Other (Specify)	

2. What kind of latrine facility is available for use by members of your household?

Water seal.....	☐ 1
Pour flush.....	☐ 2
Pit.....	☐ 3
Bucket..... ...	☐ 4
Other (Specify).....	☐ 5
None.....	☐ 6

3. Does your house have the following?

	Yes 1	No 2
Electricity	☐	☐
A radio	☐	☐
A television	☐	☐
A refrigerator	☐	☐
Telephone	☐	☐

4. Does any member of your household own the following?

	Yes 1	No2
A bicycle	☐	☐
A car-	☐	☐
A motorcycle	☐	☐
A van	☐	☐
A tractor	☐	☐
Any other vehicle-specify.....	☐	☐

5. What is the main material of the floor of your house?

Terrazo/Granite/Floor tile	☐ 1
Cement	☐ 2
Wood	☐ 3
Dung/Mud	☐ 4
Sand	☐ 5
Other (Specify).....	☐ 6