Subjective measures of socio-economic position and the wealth index: a comparative analysis

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Introduction: The wealth index is a commonly-used measure of socio-economic position (SEP) in low- and middle-income settings, but there is concern that it is strongly influenced by community-level as well as household-level factors. Subjective SEP indicators are infrequently used in health research.

Methods: We use data from 11 280 households included in the Malawi Integrated Household Survey 2004/5. We compare the wealth index with four subjective measures of SEP: perceived food consumption adequacy, perceived overall consumption adequacy, an economic ladder question, and perceived income sufficiency. The wealth index is compared with each subjective SEP measure in terms of: (i) agreement of classification of households, (ii) targeting accuracy with respect to US$1-a-day poverty based on consumption expenditure, and (iii) the socio-economic processes (household- and community-level) giving rise to the SEP scores.

Results: Each subjective SEP indicator resulted in considerable differential classification of households compared with the wealth index. Three measures of subjective SEP (perceived food consumption adequacy, economic ladder question, and perceived income sufficiency) identified a higher proportion of dollar-a-day poor households as poor than the wealth index. The wealth index was strongly influenced by community infrastructure, but all subjective SEP indicators were free from strong community-level influence.

Conclusion: The strengths and limitations of any measure of SEP depend on the context and purpose for which it is being used. In these data, the wealth index was strongly influenced by community infrastructure, whereas the subjective SEP measures were not, perhaps allowing analyses using them to disentangle household and community influences. Several subjective measures also corresponded to dollar-a-day poverty more strongly than the wealth index. Subjective measures may therefore be preferable to the wealth index in some circumstances, although they have their own set of potential biases.

Keywords Wealth, asset, subjective, socio-economic position, poverty

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KEY MESSAGES

- The wealth index is a widely-used measure of socio-economic position (SEP) in low- and middle-income countries; subjective SEP measures are less commonly used.
- Subjective SEP measures and the wealth index identify different households as ‘poor’.
- Some subjective measures had stronger agreement with dollar-a-day poverty (assessed by consumption expenditure) than the wealth index.
- Subjective SEP measures are not strongly influenced by community infrastructure, whereas the wealth index is.

Introduction

Measures of socio-economic position (SEP) are crucial for health research, programme targeting, and policy monitoring and evaluation. Traditional economic measures include income and consumption expenditure, but data collection for these measures is difficult and time-consuming, particularly in low- and middle-income settings (Deaton and Zaidi 1999).

The wealth index (also referred to as an asset index or standard of living index) is an SEP indicator that is increasingly used in low- and middle-income settings. A wealth index is a composite index of ownership of consumer durables, access to services and dwelling characteristics. Wealth indices are widely used for pro-poor targeting or assessing the equity of interventions and policies (Ahmed and Bouis 2002; Garenne and Hohmann-Garenne 2003; Onwujekwe et al. 2004; Grabowsky et al. 2005; Montagu et al. 2005; Victora et al. 2005; Fenn et al. 2007; Onwujekwe et al. 2007; Sinha et al. 2007; Boerma et al. 2008), measuring health inequalities (Sastry 2004; Machado and Hill 2005; Sastry and Burgard 2005; Subramanian et al. 2006; Dieu et al. 2007; Cuong et al. 2007; MacArthur et al. 2007), and controlling for socio-economic confounding in analyses of epidemiological data (Shapiro et al. 2005; Burgard and Treiman 2006; Brooker et al. 2007; Ferreira et al. 2007).

Data for a wealth index are easier to collect than income or consumption expenditure data. Some have claimed that a wealth index has superior reliability data compared with other SEP indicators (Filmer and Pritchett 2001), although the reliability of the wealth index has been questioned by others (Onwujekwe et al. 2006). Some proponents view the wealth index as a proxy for consumption expenditure (Rutstein and Johnson 2004), but a systematic review showed generally weak agreement between the two measures (Howe et al. 2009) and inequalities using the two indicators have been shown to differ (Chuma and Molyneux 2009). Since the wealth index cannot be considered a proxy for consumption expenditure, the socio-economic processes leading to a wealth index hierarchy within a population remain uncertain. There is some concern that a wealth index represents an unhelpful mixture of household- and community-level effects, since many of the indicators used to construct a wealth index are supplied at the community level (water supply, electricity, etc.) (Bingenheimer 2007).

The problem faced by researchers is that feasible alternatives to the wealth index appear to be scant. Education measures are one possibility, but education is often associated with health outcomes through multiple pathways in addition to its effect through a household’s economic status (Chandola et al. 2006) and so researchers often seek to use education in addition to more strictly economic measures. Morris et al. demonstrated that it is possible to construct a proxy for consumption expenditure (r = 0.74) using a list of only 10 items (Morris et al. 2000), but this method requires an existing recent dataset with full consumption expenditure data from the setting of interest that can be used to select the items most predictive of overall expenditure. Participatory approaches are possible in some situations (Chambers 1994; Hargreaves et al. 2007), but can only be used in small geographical areas.

One type of socio-economic indicator that has been mostly ignored in health research in low- and middle-income settings is subjective measures. ‘Subjective’ measures of SEP are where the research participants themselves are asked to rate their own position in the socio-economic hierarchy, in contrast to ‘objective’ measures where the researcher determines the individual or household’s SEP based on data. For example a subjective measure of income would ask ‘is your income sufficient to meet your household’s needs’ whereas an objective measure could ask ‘how much is your income each month’. It has been argued that subjective measures may ‘more accurately capture subtle aspects of social status’, i.e. they may encapsulate the net effect of a variety of socio-economic factors that reinforce or counter-act each other (Operario et al. 2004). In addition, they allow the research participants to direct the process of SEP quantification, rather than imposing pre-conceived notions and assumptions about the important socio-economic processes for a given population.

Subjective measures of SEP have been used in a variety of settings, and shown to be associated with a range of health outcomes (reviewed in MacArthur and MacArthur 2007), including independently of objective indicators (Adler et al. 2000; Ostrove et al. 2000).

Various subjective SEP indicators are available. One example is an Economic Ladder Question (ELQ). A pictorial ladder is presented to respondents, with the bottom step representing the ‘most poor’ and the top step representing the ‘most rich’. Respondents are asked which step they feel they stand on. Other examples of subjective SEP indicators include measures of perceived consumption adequacy, and questions about whether income is sufficient to meet the household’s needs. For perceived consumption adequacy, respondents are asked to rate their household’s consumption according to whether or not it is sufficient to meet the household’s needs. Generally, several questions are asked relating to specific aspects of expenditure, such as food, clothing, housing and health care.
We seek to explore similarities and differences between the wealth index and subjective measures of SEP using a large household survey from Malawi as a case study.

There is no universally agreed approach to comparing socio-economic indicators. However, certain desirable characteristics of an SEP indicator can be identified. For use in health research or policy development or evaluation in a low- or middle-income setting, we propose the following as a non-comprehensive list of desirable features of an SEP indicator:

1. Complexity and cost of data collection should be within feasibility constraints;
2. The indicator should be reliable and reproducible;
3. The social stratification processes underlying the SEP indicator should be well-understood.

The wealth index and subjective SEP indicators are all simple to incorporate into questionnaires and require minimal interview time and interviewer training. There is only one study of reliability of the wealth index, which demonstrated at best moderate test-retest and inter-observer reliability (Ongwujeke et al. 2006). To our knowledge there are no such studies concerning subjective measures of SEP. It was not possible to address the reliability of any indicators in these analyses, since repeat measures were not available.

Arguably the most important characteristic of an SEP indicator is that the social stratification processes being captured should be well understood. Without this understanding, it is difficult to interpret research evidence and design policies on the basis of research findings. It is this aspect of comparison between the wealth index and subjective measures of SEP that our analyses seek to explore. The first stage of our analyses is to compare the classification of households by the wealth index and subjective SEP measures. Whilst this will not yield evidence about the socio-economic processes underlying either of the measures, it will be informative as to whether or not these processes differ. In the second stage of our analyses, we compare the strength of agreement of the wealth index and each subjective SEP measure with dollar-a-day poverty. Dollar-a-day poverty is derived from consumption expenditure, a standard tool in economics but the data collection for which is beyond the scope of many health research and policy initiatives. Dollar-a-day poverty should not be considered as a gold standard; consumption expenditure data are fraught with potential biases. Data collection relies on recall of purchases and home-production of a long list of items. Complex imputations are used to assign a value to home-produced goods, and various adjustments are necessary to account for regional price differences. Despite these limitations, dollar-a-day poverty is frequently used to target pro-poor interventions. Thus we feel it is useful to explore whether the extent of agreement with dollar-a-day poverty differs between the wealth index and subjective SEP measures.

The final stage of our analyses involves exploring whether the socio-economic processes underlying the distributions of the wealth index and subjective SEP measures differ. We explore the associations between a key set of socio-economic variables and the wealth index and each subjective SEP measure. In particular, we assess whether there are differences in the extent to which the wealth index and subjective measures of SEP are driven by community-level factors as opposed to household-level processes.

**Methods**

**Data**

We use data from the Malawi Integrated Household Survey 2004/2005 (IHS), which was conducted between March 2004 and March 2005 by the National Statistics Office of Malawi, with technical assistance from the World Bank. Full survey details are available elsewhere (National Statistical Office of Malawi 2005a). Briefly, 11,280 households were surveyed using multi-stage sampling to obtain a nationally representative sample. The household questionnaires covered a wide range of topics, including the assets commonly used to construct a wealth index and several subjective measures of SEP. Characteristics of the IHS sample are presented in Table 1. As well as household questionnaires, community questionnaires were administered to a panel of community leaders in each community [defined as administrative area as per survey documentation (National Statistical Office of Malawi 2005a)].

**Construction of SEP indicators**

Wealth indices were constructed using the set of indicators most commonly used for this purpose (Filmer and Pritchett 2001). Principal components analysis (PCA) was used (Filmer and Pritchett 2001; Howe et al. 2008) to combine indicators of ownership of consumer durables and transport (radio, television, bicycle, motorbike, car), access to services (toilet facility, main drinking water source, main cooking fuel, presence of electricity), dwelling characteristics (main floor material), and other household characteristics (presence of a domestic servant, ownership of agricultural land) into a single measure. Presence of a domestic servant was identified through the household listing, which detailed each household member’s relationship to the household head. All other indicators were obtained from interviewing the household head. The prevalence of each indicator and the weights assigned to them by PCA are presented in the supplementary data available at *Heapol* online (Table S1).

Four measures of subjective SEP were used: (i) perceived food consumption adequacy, (ii) perceived overall consumption adequacy, (iii) economic ladder question (ELQ), and (iv) perceived income sufficiency (Table 1). Overall perceived consumption adequacy was measured by combining perceived food, housing, clothing and health care adequacy using PCA with polychoric correlations (for weights assigned to indicators, see Table S2 available as supplementary data at *Heapol* online). Food consumption adequacy was additionally examined as a separate indicator since we hypothesized it might be the aspect of consumption adequacy most relevant to economic status. Subjective SEP measures were generated from interviewing the household head, but relate to the ‘household’s standard of living’.

The overall consumption adequacy measure and the wealth index were categorized into five equal groups (quintiles). Quintiles of the wealth index do not contain equal numbers of households, since there is ‘clumping’ of wealth index scores,
i.e. many households (predominantly in rural areas) have the same or very similar wealth index scores. The top three categories of the ELQ (steps four to six) were pooled due to few respondents placing themselves on steps five and six.

### Assessment of agreement across SEP indices

Agreement of classification of households according to these different SEP indices was assessed by cross-tabulations and Kappa statistics. The Kappa statistic is a measure of agreement between categorical variables, which takes into account the agreement expected by chance. If there is complete agreement, Kappa equals one; if there is no agreement beyond that expected by chance, Kappa is zero. Since food consumption adequacy, the ELQ and income sufficiency all have different numbers and/or sizes of groups, it was not possible to measure agreement by cross-tabulating with quintiles of the wealth index. In each case, new categorized versions of the wealth index were created, such that group sizes were the same as the subjective SEP indicator, e.g. 44% of households placed themselves on the bottom step of the ELQ so new variables were created that had the lowest 44% of wealth index scores in the bottom group.

### Assessment of agreement with dollar-a-day poverty

To compare the ability of the wealth index and each subjective SEP indicator to identify ‘poor’ households, a measure of dollar-a-day poverty was constructed using the full consumption expenditure data available in the IHS (for full details see National Statistical Office of Malawi 2005b). The US$1-a-day poverty line was defined as a per capita consumption expenditure of less than 11 051 Kwacha, which corresponds to consumption expenditure of less than US$1.08 at 1993 international PPP exchange rates inflated to the appropriate value for the survey year (National Statistical Office of Malawi 2005b). The targeting differential (percentage of true dollar-a-day poor households correctly classified) is calculated for the wealth index and each subjective SEP indicator. For the wealth index, the poverty cut-off line was taken as the bottom 20% of the population, since this is the approximate percentage of the population under the US$1-a day poverty line. For the ELQ, the poverty line was taken as those on the bottom of the six steps. For perceived adequacy of food consumption, the poverty line was taken as ‘less than adequate for household’s needs’. For the measure of consumption adequacy, the poverty line is taken as the bottom 20% of the population. For subjective income sufficiency, the poor are taken as those in the bottom category, i.e. those who must borrow to meet their needs.

### Path analysis

To explore differences in the socio-economic processes giving rise to distributions of the wealth index and subjective measures of SEP, path analysis models were run. We considered the wealth index and subjective SEP indicators to be proximal indicators of SEP, i.e. other socio-economic processes might affect the wealth index/subjective SEP score, but not vice versa. Separately for the wealth index and each subjective indicator, path analysis models were run to look at the influences of consumption expenditure, education of the household head, community infrastructure and area of residence. The hypothesized relationships between the indicators are presented in Figure 1.

Consumption expenditure was a standardized variable of the full per capita consumption expenditure aggregate detailed elsewhere (National Statistical Office of Malawi 2005b). Due to its right-skewed distribution, it was used as a log transformation. Education of the household head was used as a three category variable: no or only pre-school education, partial or completed primary school, or secondary and above. Two dummy variables were included in the path models;
Community infrastructure was a measure of services and facilities available at the community level, constructed using aggregates from household questionnaires in the IHS as well as information from the community questionnaire. Each community was assigned a community infrastructure score using PCA with polychoric correlations. The variables used to create the community infrastructure measure, and the weights assigned to them by PCA, are detailed in Table S3, available as supplementary data at Heapol online. The score was used as a continuous variable in path models. Area of residence is a three category variable: urban, peri-urban or rural. Two dummy variables were included in the model, with urban area as the reference category.

Path models were run using weighted least squares mean and variance adjusted estimation. Standardized parameters are reported to assist comparison of the influence of each socio-economic process on the wealth index/subjective measures. Goodness of fit was assessed using a range of measures, as recommended by Hu and Bentler (1999). The comparative fit index (CFI) can be between zero and one, with one indicating perfect fit. The Tucker Lewis Index (TLI) also indicates better fit when its value is closer to one. The root mean squared error of approximation (RMSEA) is a measure of global fit; it estimates the discrepancy in fit per degrees of freedom and is zero for perfect fit. Lower values of the weighted root mean square residual (WRMR) indicate better fit. Direct and indirect effect estimates are presented where appropriate; direct effects refer to effects not mediated by other covariables included in the model and do not necessarily imply a direct causal path.

Levels of missing data were very low; complete data on all variables of interest was available for 10 943 households (97%). Path analysis was run in MPlus version 5 (Muthén and Muthén 2007). All other analyses were run in Stata version 10.0 (StataCorp 2008). All analyses accounted for clustering induced by the sampling design.

Results

Agreement of subjective SEP indicators with the wealth index

Each subjective SEP indicator showed considerable differential classification of households compared with the wealth index (Table 2). At most, about half of households were in the same group in the wealth index and subjective SEP indicator; highest agreement was for perceived food consumption adequacy, and lowest agreement was for overall perceived consumption adequacy.

Targeting differential of the wealth index and subjective SEP indicators

The percentage of households that are dollar-a-day poor is high across the bottom four quintiles of the wealth index; in the fourth highest quintile almost 20% of households are dollar-a-day poor (Table 3). Using the bottom 20% of the wealth index as the poverty line, just 29% of the dollar-a-day poor are ‘correctly’ classified as poor by the wealth index (Table 4).
Table 3 Distribution of the dollar-a-day poor across categories of the wealth index and subjective measures of SEP

<table>
<thead>
<tr>
<th>Class</th>
<th>Overall (% households)</th>
<th>Wealth index</th>
<th>Subjective food consumption adequacy</th>
<th>Subjective consumption adequacy</th>
<th>Income sufficiency</th>
<th>Economic ladder question</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 11 280)</td>
<td>Quintile 1 (lowest) (n = 2326)</td>
<td>Quintile 2 (n = 3105)</td>
<td>Quintile 3 (n = 1467)</td>
<td>Quintile 4 (n = 2212)</td>
<td>Quintile 5 (highest) (n = 2133)</td>
</tr>
<tr>
<td>% households</td>
<td>21.4</td>
<td>29.2</td>
<td>25.6</td>
<td>27.3</td>
<td>19.8</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Table 4 Targeting differential between dollar-a-day poverty and each of the wealth index and subjective SEP indicators

<table>
<thead>
<tr>
<th></th>
<th>Dollar-a-day poor</th>
<th>Dollar-a-day poor</th>
<th>% poor correctly classified*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wealth index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non poor (n = 8917)</td>
<td>63.7</td>
<td>15.3</td>
<td></td>
</tr>
<tr>
<td>Poor (n = 2326)</td>
<td>14.9</td>
<td>6.1</td>
<td>28.5</td>
</tr>
<tr>
<td>Economic ladder question</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non poor (n = 6246)</td>
<td>37.3</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>Poor (n = 5017)</td>
<td>41.3</td>
<td>15.4</td>
<td>71.6</td>
</tr>
<tr>
<td>Subjective food consumption adequacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non poor (n = 8125)</td>
<td>58.2</td>
<td>13.1</td>
<td></td>
</tr>
<tr>
<td>Poor (n = 3142)</td>
<td>20.3</td>
<td>8.3</td>
<td>38.8</td>
</tr>
<tr>
<td>Income sufficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non poor (n = 5628)</td>
<td>41.0</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>Poor (n = 5643)</td>
<td>37.6</td>
<td>14.0</td>
<td>66.7</td>
</tr>
</tbody>
</table>

*% poor correctly classified is the percentage of the dollar-a-day poor households that were identified as poor using the wealth index and each of the subjective SEP indicators.

There are also high percentages of dollar-a-day poor households across all groups of the other SEP indicators, for instance over 13% of households in the top groups of the food consumption adequacy measure and the consumption adequacy measure are dollar-a-day poor, and over 6% of those who say their income is sufficient to allow saving are dollar-a-day poor (Table 3). Just 39% of dollar-a-day poor households are classified as ‘poor’ using the overall consumption adequacy measure; this percentage rises to 62% for the food consumption adequacy measure, 67% for income sufficiency, and 72% for the economic ladder question (Table 4).

Socio-economic processes giving rise to distributions of the wealth index and subjective SEP indicators

The most striking difference between the model of the wealth index and the models of the subjective SEP indicators is that the importance of community infrastructure is dramatically higher for the wealth index (Table 5). Of the four subjective SEP indicators, community infrastructure is only a strong determinant of consumption adequacy, and in this case the coefficient is less than half that for the wealth index. The coefficient for log per capita consumption expenditure is broadly similar for the wealth index and all of the subjective SEP indicators. Education appears to be a stronger determinant of the wealth index and the ELQ than the other subjective SEP indicators.

The indirect effect of rural area is strong for the wealth index; this is not the case for any of the subjective SEP indicators. Interestingly, the direct effects of peri-urban and rural areas are positive (compared with urban areas) for food consumption adequacy and consumption adequacy, although P values are large.

All path analysis models have acceptable fit as judged by the CFI, TLI, RMSEA and WRMR (Table 6).

Discussion

We have shown that subjective measures of SEP result in considerably different classifications of households compared with the wealth index. The wealth index therefore corresponds neither to traditional economic measures such as consumption expenditure (Howe et al. 2009), nor, in these data at least, to households’ own views of their economic status.

The differential classification of households between the wealth index and subjective measures of SEP suggests that the approaches are capturing different concepts. The consequences of this will differ depending on the purpose for which the indicator is being used. When SEP measures are used to quantify inequalities or to control for socio-economic confounding in analysis of epidemiological data, such differences are not
necessarily a concern in themselves. Differences are of most concern when SEP measures are used to identify households that are eligible for interventions or policies. Three of the subjective SEP measures (perceived food consumption adequacy, economic ladder question and perceived income sufficiency) had a considerably narrower dollar-a-day targeting differential compared with the wealth index. It is important to remember, however, that the consumption expenditure data used to create the dollar-a-day poverty line have their own reliability issues (Deaton and Zaidi 1999). These data require lengthy, complicated questionnaires and rely on accurate recall of the purchase/use of many items (Pradhan 2000).

One extremely important limitation of subjective measures in the context of using them to target interventions and policies is that subjective SEP indicators can be manipulated by the respondent. If an individual feels they could gain from reporting low SEP, it would be very easy for them to do so and very difficult for the interviewer to verify. In contrast, the wealth index includes many indicators that can be directly observed by the interviewer (building materials, etc.). A further very important limitation to the use of subjective measures of SEP for targeting interventions and policies is that, in this population at least, the measures tended to identify a very large proportion of the population as ‘poor’, e.g. over 40% of households are in the bottom category of the ELQ. These methods could not, therefore, be used to target pro-poor interventions at the most deprived households, and the specificity of the subjective measures with respect to targeting accuracy compared with dollar-a-day poverty would be lower than for the wealth index.

Measuring changes in inequality over time is vital for monitoring equity trends and establishing the efficacy of policies and interventions. It is unclear how a wealth index should be used for this, e.g. should the same weights be used for each time point? The consequences of different approaches to using a wealth index to monitor changes in inequality over time are unknown. A difference in inequality between two time points could result from a real change in inequality or from a change in the distribution of wealth, and it would be difficult to tell which was occurring. This is an area that has received very little attention in the methodological literature. Using subjective measures of SEP to track changes over time, however, is also likely to be problematic.

Importantly, we have demonstrated that the wealth index is very strongly influenced by community infrastructure. Since several of the key indicators used to construct a wealth index are provided primarily at the community level (electricity, water supply, etc.), where a household is located has a very strong influence on its wealth index score. Undeniably, area characteristics are important determinants of living standards. Households in areas with a clean water supply are certainly better off than those living in an area with only unsafe water.

### Table 5 Socio-economic processes contributing to distributions of wealth index scores and subjective SEP indicators (standardized ordinal probit regression coefficients)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Wealth index (n = 10 943)</th>
<th>Food consumption adequacy (n = 10 976)</th>
<th>Consumption adequacy (n = 10 970)</th>
<th>Economic ladder question (n = 10 965)</th>
<th>Income sufficiency (n = 10 973)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct</td>
<td>Indirect</td>
<td>Direct</td>
<td>Indirect</td>
<td>Direct</td>
</tr>
<tr>
<td>Log of per capita consumption expenditure</td>
<td>0.351***</td>
<td>0.438***</td>
<td>0.364***</td>
<td>0.455***</td>
<td>0.356***</td>
</tr>
</tbody>
</table>

**Education of the household head:**

- None/pre-school
  - Direct: –
  - Indirect: –
- Primary only
  - Direct: 0.268***
  - Indirect: 0.049***
  - 0.176***
  - 0.049***
  - 0.136*
  - 0.048***
  - 0.318***
  - 0.059***
  - 0.113
  - 0.047**
- Above primary
  - Direct: 0.776***
  - Indirect: 0.210***
  - 0.441***
  - 0.221***
  - 0.437***
  - 0.214***
  - 0.840***
  - 0.265***
  - 0.380***
  - 0.208***

**Community infrastructure**

- Direct: 0.283***
- Indirect: 0.060
- 0.095**
- 0.063*
- 0.037

**Area of residence:**

- Urban
  - Direct: –
  - Indirect: –
- Peri-urban
  - Direct: –0.235
  - Indirect: –0.221
  - 0.281
  - –0.165
  - 0.262
  - –0.085
  - 0.025
  - –0.024
  - –0.227
  - –0.052
- Rural
  - Direct: –0.736*
  - Indirect: –0.704***
  - 0.390
  - –0.205*
  - 0.229
  - –0.293*
  - –0.016
  - –0.240*
  - –0.299
  - –0.185*

**Table 6 Goodness of fit for the models of socio-economic processing giving rise to distributions of the wealth index and subjective SEP indicators**

<table>
<thead>
<tr>
<th>Index</th>
<th>Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wealth index model</td>
</tr>
<tr>
<td>CFI</td>
<td>1.00</td>
</tr>
<tr>
<td>TLI</td>
<td>1.00</td>
</tr>
<tr>
<td>RMSEA</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>WRMR</td>
<td>0.074</td>
</tr>
</tbody>
</table>
In many analyses, however, it would be useful to examine the effects of household- and community-level factors separately. For instance separating household- and community-level effects would help to predict the different potential effects of targeting interventions either at poor areas or at poor households. Furthermore, such separation facilitates studies exploring questions such as the effects of being a poor household in a wealthy area, or vice versa. Using the wealth index as it is commonly constructed as the measure of SEP precludes disentangling these processes. Whilst the subjective SEP indicators were similarly strongly influenced by consumption expenditure and education of the household head, they were not strongly associated with community infrastructure. The indicators used to construct the wealth index may affect the strength of its relationship with community infrastructure. One study demonstrated that removing community-level indicators altered the observed health inequalities in unpredictable ways (Houweling et al. 2003). Given the number and range of indicators commonly used to construct a wealth index, removing those most strongly related to community infrastructure would leave relatively few indicators. Further studies are recommended to explore the impact of the number and type of indicators included in a wealth index on its properties.

We would argue that subjective SEP indicators offer several advantages over the wealth index. Not only do they have the advantage of being free from the influence of community infrastructure, they also allow households to judge their own SEP, rather than inflicting the researcher's own views of the important socio-economic stratification processes in a given setting. As Operario et al. (2004) argued, they allow respondents to rank their own overall socio-economic conditions based on various factors that may reinforce or counteract each other. The wealth index is frequently constructed using a ‘standard’ set of indicators, which have become standard only because they were present in the Demographic and Health Survey (DHS) datasets, where the origins of the wealth index approach lie (Rutstein et al. 2007). Such indicators are likely to have very different meanings in terms of SEP in different settings. The wealth index has proved to be an invaluable tool in the analysis of DHS and other existing datasets, and has allowed for the quantification and comparison of health inequalities in low- and middle-income settings on an unprecedented scale (Gwatkin et al. 2007). Such indicators are likely to have very different meanings in terms of SEP in different settings. The wealth index has proved to be an invaluable tool in the analysis of DHS and other existing datasets, and has allowed for the quantification and comparison of health inequalities in low- and middle-income settings on an unprecedented scale (Gwatkin et al. 2007). In contrast, subjective SEP measures are not generally available in existing datasets from low- and middle-income countries. However, the use of the wealth index in primary data collection is more questionable, and we believe that alternative simple measures such as the subjective SEP indicators explored in this study could be more widely used. The limitations of subjective measures for a given purpose should also be considered.

A further complication with subjective indicators is that they require the assumption that there is inter-person comparability of question interpretation, i.e. a given question response means the same thing to all respondents in terms of SEP. This is not necessarily true, and is also an un-testable assumption, although qualitative research could be used to gain some understanding of the reasons people place themselves in a given category.

The reasons people respond to subjective SEP questions in certain ways are likely to be multi-factorial, and to differ across time, people and place. Ravallion and Lokshin (1999) evaluate an ELQ in which respondents are asked to ‘imagine a 9-step ladder where on the bottom, the first step, stand the poorest, and on the highest step, the ninth, stand the rich’ and directed to say which step they stand on today. They discuss ways that the ELQ might differ from an objective measure of income, including: (i) differences in the time period over which income is measured and the time period that informs subjective welfare rating, (ii) differences in the impact of relative income on perception of affluence, and (iii) ‘mood effects’, i.e. transient and fixed idiosyncratic factors such as recent experiences, personality and temperament.

In another study using data from Russia, Ravallion and Lokshin (1999) explore the relationship of the ELQ with objective income measurement, and the determinants of the ELQ. They categorize the income measure such that the groups have the same number of individuals in them as in the categories of the ELQ, and assess agreement between the measures. This demonstrates that agreement between the objective and subjective measures is weak, with considerable differential classification. A further exploration of the factors predictive of the ELQ shows that health, education level, individual income (independently of household income), relative income, household size, proportion of adult men, age, marital status, uncertainty about finding a job, and ownership of certain consumer durables are all important determinants of the ELQ. Goldman et al. (2006) also explore the determinants of an ELQ, and show that in a sample of older Taiwanese people, income, education, schooling of children, occupation, car ownership, ethnicity, and number of sons are all important determinants of position on the ELQ.

Two separate studies have shown that consumption expenditure is highly predictive of perceived consumption adequacy, and that poverty rates are similar using the objective and subjective consumption data (Pradhan and Ravallion 2006). These studies also demonstrated that a wide range of other indicators tend to predict subjective consumption adequacy, including household size, educational levels of household members, employment of household members, health of household members, average community expenditure and region.

Although the evidence suggests that subjective SEP rankings are influenced by a broad range of factors, it is at least possible to explore these factors through qualitative research in a given setting. It is not possible, in contrast, to qualitatively assess the context-specific processes leading to wealth index rankings. To our knowledge, however, there are no existing studies using qualitative work to either explore participants’ responses to survey questions about subjective SEP. This would represent an extremely useful and interesting addition to the literature.

Like the wealth index, subjective SEP measures can only be considered measures of relative socio-economic position, i.e. they can capture a household’s position within the socio-economic hierarchy but cannot measure absolute poverty. Although they may give the impression of being absolute measures of poverty—for example, the household’s food is or is not sufficient to meet the household’s needs—the ways in
which a household will judge whether the amount of food is sufficient to meet their needs will depend on the horizon for judging adequacy, which will vary from place to place.

Strengths and limitations of this study
We have compared the wealth index with several different subjective measures of SEP in various ways. This has enabled us to compare the strengths and weaknesses of these alternative SEP indicators, all of which necessitate only simple and rapid data collection and could easily be included in a questionnaire in low- and middle-income settings. This study has focused on Malawi as a case study, and the findings are not necessarily generalizable to other settings. Malawi is a small, deeply impoverished country in sub-Saharan Africa, and the socio-economic processes affecting both the wealth index and subjective SEP indicator distributions are likely to differ in other places. We have also focused our analyses on the most common methodology for constructing a wealth index; we used both the asset indicators and the weighting method (PCA) most frequently used. Alternative constructions of the wealth index may have resulted in different findings to those reported here.

Conclusion
The wealth index is widely used in low- and middle-income countries, despite many limitations and questions over its validity as a measure of SEP. In these data, subjective SEP indicators offered certain advantages over the wealth index. They are not strongly influenced by community infrastructure, whereas the wealth index represents a mixture of household-and community-level influences. Furthermore, several of the subjective measures explored in this dataset had a stronger association with dollar-a-day poverty than the wealth index. The use of the wealth index in situations where it is important to disentangle the effects of household- and community-level processes, or where identification of ‘poor’ households is important, is questionable, and we believe that subjective SEP measures may be a simple and advantageous alternative. Limitations of subjective SEP measures should, however, be considered. In particular, subjective measures of SEP can easily be manipulated by respondents, which may be problematic if they are used for policy or programme targeting.

Contributions
LDH, JRH and SRH conceptualized the study. LDH, BdS and GP designed the analysis methods. LDH conducted the analysis and wrote the first draft of the manuscript. All authors commented on manuscript drafts and approved the final version.

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