Socioeconomic inequality in health service utilisation: does accounting for seasonality in health seeking behaviour matter?

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Abstract

Seasonal variations exist in disease incidence, varying across the different regions in a country. This paper argues that using national household data that are not adjusted for seasonal and regional variations in disease incidence may not be directly suitable for assessing socioeconomic inequality in annual outpatient services utilisation, including for cross-country comparison. In fact, health service utilisation may be under- or over-stated depending on the period of data collection. This may lead to miss-estimation of socioeconomic inequality in health service utilisation depending, inter alia, on how health service utilisation, across geographic areas, varies by socioeconomic status. Using a nationally representative dataset from South Africa, the paper applies a seasonality index that is constructed from the District Health Information System to annualise public outpatient health service visits. Using the concentration index, socioeconomic inequality in health service visits, after accounting for seasonal variations, was compared to that when seasonal variations are ignored. It was found that socioeconomic inequality in outpatient health service visits depends on the socioeconomic distribution of the seasonality index, justifying the need to account for seasonal and geographic variations.

Key words
Seasonal variation; seasonality index; socioeconomic inequality; concentration index
Introduction

Seasonal variations in disease incidence has been documented (Sauerborn et al., 1996; Briet, 2002) including for mental illness (Tyrer et al., 2016) and emergency general surgery (Zangbar et al., 2016). In many parts of sub-Saharan Africa, for instance, malaria accounts for a huge burden of disease and its incidence is seasonal and this may vary by geographic areas in a country (Zhou et al., 2004; Mabaso et al., 2005; Cairns et al., 2012). In the context of socioeconomic inequalities in health, seasonality indices may be used to annualise health service utilisation (McIntyre and Ataguba, 2011). This is in part because household data collected for assessing inequality and inequity in health service utilisation that are largely cross-sectional often use a fixed recall period. These surveys are also conducted within a certain time of the year, corresponding to different seasons. Four or 2 weeks are the most common recall periods for outpatient service utilisation while inpatient admissions use a 6 or 12 month recall period. Traditionally, reported outpatient service utilisation data are annualised by multiplying them by 12, if the recall period was the last one month. However, if data were collected during a season of low (or high) disease incidence, all things being equal, annual disease burden and annual health service utilisation may be underestimated (or overestimated).

The impact of such under- or over-estimation for socioeconomic health inequality may be negligible if the pattern remains similar for all socioeconomic groups. However, there is a correlation between spatial distribution of people and the extent to which they are exposed to different health conditions (Blanchard et al., 2001), hence variations in health service utilisation patterns. These variations may affect different socioeconomic groups differently that should be considered in assessing socioeconomic inequality in health service utilisation. Also, cross-country comparisons are difficult to achieve without accounting for seasonal and regional variations in health service utilisation within countries. Thus, this paper constructed and used seasonality indices to assess the sensitivity of socioeconomic inequalities in public outpatient health service visits to seasonal and regional variations in disease incidence.
Methods

The nationally representative SACBIA survey\(^1\) data are used in this paper. Among other things, the SACBIA dataset obtained reliable data on health service utilisation. The data structure including the sampling procedure have been described elsewhere (Ataguba and McIntyre, 2013). Data were collected over 3 months between April and July 2008 in all nine South African provinces. A total of five households were selected from each of the 960 enumeration areas identified. The total sample size was 4,800 households (approx. 22,000 individuals). Health services utilisation data include the use of inpatient and outpatient services at both public and private facilities. The recall period for inpatient service utilisation was 12 months while outpatient services was one month. Thus, only outpatient visits are used in this paper as no further annualisation was required for inpatient services.

Two forms of annualization were performed and the results of socioeconomic inequality in public outpatient health service visits was compared between them. The first, also called uniformly annualised visits, was done by multiplying public outpatient visits by 12 (this assumes the same utilisation pattern throughout the year). The other (i.e. seasonally annualised visits) involved annualising public outpatient visits using a seasonality index generated based on aggregate public outpatient visits in each district recorded in the District Health Information System (DHIS). Because the DHIS contains data on public facility utilisation, only public outpatient visits disaggregated by health provider level (clinics, district hospitals, etc.) was considered in this paper. The disaggregation does not contain information on specific diseases.

The SACBIA dataset was representative at the province and not the district level, thus, province specific seasonality indices were used. The seasonality index for month \(j\) (i.e. the month that the survey was conducted in each province), for visits to facility \(k\) in province \(l\) (i.e. \(SI_{jk}^l\)) is defined as:

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\(^1\) The SACBIA (South African Consortium for Benefit Incidence Analysis) survey was a collaborative initiative by the Health Economics Unit, University of Cape Town; Centre for Health Policy, University of the Witwatersrand; the National Department of Health; and the London School of Hygiene and Tropical Medicine. SACBIA was funded by the South African National Department of Health, the European Union and data were collected by the Community Agency for Social Enquiry (CASE).
where $U_{i,k}^l$ is the total visits to a specified facility $k$ in month $i$ in province $l$, and $U_{j,k}^l > 0$ is the total visits to facility $k$ in month $j$ in province $l$.

Concentration indices were used to assess socioeconomic inequality in public outpatient visits and socioeconomic inequality in the seasonality indices. These indices are computed using the DASP routine in Stata 15. Briefly, the concentration index shows the extent to which health service utilisation occurs more among the richer or poorer segment of the population. The values of index range from $-1$ to $+1$. A positive (negative) concentration index means that richer (poorer) households or individuals use more health services compared to their poorer (richer) counterparts. Stated differently, a positive concentration index implies a pro-rich distribution while a negative index implies a pro-poor distribution.

Generally, the difference in sign between the concentration index of seasonally annualised visits ($CI_{SA}$) and the concentration index of uniformly annualised visits ($CI_{UA}$) is determined by the sign of the concentration index of the seasonality index ($CI_{SI}$).

$$
\left| CI_{SA} \right| = \begin{cases} 
> |CI_{UA}| & \text{if } CI_{SI} > 0 \\
< |CI_{UA}| & \text{if } CI_{SI} < 0 \\
= |CI_{UA}| & \text{if } CI_{SI} = 0
\end{cases}
$$

(2)

Briefly, when $CI_{SI} > 0$, and seasonal variations have not been accounted for, estimated inequality ($CI_{UA}$) will be biased in favour of the poor. The reverse is the case when $CI_{SI} < 0$.

Because the difference between these indices ($CI_{UA}$ and $CI_{SA}$) is computed based on underlying concentration curves, statistical test for dominance was performed using the intersection and union approach as detailed in O’Donnell et al. (2008)\(^2\). As explained elsewhere (Ataguba and McIntyre, 2013), household living standard was assessed using per adult equivalised household consumption.

\(^2\) The -dominance- command written by Owen O’Donnell was used to perform statistical dominance tests <http://siteresources.worldbank.org/INTPAH/Resources/Publications/459843-1195594469249/dominance.ado>
Results and discussion

Socioeconomic inequality in the seasonality indices shows a pro-rich distribution for visits to all public health services in Table 1. This result means that, on average, the seasonality indices of the rich are greater than those of the poor as richer individuals live in provinces with higher seasonality index values.

Based on the socioeconomic distribution of the seasonality indices shown in Table 1 ($CI_{SI} > 0$), and as discussed in equation (2), it is expected that $|CI_{SA}| > |CI_{UA}|$. In fact, this pattern is confirmed in Table 2. For example, the use of public clinics and community health centres became less pro-poor after accounting for seasonality variations in public outpatient visits. The same pattern is observed for the use of public district hospital and provincial tertiary hospitals. Similarly, the use of regional and national central hospital outpatient services became more pro-rich after applying the seasonality index. Some of these differences ($CI_{UA} - CI_{SA}$) in Table 2 are statistically significant. For example, the decreased pro-poorness of visits to district hospitals was confirmed to be statistically significant at the 5% level while the increased pro-richness of visits to regional hospitals was confirmed to be statistically significant at the 1% level. Using statistical dominance tests, only regional hospital outpatient services show statistically significant difference between using the uniformly and seasonally annualised visits. In some cases, the concentration curves cross each other or there is no clear dominance between curves.

Overall, using data collected between April and July 2008, the results show the importance of accounting for seasonal and regional variations in disease patterns within a country. Here, disease pattern was proxied by reported utilisation obtained from the comprehensive DHIS database. In this case, there is a statistically significant and systematic variation in the distribution of the seasonality indices in favour of the rich. If this variation is not accounted for within a country, socioeconomic inequalities may be overstated in favour of the poor, when annual generalisation are intended. It is important to note that the pro-rich pattern obtained in Table 1 may not always be the case as this was specific to the period when the
SACBIA data were collected. Thus, it cannot be generalised that outpatient health service utilisation (even in South Africa) will be biased in favour of the poor when annualisation is based on a uniform scalar. In fact, as shown in equation (2), if $CI_{SI} < 0$, there is a possibility that $CI_{SA}$ could become pro-rich even when $CI_{UA}$ was pro-poor or vice versa. Thus, it is important to first understand the socio-economic distribution of the seasonality index within each context to conclude on the direction of the relationship between socioeconomic position and annual utilisation of health services.

**Conclusion**

Quantitative evidence suggests that accounting for seasonal patterns in health service utilisation across provinces in South Africa may significantly impact on the socioeconomic distribution of annualised outpatient health service utilisation using concentration indices. However, in the case provided, this was not significant qualitatively as the seasonality index was concentrated among the rich. As demonstrated in the paper, this may not always be the case, especially when the seasonality index is concentrated among the poor. Overall, it is important to account for seasonal variations in disease incidence or utilisation patterns when annualising health service utilisation data for assessing socioeconomic inequalities in health utilisation. If seasonality is to be ignored, results must be interpreted accordingly to reflect the period that the data were collected and may not be comparable between countries.

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References


### Table 1: Socioeconomic inequality in the seasonality index

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Concentration Index</th>
<th>*statistically significant at the 1% level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinics and community health centres</td>
<td>0.0018*</td>
<td></td>
</tr>
<tr>
<td>District hospital</td>
<td>0.0014*</td>
<td></td>
</tr>
<tr>
<td>Regional hospital</td>
<td>0.0028*</td>
<td></td>
</tr>
<tr>
<td>Provincial tertiary hospital</td>
<td>0.0050*</td>
<td></td>
</tr>
<tr>
<td>National central hospital</td>
<td>0.0026*</td>
<td></td>
</tr>
</tbody>
</table>

Note: *statistically significant at the 1% level

### Table 2: Socioeconomic inequality in public health service utilisation using uniform and seasonally annualised visits

<table>
<thead>
<tr>
<th>Service Type</th>
<th>$Cl_{SA}$</th>
<th>$Cl_{UA}$</th>
<th>Difference</th>
<th>Dominance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinics and community health centres</td>
<td>-0.1337***</td>
<td>-0.1342***</td>
<td>-0.0005</td>
<td>CX</td>
</tr>
<tr>
<td>District hospitals</td>
<td>-0.2245***</td>
<td>-0.2259***</td>
<td>-0.0015**</td>
<td>ND</td>
</tr>
<tr>
<td>Regional hospitals</td>
<td>0.0143</td>
<td>0.0103</td>
<td>-0.0040***</td>
<td>2D1</td>
</tr>
<tr>
<td>Provincial tertiary hospitals</td>
<td>-0.0012</td>
<td>-0.0073</td>
<td>-0.0060*</td>
<td>ND</td>
</tr>
<tr>
<td>National central hospitals</td>
<td>0.3578***</td>
<td>0.3543***</td>
<td>-0.0036</td>
<td>ND</td>
</tr>
</tbody>
</table>

Note: CX = curves cross; ND = non-dominance; 2D1 = the concentration curve of uniform annualised visits dominates the concentration curve of seasonally annualised visits

*, **, *** statistically significant at the 10%, 5% and 1% levels, respectively.