
DOI

Link to record in KAR

http://kar.kent.ac.uk/46762/

Document Version

UNSPECIFIED

Copyright & reuse
Content in the Kent Academic Repository is made available for research purposes. Unless otherwise stated all content is protected by copyright and in the absence of an open licence (eg Creative Commons), permissions for further reuse of content should be sought from the publisher, author or other copyright holder.

Versions of research
The version in the Kent Academic Repository may differ from the final published version. Users are advised to check http://kar.kent.ac.uk for the status of the paper. Users should always cite the published version of record.

Enquiries
For any further enquiries regarding the licence status of this document, please contact:
researchsupport@kent.ac.uk

If you believe this document infringes copyright then please contact the KAR admin team with the take-down information provided at http://kar.kent.ac.uk/contact.html
Measuring regional variation in the productivity of care home in England:
Using Adult Social Care Outcomes Toolkit (ASCOT) to adjust for quality of care

Wei Yang
Julien Forder
Personal Social Services Research Unit
University of Kent

This research is funded by Economics of Social and Health Care Research Unit, Department of Health, UK
Why do we care about regional productivity of care home? (1)

In England, the Department of Health (DH) holds overall responsibility for adult social care (ASC).

The aim of ASC is to provide services to adults who for reasons of age, disability, illness or other dependency, need help to live as normal life as possible, within a residential care setting or in their own home.

Residential and nursing care for old people account for a significant proportion of total ASC in England. We need to know whether this care is provided efficiently.
Why do we care about regional productivity of care home? (2)

• Demographic change
  o More than 1 in 10 of the population will be aged 75 or over by 2030 (Audit Commission, 2011);
  o A rise in the conditions associated with old age that require both health and social care services. For instance, the number of people living with dementia in the UK is expected to reach 1.4 million by 2040 (Audit Commission, 2011);

• Rising costs of care and support services (Fernandez and Forder, 2012)

Councils with care responsibilities have to make their own decisions about how to spend their money wisely. This means they have to
  o Maintain or reduce the costs of services;
  o Preserving quality of care and service outcomes.

We need to measure the regional productivity of care homes in order to

understand whether public spending on care homes has achieved ‘value for money’ in different regions.
How to measure productivity in ASC? (1)

A cost weighted output index is constructed by a Laspeyres form. Output index growth in LA is written as,

\[ I_{it+1} = \frac{\sum_{j=1}^{J} x_{jit+1} c_{jit} \left( \frac{q_{it+1}}{q_{it}} \right)}{\sum_{j=1}^{J} x_{jit} c_{jit}} \]

Where \( x_{jt} \) is the volume of ASC type \( j \) with \( j = 1, \ldots, J \) in period \( t \), and \( c_{jt} \) is the unit cost of output \( j \) at time \( t \) (Castelli et al., 2007, Bojke et al., 2013, Eurostat, 2001).

Total input of social care can be measured by the money spent on adult social care by the social services department in LAs in England (equivalent to direct input),

\[ Z_{ind} = \frac{\sum_{n=1}^{N} \gamma_n E_{nt+1}}{\sum_{n=1}^{N} E_{nt}} \]

Where \( E_n \) is expenditure on input type \( n \); \( \gamma_n \) is the deflator applied to input \( n \) to wash out the effect of price rises in expenditure growth, and \( t \) is time (Bojke et al., 2012).
How to measure productivity in ASC? (2): Productivity growth

- Productivity is to compare total amount of the output to total input for ASC (Castelli et al., 2007, Dawson et al., 2005):

  \[
  \text{Productivity growth index} = \left( \frac{I}{Z} \right) \times 100
  \]

  Where \( I \) is the index of output growth, \( Z \) is the index of input growth.
Challenges we face in measuring productivity in social care


Limitations

- No quality adjustment of output because of data availability;
- Do not take into account attribution problems, such as general health needs of the population.
Can we learn from productivity analysis in health care?

• The productivity measures used in healthcare have a number of advantages:
  o Capture a range of health services delivered to NHS patients;
  o Make use of routine collection of health outcome data as quality adjustment of output;
  o Can be disaggregated both to different settings and to sub-national levels.

• Limitations
  o The quality adjustment indicators (survival rates, waiting times, etc) are not applicable for ASC;
  o Cannot solve attribution problems. For example, changing levels of average need in the region.
Measuring productivity in social care (1): Quality adjustment

• Quality indicators:
  o Structure:
    ➢ ‘Relatively stable characteristics of the providers of care, of the tools and resources they have’ (Donabedian, 1980);
    ➢ Insensitive to changes over time, lack the core focus of the carer-service user relationship (Malley and Fernández, 2010)
  o Process and outcomes: Can be captured by using Adult Social Care Outcomes Toolkit (ASCOT)

ASCOT is developed to measure social care outcome and process in eight conceptually distinct attributes:
1) personal cleanliness and comfort, 2) food and drink, 3) control over daily life, 4) personal safety, 5) accommodation cleanliness and comfort, 6) social participation and involvement, 7) occupation, 8) dignity (Netten et al. 2012b).
Measuring productivity in social care (2): Quality adjustment

• Two main attribution problems may influence quality of care:
  o Clients’ needs;
  o Other attribution problems:
    ➢ Population level needs;
    ➢ Demographic characteristics;
    ➢ Socioeconomic characteristics.
Measuring productivity in social care (3): Quality adjustment

We are interested in knowing the gain in Quality of Life (QoL) that our ASC services create for service users (i.e. gain in ASCOT).

\[ \Delta y = y^c (\text{quality, needs, otherattri}) - y^e (\text{needs, otherattri}) \]

A linear model using ASCOT as the dependent variable can be denoted as follows,

\[ y_{it} = \alpha + \sum_j \beta_j x_{jit} + \sum_k \gamma_k z_{kit} + \varepsilon_{it} \]

Where i is LA, t is the years, are the health needs variables, i.e., health needs; zk are LA characteristic variables, i.e., population needs, demographic characteristics and economic development variables; and a, b, and r are the parameter vectors, e is the residual.
Measuring productivity in social care (4): Quality adjustment

Predicted value for quality of care can be obtained after controlling for needs from service users and LA level characteristics.

The residual of Equation above, in a panel data regression, comprises two parts: \( v_i \) - unobserved quality factors that are constant across years; \( \mu_{it} \) - the idiosyncratic quality changes. In other models, the residual can be obtained directly from the difference between the actual ASCOT and the predicted ASCOT. We obtain the predicted value for quality of care,

\[
q_{it} = y_{it} - (\alpha + \sum_j \beta_j x_{jit} + \sum_k \gamma_k z_{kit} \gamma_k) = \varepsilon_{it}
\]

Normalising quality of care,

\[
q_{it}^{\text{SCRQoL}} = \varepsilon_{it} + \bar{y}
\]

The year to year quality of care change can then be obtained by

\[
\Delta \text{Quality} = \frac{q_{it+1}}{q_{it}} = \frac{\varepsilon_{it+1} + \bar{y}}{\varepsilon_{it} + \bar{y}}
\]
Measuring productivity in social care (5): Output growth index with quality adjustment

- Output Growth Index with quality adjustment

$$I_{it+1} = \frac{\sum_{j=1}^{J} x_{jit+1} c_{jit} \left( \frac{q_{it+1}}{q_{it}} \right)}{\sum_{j=1}^{J} x_{jit} c_{jit}} = \frac{\sum_{j=1}^{J} x_{jit+1} \left( \frac{\epsilon_{jit+1} + \bar{y}}{\epsilon_{jit} + \bar{y}} \right) c_{jit}}{\sum_{j=1}^{J} x_{jit} c_{jit}}$$
Outline of the rest of the presentation

- Data sources
  - Adult Social Care Survey 2010, 2011 and 2012;
  - Personal Social Services Expenditure and Unit Costs (PSSEX1) and Adult Social Care Survey (ASCS) of 2010 to 2012;
  - Various council data sets.

- Main findings

- Discussion and limitation
Data sources
Data sources

- Adult Social Care Survey (ASCS) 2010, 2011 and 2012
  - An annual survey
  - Service users were sent questionnaires to seek their opinions over a range of outcome areas to gain an understanding of service users’ views and experience.
  
  → Use ASCS to obtain aggregated ASCOT scores, client needs at LA level.

- Personal Social Services Expenditure and Unit Costs (PSSEX1) 2010, 2011 and 2012
  
  → Use PSSEX1 to obtain output and input data at LA level.

- Various datasets from LA and census

Sample selection (N = 142): Drop LAs who did not provide full information on output, input and ASCOT
Variable specifications (1): Quality adjustment

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Variable specification</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCOT (for service user above 65 residential and nursing care)</td>
<td>An average ASCOT score for each LA is used.</td>
<td>ASCS 2010, 2011 and 2012. Aggregated to LA level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Variable specification</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service user health needs variables</td>
<td>Health needs</td>
<td>ASCS 2010, 2011 and 2012. Aggregated to LA level.</td>
</tr>
<tr>
<td></td>
<td>• Percentage of male service users</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• EQ5D:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Pain and discomfort;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Anxiety and depression;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to get around indoors;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IADL (Instrumental ADL)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to deal with finances/paperwork;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ADL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to get in/out bed/chair by yourself;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to feed yourself;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to deal with finances/paperwork;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to wash all over by yourself using bath or shower;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to get dressed/undressed by yourself;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to use WC/toilet by yourself;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Being able to wash face and hands by yourself.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LA level characteristics</th>
<th>Demographic characteristics</th>
<th>Various sources from Office of National Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Percentage of population above 65</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Percentage of population above 85</td>
<td></td>
</tr>
<tr>
<td>Pop needs</td>
<td>Mortality rate, Limiting long standing illness etc.</td>
<td></td>
</tr>
<tr>
<td>Socioeconomic characteristics</td>
<td>Average housing price</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average weekly wage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Living arrangement</td>
<td></td>
</tr>
</tbody>
</table>
Variable specifications (2): Output and input measure

• **Output**
  - Services measured in terms of time (e.g. number of weeks of residential care);
  - Weighted by unit cost;
  - Aggregated at LA level.

• **Input**
  - **Net current expenditure** excludes capital charges less total income;
  - Gross current expenditure excludes capital charges less income from joint arrangements, the NHS, and other income;
  - Net total expenditure includes capital charges less total income;
  - Deflated by Personal Social Services (PSS) Pay and Prices Index (Personal Social Services Research Unit, 2013)
Main findings
### Regional output 2010 to 2012 (unadjusted) (£000’s)

<table>
<thead>
<tr>
<th>Region</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Midlands</td>
<td>36224.43</td>
<td>36153.7</td>
<td>36708.14</td>
</tr>
<tr>
<td>Eastern</td>
<td>35310.04</td>
<td>36321.48</td>
<td>38041.11</td>
</tr>
<tr>
<td>London</td>
<td>17423.29</td>
<td>18523.58</td>
<td>18982.43</td>
</tr>
<tr>
<td>North East</td>
<td>25790.07</td>
<td>26139.16</td>
<td>27636.67</td>
</tr>
<tr>
<td>North West</td>
<td>27989.87</td>
<td>28743.82</td>
<td>30722.26</td>
</tr>
<tr>
<td>South East</td>
<td>47838.13</td>
<td>47214.54</td>
<td>49263.94</td>
</tr>
<tr>
<td>South West</td>
<td>36181.21</td>
<td>35545.64</td>
<td>34784.14</td>
</tr>
<tr>
<td>West Midlands</td>
<td>32778.69</td>
<td>32638.1</td>
<td>35128.64</td>
</tr>
<tr>
<td>Yorkshire &amp; Humb</td>
<td>32771.47</td>
<td>34171.6</td>
<td>35369.53</td>
</tr>
</tbody>
</table>

Outputs (without quality adjustment) are increasing for most regions from 2010 to 2012, except for SW.
Quality adjustment using ASCOT score

<table>
<thead>
<tr>
<th>Client needs</th>
<th>OLS1</th>
<th>OLS2</th>
<th>FE1</th>
<th>FE2</th>
<th>RE1</th>
<th>RE2</th>
</tr>
</thead>
<tbody>
<tr>
<td>gender</td>
<td>-1.331*</td>
<td>-1.502*</td>
<td>-1.551</td>
<td>-1.351</td>
<td>-1.257*</td>
<td>-1.305</td>
</tr>
<tr>
<td>ADL</td>
<td>-0.227***</td>
<td>-0.309***</td>
<td>-0.173***</td>
<td>-0.239***</td>
<td>-0.208***</td>
<td>-0.284***</td>
</tr>
<tr>
<td>IADL</td>
<td>0.209</td>
<td>0.617*</td>
<td>0.224</td>
<td>0.603</td>
<td>0.141</td>
<td>0.535*</td>
</tr>
<tr>
<td>EQ5D</td>
<td>-1.563***</td>
<td>-1.361***</td>
<td>-1.530***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg. weekly wage(lg)</td>
<td>-0.058</td>
<td>-0.025</td>
<td>-1.178</td>
<td>-0.682</td>
<td>-0.222</td>
<td>-0.179</td>
</tr>
<tr>
<td>Avg. weekly HH income</td>
<td>0.049</td>
<td>0.103</td>
<td>-0.293</td>
<td>-0.94</td>
<td>0.13</td>
<td>0.18</td>
</tr>
<tr>
<td>Standardised mortality rate</td>
<td>0.006</td>
<td>0.008</td>
<td>0.006</td>
<td>-0.003</td>
<td>0.007</td>
<td>0.009</td>
</tr>
<tr>
<td>%Attendance allowance%</td>
<td>-2.222</td>
<td>-3.85</td>
<td>-6.18</td>
<td>-0.118</td>
<td>-3.246*</td>
<td>-4.637*</td>
</tr>
<tr>
<td>%pop65plus</td>
<td>0.42</td>
<td>-2.255</td>
<td>24.399</td>
<td>33.184</td>
<td>0.313</td>
<td>-1.912</td>
</tr>
<tr>
<td>%pop85p</td>
<td>5.116</td>
<td>17.636</td>
<td>-96.454</td>
<td>-137.516</td>
<td>1.715</td>
<td>12.438</td>
</tr>
<tr>
<td>%limiting long standing illness</td>
<td>0.003</td>
<td>0.005</td>
<td>-0.028</td>
<td>-0.025</td>
<td>0.004</td>
<td>0.005</td>
</tr>
<tr>
<td>%Living alone</td>
<td>1.340*</td>
<td>1.754*</td>
<td>0.21</td>
<td>0.313</td>
<td>1</td>
<td>1.298</td>
</tr>
</tbody>
</table>

Using adjusted ASCOT from the regression:

\[ q_{it}^{\text{SCRQoL}} = \varepsilon_{it} + \bar{y} \]

Normalising the residual:

\[ q_{it} = y_{it} - (\alpha + \sum_{j} \beta_{j} x_{jit} + \sum_{k} \gamma_{k} z_{kit} \gamma_{k}) = \varepsilon_{it} \]

Quality growth:

\[ \Delta \text{Quality} = \frac{q_{it+1}}{q_{it}} = \frac{\varepsilon_{it+1} + \bar{y}}{\varepsilon_{it} + \bar{y}} \]

Quality of care is associated with client needs and some of the regional characteristics.
ASCOT (Unadjusted and Fixed Effect Adjusted) 2010 - 2012

Some difference are observed between unadjusted ASCOT and adjusted ASCOT using fixed effects model.
Regional output growth indices (quality adjusted)

Quality adjustment made some differences on the overall output growth indices (see the marked bars).
Regional input growth indices (PSS deflated)

Input growth indices were negative for most regions from 2010 to 2011, and were positive most regions from 2011 to 2012.
Regional productivity growth indices 2010 to 2012

Productivity Growth Indices (Unadjusted and Fixed Effect Adjusted)

Productivity Growth Standardised by National Average (Unadjusted and Fixed Effect Adjusted)
Discussion and conclusion
Some conclusions

- **Quality adjustment**
  - The quality adjustments made some differences on output growth indices (slide 20, 21 and 22);
  - Our results suggest that the quality of care for older adults increased from 2010 to 2011, and slightly decreased from 2011 to 2012.

- **Productivity growth**
  - This study found that output in most regions continue to increase, meaning that the amount of residential and nursing care provided to older people from 2010 to 2012 increased;
  - Input growth indices were negative for most regions from 2010 to 2011, and were positive most regions from 2011 to 2012;
  - Most regions showed some increases in productivity from 2010 to 2011. Productivity remained the same or showed some slight decreases for most regions from 2011 to 2012.

- **Policy implications**
  - By adopting productivity growth in a cross-sectional context, we are able to identify underperforming regions, and demonstrate areas where potential savings can made.
  - The next step would be to identify reasons why some regions are more productive than others, and to extend this method to other areas of ASC to monitor the performance of different regions.
Limitations

- **Data source**
  - ASCS: Unable to capture those service users who are not able to complete the questionnaires by themselves;
  - PSSEX1: Cannot separate expenditures from different input sources, i.e., labour, intermediate and capital input.

- **Methods**
  - Cannot adjust for all the attribution problems using the residual methods.
  - We are effectively estimating attribution problems as $\alpha + \sum_j \beta_j x_{jit} + \sum_k \gamma_k z_{kit}$ but this is likely to be mis-specified due to omitted variable (endogeneity bias).

- **Changing policy context**
  - Creates ‘noise’ in the analysis and makes interpreting changes more difficult. For example, the allocation of additional budget from NHS to ASC in 2011.
References

Thank you! 😊

Wei Yang: w.yang-33@kent.ac.uk
Julien Forder: j.e.forder@kent.ac.uk