Short communication

Born equal? The distribution of government Medicare spending for children

Kim M. Dalziel, Li Huang, Harriet Hiscock, Philip M. Clarke

A Centre for Health Policy, Melbourne School of Population and Global Health, The University of Melbourne, Melbourne, Australia
b Murdoch Childrens Research Institute, The Royal Children’s Hospital, Melbourne, Australia
c Department of Paediatrics, The University of Melbourne, Melbourne, Australia

ABSTRACT

Providing equitable care is an objective of many national healthcare systems. Using the birth cohort of the nationally representative Longitudinal Study of Australian Children linked with the Medicare Benefits Scheme billing data who were recruited in 2004 at ages 0–1 years and assessed biennially for six waves, we assessed the distribution of out-of-hospital government Medicare spending by household income. 4853 children followed over 11 years were included in the study. Distributions of major spending components including general practitioner and specialist care were assessed using concentration indices. Trends in the inequalities as children grow were investigated. The results showed that after controlling for health care needs, total government Medicare spending over 0–11 years of age favoured the rich (concentration index 0.041). The Medicare spending for general practitioner care was equal (concentration index 0.005) while for specialist care and diagnostics and imaging were ‘pro-rich’ (concentration index 0.108 and 0.088 respectively). Children from poorer families were most disadvantaged when aged 0–1 years in specialist spending, and the disparity lessened as children approached adolescence. Our findings suggest that income-related inequalities exist in government Medicare spending particularly in the first few years of life. As early years of life are a critical window in childhood development and building block for future health, the results warrant further investigation and attention from policy makers.

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1. Introduction

Providing equitable care is a priority for most national healthcare systems (Asaria et al., 2016). Like many universal healthcare systems, Medicare in Australia provides government subsidies to all population for primary and secondary care. A fixed fee for service subsidy is provided for each type of consultation. Statistics show that general practitioner (GP) visits were largely bulk billed– most patients incur no out-of-pocket costs (Medicare Statistics, 2016). Specialist care on the other hand frequently involves patient out-of-pocket costs on top of the standard fee for service subsidy is pro-rich. Despite the universal coverage in which subsidies do not depend on levels of income, it was observed that higher income adults are more likely to consult specialists and lower income groups more likely to consult GPs in Australia with the same finding also observed for 12 European Union states (van Doorslaer et al., 2004, 2008). For children, Saxena et al. (2002) reported that 2–20 year olds from ethnic minority groups in England could access primary care but received less secondary care. In Nordic countries, Hallldorsson et al. (2002) reported lower odds of visiting specialists for children aged 2–17 years of lower socioeconomic groups. Both studies relied on self-reported visits and a broad range of child ages were included preventing a more detailed understanding of how healthcare spending varies by age. Another limitation of these studies is that visits do not accurately reflect value of services.

In this study, we extend previous analyses through the use of administrative data on government payments associated with Medicare services. This enables us to examine the distribution of government Medicare spending by family income for children and examine whether the distribution changed over time as children grow using the nationally representative Longitudinal Study of Australian Children (LSAC). The overall level of government Medicare spending and major spending components including GP and specialist care were investigated using the Medicare Benefits Scheme (MBS) billing data to determine if government spending is pro-rich or pro-poor. We hypothesised based on...
Australian Medicare design that after adjusting for health care need, GP spending is neutral regarding income, and specialist spending is pro-rich for children across different ages.

2. Methods

The data we used was the LSAC, which commenced in 2004 and involves repeated biennial assessment (‘waves’) of over 10,000 children across two cohorts (birth cohort aged 0–1 in 2003–2004, and kindergarden cohort aged 4–5 in 2003–2004). The survey utilises a two-stage cluster sampling design with stratification by state and then by major metropolitan centre versus others to obtain a geographically representative sample of children and their families. Survey weights for each wave were available to account for the unequal probability of participant selection, sample attrition and the multistage, clustered sampling design (Norton and Monahan, 2015). This research utilised all six waves of the birth cohort with wave 6 occurring at 10–11 years of age, and applied population weights to each wave (i.e. each sampled child represents a group of children in the population depending on his/her population weights in that wave so that each wave of weight-adjusted sample is population-representative). Survey population weights were applied in all analyses.

When enrolling in LSAC families were asked for permission to link their survey data with the administrative Medicare data (Australian Institute of Family Studies, 2015). Each wave was approved by The Australian Institute of Family Studies Ethics Committee, and families provided written informed consent. This study utilised the linked MBS data, and examined both the total government MBS spending and the major spending components including GP and specialist care. Major spending components were categorised based on the MBS statistics. According to the statistics, MBS can be organised into 10 categories of spending. The spending on GP care was taken from Category 1 of attendances by a medical practitioner including a general practitioner but not a specialist or consultant physician, plus other GP related items in Category 8 and management of bulk billed services. The spending on specialist care was taken from specialist consultations in Category 1 and 8 (medical and allied). We also examined diagnostic imaging and pathology spending (Categories 5 and 6) and all other spending (see detailed categorization in Appendix Table S1).

The LSAC survey contains information on mean weekly before-tax household income in all waves. In Wave 1 when the exact amount of the household income was missing, the middle point of the recorded income range was applied. Income prior to 2014 was inflated to 2014 Australian dollars, and converted to equivalised household income using the square root scale (Stand and Rising, 2011). For the analysis covering children from 0 to 11 years, mean income across all waves was used, characterising permanent income over the period. For the analysis of individual age groups, income at the corresponding wave was used, characterising transient income. Children who had no Medicare records (non-consenting parents) or with household income missing in all waves were excluded from the analysis.

To assess the income-related inequality in Medicare spending, desirable inequalities such as spending based on healthcare need are adjusted using indirect standardization as described in Wagstaff and van Doorslaer (2000) and van Doorslaer et al. (2008). More specifically, Medicare spending for individual child was adjusted for health care need as follows:

\[ y_i = \alpha + \beta \ln hi_i + \sum_k x_{ki} \gamma_k + \sum_p z_{pi} \delta_p + \epsilon_i \]  

(1)

where \( y_i \) refers to Medicare spending for child \( i \), \( \ln hi_i \) is the logarithm of the equivalised household income \( hi_i \). Health care need was adjusted using a set of \( K \) need indicators \( x_k \), which includes gender and whether the child had special health care need. A set of \( p \) non-need variables were controlled for and are represented by \( z_{pi} \), including whether mother has a diploma, whether living in major urban areas, and whether child has indigenous status. \( \epsilon \) is an error term. Special health care need was defined with the 2-item short form of the parent-reported Children with Special Health Care Needs Screener: “Does child currently need or use medicine prescribed by a doctor, other than vitamins?” and “Does child need or use more medical care than is usual for most children of the same age?” Parents who responded “Yes” were asked 2 additional parts for the items “whether the medication or service use was because of any medical, behavioural, or other health condition” and “if so, whether the condition was expected to last 12 months.” “Yes” to all 3 parts of either item was classified as having a special health care need. The 2-item short form screener has shown to have 80–90% agreement with the full 5-item version (Bethell et al., 2002).

The need-adjusted spending was obtained as:

\[ \hat{y}_i^X = \hat{\alpha} + \hat{\beta} \ln hi_i + \sum_k \hat{\gamma}_k x_{ki} + \sum_p \hat{\delta}_p z_{pi} \]  

(2)

where the means (superscript \( m \)) of the non-need variables \( z_{pi}^m \) and household income \( hi_i^m \) were used to indicate the amount of spending a child would receive if they had received the same treatment as others with the same need characteristics. The (indirectly) need-standardized health care spending, \( \hat{y}_i^X \), can then be obtained as the difference between actual and need-adjusted (or x-expected) spending, added to the sample mean, \( y^m \):

\[ \hat{y}_i^{IS} = y_i - \hat{y}_i^X + y^m \]  

(3)

To determine the distribution of Medicare spending across income groups, concentration curves and indices were used (Wagstaff et al., 1991). Concentration curves plot the cumulative percentage of health spending on the y axis against the cumulative percentage of the sample ranked by household income beginning with the poorest and ending with the richest on the x axis (Wagstaff and van Doorslaer, 2000). Equal distribution is represented as a 45-degree line. The concentration index is twice the area between the curve and line of equality, ranging between −1 and 1 with zero indicating equality. We estimated the concentration indices for the total Medicare spending and the major spending components, as well as the contributions of each spending component to the overall income-related inequality measure using a previously described decomposition method (Clarke et al., 2003). More specifically, if total mean spending \( y^m \) is composed of \( S \) spending components \( y^m_s \), \( s = 1, 2, \ldots, S \), the concentration index for total spending \( CI \) can be decomposed into the concentration index for each spending component \( CI_s \) as below:

\[ CI = \sum_{s=1}^S w_s CI_s \]  

(4)

where \( w_s = y^m_s / y^m \). Then each component’s share of overall inequality can be calculated by dividing \( w_s CI_s \), through by \( CI \).

Analyses were first repeated over 0–11 years of age and then repeated for each age group to assess inequalities as children age. Sum of special health care need over the period was used in the analysis covering 0–11 years of age. The robustness of the result was tested using bootstrapping method with 1000 replications drawing from observations at child level; an alternative method of estimating equivalised income (weighting income by assigning a weight of 1 applied to first adult, 0.5 to an additional adult and 0.3 to each child, see Hagenaars et al., 1994) and unadjusted raw household income; restricting to only children living in major urban areas or whose mother has a diploma (dropping variables likely correlated with income); and restricting to children born at least second in birth order (testing the learning effect for parents). We also estimated the concentration indices for specialist spending split by medical and allied health specialists (testing the effect of different categorizations of specialist care), and the concentration indices by using Generalized Linear Model (GLM) regression method instead of Ordinary Least Squares in adjusting for health care need.
distributions are attributable to the year effect (change with age) instead of the age effect (change with age), the LSAC kindergarten cohort of children aged 4–15 who were surveyed in the exact same period were used to repeat the analysis. We also presented the absolute inequalities as measured by the generalized concentration index, and estimated the concentration indices by counting the billed MBS items which represents volume of services and approximates service use. All analyses were performed using the Stata statistical software package (version 14.0, Texas, USA).

3. Results

For all 5107 children in the LSAC birth cohort, 233 had no linked Medicare record due to lack of parental consent and 21 were missing household income in all waves thus dropped leaving 4853 children in the analysis (95.0%). The characteristics of the children are described in Table 1 and compared with the full LSAC birth cohort. No statistically significant difference was found between the samples.

The average total MBS spending per child from birth to 11 years of age is estimated to be A$3126. The greatest category of spending was GP care (with a mean of A$1849 taking up 59% of the total spending), followed by specialist care (22%) and diagnostic imaging and pathology (12%). Other services were estimated to account for 8% of the total spending.

The concentration curves for total MBS spending and the spending for GP care, specialist services and diagnostic imaging and pathology, adjusted for health care need, are presented in Fig. 1 with the underlining shares of the spending by income quintile described in Appendix (Table S2). The regression results used in the adjustments are presented in Appendix (Table S3). GP spending is closest to the line of equity, whereas spending for specialist services is most unequal across income.

The need-adjusted concentration indices for the total MBS spending and the major spending components are presented in Table 2. The total MBS spending over 0–11 years of age produces a need-adjusted concentration index of 0.041 (95% CI 0.028, 0.053), indicating a pro-rich distribution. The concentration index for GP care across all waves was 0.005 (95% CI = 0.007, 0.017), which was neutral. For specialist care and diagnostic imaging and pathology the concentration indices were 0.108 (95% CI 0.082, 0.134) and 0.088 (95% CI 0.065, 0.111) respectively which are both pro-rich (see Appendix Table S2 for underlining shares of the spending by income quintile). Spending for GP care, specialist care and imaging and pathology contributed 7%, 56% and 25% respectively to the overall pro-rich distribution of government Medicare spending (0.041, 95% CI 0.028, 0.053).

Tests of robustness showed that there was little variation in the size or direction of concentration indices when bootstrapping method and different income estimates are used (Table 2). When restricting the sample to only children living in major urban areas, GP spending became pro-poor, indicating that lower income families in major urban areas benefit more from government GP spending. When restricting to children whose mother has a diploma, GP spending is still largely neutral but specialist spending became less pro-rich, indicating that higher education prompted the use of specialist care. For the sample with only children with older siblings, little variation in concentration index was seen indicating that parent prior learning of healthcare system by having children is not driving service use and the income-related inequality in spending.

When examining the distribution of Medicare spending by age group, total spending moves from pro-rich to pro-poor as children age (Fig. 2). GP spending was more pro-poor after school entry age of 4–5 years, and specialist spending becomes less pro-rich with a pro-poor distribution observed approaching adolescence. Less consistent changes are observed for imaging and pathology, where the distribution was slightly pro-rich except for the school entry age. Overall, the largest disparities occur when children were between 0 and 1 years. It is possible that the changes in distributions are driven by the year effect instead of age effect due to the cohort design of LSAC. If the year effect dominates, the downward trend in income-related inequality would also be observed in the LSAC kindergarten cohort which was conducted parallel with the LSAC baby cohort i.e. conducted in the exact same period. However further investigation using the separate LSAC kindergarten cohort showed that the downward trend was not observed over the same period (Appendix Figure S1). Absolute inequalities as measured by the generalized concentration index and the additional concentration indices estimated based on MBS item counts were also explored (Appendix Figure S2 and Figure S3), which confirms the trend observed.

4. Discussion

Focusing on children in a health system with universal public
insurance, this study assessed the distribution of Australia Medicare spending by household income. Overall, children from higher income families in Australia received more government Medicare spending, largely due to the spending on specialist care. More importantly, the largest inequalities in government spending were observed in the earliest years of life and become less marked as children age, which may reflect differences in individual's access or barriers to health care, different help-seeking preferences, or a delay in decisions to start accessing care.

The finding is concerning given that the need for health services is not uniform across childhood and there is on average higher need for health services in the first year of life followed by lower needs through childhood. More importantly, early childhood investment has been repeatedly cited as a critical building block for future health, education and wellbeing (see for instance, Heckman, 2006; Mustard, 2010; Elgar et al., 2017) and research is now evaluating the causal relationship between childhood antecedents to chronic disease in older life (Halfon et al., 2012). For instance, smaller size or relative thinness at birth and at one year has been observed to be associated with increased rates of coronary heart disease, stroke, type 2 diabetes mellitus, and osteoporosis in adult life (Gluckman et al., 2008). There is a critical role for specialists such as paediatricians and allied health practitioners in addressing early life health concerns and early origins of adult disease in order to alleviate later inequalities in health.

Several limitations of the study were identified. The linked Medicare data did not allow for a consideration of patient out-of-pocket spending alongside the government Medicare spending, which would underestimate the disparities especially for specialist care. The

<table>
<thead>
<tr>
<th>Test of robustness</th>
<th>Total spending</th>
<th>GP</th>
<th>Specialist*</th>
<th>Imaging and pathology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base case</td>
<td>0.041 (0.028, 0.053)</td>
<td>0.005 (−0.007, 0.017)</td>
<td>0.108 (0.082, 0.134)</td>
<td>0.088 (0.065, 0.111)</td>
</tr>
<tr>
<td>Contribution to overall inequality</td>
<td>7%</td>
<td></td>
<td>56%</td>
<td>25%</td>
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</tr>
</thead>
<tbody>
<tr>
<td>Bootstrapping method</td>
<td>0.040 (0.034, 0.47)</td>
<td>0.005 (−0.001, 0.011)</td>
<td>0.108 (0.095, 0.121)</td>
<td>0.088 (0.076, 0.99)</td>
</tr>
<tr>
<td>Alternative method for equivalised income</td>
<td>0.041 (0.028, 0.054)</td>
<td>0.004 (−0.007, 0.016)</td>
<td>0.111 (0.085, 0.136)</td>
<td>0.089 (0.066, 0.112)</td>
</tr>
<tr>
<td>Raw income</td>
<td>0.035 (0.022, 0.048)</td>
<td>0.0001 (−0.011, 0.012)</td>
<td>0.099 (0.073, 0.124)</td>
<td>0.081 (0.058, 0.104)</td>
</tr>
<tr>
<td>Major urban only</td>
<td>0.022 (0.006, 0.039)</td>
<td>−0.019 (−0.034, −0.004)</td>
<td>0.111 (0.080, 0.142)</td>
<td>0.071 (0.042, 0.100)</td>
</tr>
<tr>
<td>Mother with diploma</td>
<td>0.022 (0.004, 0.039)</td>
<td>−0.004 (−0.020, 0.012)</td>
<td>0.065 (0.031, 0.099)</td>
<td>0.068 (0.039, 0.098)</td>
</tr>
<tr>
<td>Have older siblings</td>
<td>0.028 (0.010, 0.047)</td>
<td>−0.013 (−0.028, 0.003)</td>
<td>0.104 (0.064, 0.143)</td>
<td>0.079 (0.048, 0.110)</td>
</tr>
<tr>
<td>GLM with Gamma distribution</td>
<td>0.040 (0.027, 0.053)</td>
<td>0.005 (−0.007, 0.017)</td>
<td>0.103 (0.079, 0.128)</td>
<td>0.085 (0.063, 0.108)</td>
</tr>
<tr>
<td>Unadjusted for need</td>
<td>0.043 (0.028, 0.058)</td>
<td>0.007 (−0.006, 0.019)</td>
<td>0.110 (0.081, 0.138)</td>
<td>0.089 (0.065, 0.113)</td>
</tr>
</tbody>
</table>

95% CI in brackets.

* Medical and allied health specialists included. The concentration indices for spending split by medical and allied health specialists were detailed in Appendix (Table S4).

Fig. 2. Concentration indices for age subgroups.
assessment of special health care need relied on parent's report which although well validated and reasonably objective, is not a clinical assessment. Another key limitation is that the optimal level of health care provision remains unknown, thus it is unclear to what extent poor families were underutilising care, or conversely richer families may be overusing care. We also acknowledge that given the cohort design of LSAC we are unable to separate the year effect from the age effect. However, we have demonstrated with the robustness test that the results are not driven by the year effect and are most likely attributable to age.

Acknowledging the limitations, this study used actual government Medicare spending as opposed to parent-reported health service use and tracked a nationally representative sample of children, allowing for a more nuanced understanding of how inequality in health spending varies by age and family income. Given the universal coverage of Medicare and the largely neutral distribution of GP spending, it is likely that children are equally likely to receive referrals to specialists. However, lower income families' decision of accessing specialists care might be more influenced by the extra cost given that around 8% of people in Australia who need to see a specialist reported delaying or not doing so because of cost (Australian Bureau of Statistics, 2016). With the evidence of unequal distribution of specialist spending from this study, there may be room for policy reform around the financing and pricing of specialist care. Although safety net is used to ensure those with heavy need have reduced barriers to use of care, it might be not functioning well for lower income families who do not reach the threshold for safety net but still require specialist care. To alleviate the cost burden for children, it might be possible to provide specific specialist led public programs such as the US special health care need program, although their impact on reducing inequality in the important early years has not been assessed. From a health care market regulation perspective, specialist charges in Australia remain relatively unregulated. It is possible to increase competition in the specialist market through disclosure of fees to allow more public choice and reduce uncertainty in out-of-pocket payment, or to regulate fees. Furthermore, as parents' choices and help-seeking behaviours are also likely to play a role, policy makers may consider including programs to increase health literacy for low income parents.

The findings of this research will be critical to prompt future investigation particularly on specialist care in the early years of life and its financing for low income families. There is a need for similar research in other countries and systems to ascertain whether the trend of greater inequality in early years is replicated.

Acknowledgement

Appropriate approval was obtained from the Department of Social Services (Australia) to access the publicly available, de-identified longitudinal dataset. There are no conflicts of interest. We thank Vanny Chay who assisted with some of the early data preparation and analysis, and the editors and two anonymous reviewers for their valuable suggestions.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.socscimed.2018.04.037.

References


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