

Corrigendum to: What has driven acute public hospital expenditure growth in South Australia? An analysis of the relative importance of major expenditure drivers between 2006–07 and 2017–18

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The authors of the above-mentioned paper regret to advise that the sentence in the Abstract: ‘This would be facilitated by improvements in the scope, accuracy, quality and consistency of published national hospital data’ should have appeared as the second sentence in ‘What are the implications for practitioners?’ section, not the Conclusion.

What has driven acute public hospital expenditure growth in South Australia? An analysis of the relative importance of major expenditure drivers between 2006–07 and 2017–18

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Abstract.

Objective. The aim of this study was to investigate whether increasing costs of delivering care have driven real growth in acute public hospital expenditure in South Australia (SA) and what has contributed to these real cost increases.

Methods. Using published time-series data, we decomposed inflation-adjusted growth in *per capita* total acute public hospital recurrent expenditure into its major utilisation and cost components to evaluate their relative contribution over the 12 years to 2017–18.

Results. Real *per capita* total acute public hospital recurrent expenditure grew by AU\$667 (45.2%) over the 12-year period; of this, 86.0% was from real growth in input costs per weighted activity unit, with real growth in the average salaries of hospital staff accounting for AU\$247 or 37.0%. Hospital utilisation rates contributed a minor 14.0%.

Conclusion. Over the 12 years to 2017–18, real growth in average clinical salaries was a more important driver of real growth in *per capita* total acute public hospital expenditure than rates of hospital utilisation. This would be facilitated by improvements in the scope, accuracy, quality and consistency of published national hospital data.

What is known about the topic? Public hospital expenditure is one of the largest and fastest growing areas of government expenditure in Australia. Policy narratives often centre around demand pressures from an increasingly older, overweight, and chronically ill population. Comparatively little attention has been paid to the influence of increases in real input costs within the Australian context.

What does this paper add? Real salary growth has been a major driver of acute public hospital recurrent expenditure growth in SA, whereas hospital utilisation rates have played a minor role.

What are the implications for practitioners? A clearer understanding of the main drivers of acute public hospital expenditure growth and the resulting benefits to population health is needed to guide the efficient and sustainable use of scarce healthcare resources.

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Introduction

Public hospital expenditure is one of the largest and fastest growing areas of government expenditure in Australia,¹ comprising ~27.3% of reported total recurrent spending by Commonwealth and State and Territory governments in 2018–19.² Policymakers and analysts have sought to identify its main drivers to determine effective ways to control future spending, ensure sustainable growth, and direct scarce healthcare resources to their best use.^{3–9} Attention has often focussed on rising rates of chronic

illness from an increasingly older and overweight population.^{3,7,10–12} Yet, in a previous study, we found that in South Australia (SA), the cost of overweight- and obesity-attributable admitted hospitalisations^A contributed relatively little to the increase in real acute public hospital in-patient expenditure between the financial years 2007–08 and 2011–12.¹³

Although examining trends in known drivers of hospital utilisation is useful, further insight can be gained from breaking down expenditure growth into its major contributing factors

^AConditions attributable to overweight and obesity included diabetes mellitus, congestive heart failure, asthma, gallbladder disease, gallbladder cancer, rectal cancer, ischemic stroke, osteoarthritis, hypertensive heart disease, ovarian cancer, hypertension, oesophageal adenocarcinoma, breast cancer, endometrial cancer, pancreatic cancer, kidney cancer, colon cancer, and ischemic heart disease.

through decomposition analysis.^{14–19} The decomposition analysis included in our previous study found that most of the real growth in in-patient expenditure in SA acute public hospitals over the 5 years to 2011–12 was from an increased average cost of delivering in-patient care across all treatments and conditions, which is consistent with findings from four studies from the USA and one from China that have found increasing average treatment costs to be the dominant driver of healthcare expenditure growth in those countries.^{14–18} This prompted our present study to investigate whether our earlier finding is reflective of public hospital expenditure growth overall (i.e. including non-admitted care) and over the longer term and, if so, what has driven the real growth in the costs of delivering public hospital care.

In this paper, we decompose the total (admitted and non-admitted) real expenditure growth in SA acute public hospitals over a longer (12-year) timeframe to 2017–18. During this period, nominal annual expenditure^B more than doubled from AU\$1.80 billion to AU\$3.72 billion,^{20,21} representing a 61% increase in real terms (2017–18 prices).²² The SA population grew by a relatively minor 11% over the same period, from 1.57 million to 1.74 million.²³

We quantified the individual additive contributions to this expenditure growth from changes in: real average salaries; staffing inputs; and the real prices of non-labour inputs, each calculated by using a major expenditure category. Notably, the importance of labour cost drivers in expenditure growth has received seemingly little attention within the Australian literature, despite labour costs typically comprising upwards of two-thirds of acute public hospital expenditure in Australia^C (67% in 2017–18).²⁴ Unlike our previous study, here we controlled for the effect of changes in the size of the SA population on hospital utilisation to distil the expenditure effects of changes in the *per capita* rate of hospital utilisation, being the component of utilisation likely to be amenable to healthcare policy and management decisions. We also controlled for the effects of changes in the overall hospital case mix on the average cost per hospitalisation to appropriately distinguish these effects as related to changes in hospital use rather than average input costs.

Methods

We used decomposition analysis to quantify the individual effects of changes in hospital utilisation rates and average input costs on the growth in total *per capita* acute public hospital^D expenditure (APHE) between the base (2006–07) and final (2017–18) year of the study period. We excluded depreciation expenditure from the analysis because the focus of this study was growth in non-capital recurrent expenditure. During the reported years, depreciation comprised between 3.1% and 3.6% of SA’s total acute public hospital expenditure.^{20,21,25–34} APHE in each year was measured in constant 2017–18 prices, using the All

Price Consumer Price Index (CPI) for Australia’s eight capital cities.²²

For this study, we defined hospital spending as the product of the reported quantity of admitted and non-admitted services provided and the cost per service provided. We attributed the minor proportion (between 3.7% and 5.4%, based on the data available for our study period^{35–38}) of APHE that went towards teaching and research, and other miscellaneous activities to the non-admitted component of hospital services.

For the number of acute public hospital services provided, we used published activity units,^E and adjusted these for the average case complexity by multiplying by the average SA public hospital cost weight for the relevant year. This was to account for overall changes in case complexity as a utilisation-related driver of hospital expenditure growth. Average SA public hospital cost weights represent the relative cost of treating a given mix of cases in SA compared with the national average public hospital case mix during the corresponding year.

Notably, the absence of a single published series of counts of non-admitted activity over the study period necessitated that the decomposition analysis be split into two periods over which consistent non-admitted activity time-series data were published: 2006–07 to 2013–14 and 2013–14 to 2017–18. This was made possible by the reporting of counts derived from the original and revised counting method for the overlapping year (2013–14) in the published data. We summed our estimates of decomposed expenditure growth for each period to derive estimates for the whole period.

We controlled for population growth by dividing APHE in each year by the size of the SA population in that year.²³ Thus, we defined APHE *per capita* in terms of its major drivers of utilisation and input cost (Eqn 1).

$$APHE \text{ per capita} \equiv \overbrace{\text{Number of APH}}^{\text{Utilisation}} \times \overbrace{\text{Cost per APH}}^{\text{Input cost}} \quad (1)$$

weighted activity units per capita × weighted activity unit

In the absence of published annual cost weights for non-admitted activity, we derived these by assuming that the ratio of the non-admitted to admitted average cost weight in each year would be equal to the ratio of the cost per non-admitted to admitted activity unit for the corresponding year (Eqn 2).

$$\frac{\text{Average cost weight of non-admitted activity}}{\text{Average cost weight of admitted activity}} = \frac{\text{Cost per non-admitted activity unit}}{\text{Cost per admitted activity unit}} \times \frac{\text{Average cost weight of admitted activity}}{\text{Average cost weight of activity}} \quad (2)$$

^BFigures exclude administrative and depreciation expenditure, which have been inconsistently reported over the period.

^CIncludes visiting medical officer payments and superannuation and excludes other contractors (e.g. nursing agency staff).

^DThe number of SA acute public hospitals includes all SA public hospitals except free-standing dedicated public rehabilitation hospitals.

^EInpatient activity units were measured by completed admitted episodes of care. Emergency department activity units were measured by presentations until 2014–15 and then by service events; and outpatient activity units were measured by occasions of service until 2014–15 and then by service events. Definitions of each are provided in Supplementary File S2.

Finally, to identify the main drivers of expenditure growth, we further split *per capita* APHE into its non-labour and labour components, and the labour component into its components of input quantity (full-time equivalent hospital employed staff, or FTE) and the cost per hospital staff FTE (average salary). Visiting Medical Officer (VMO) payments were added as a separate item under labour, because VMO FTE data are not

available, precluding such a split. To derive salary and wages expenditures for each occupational category inclusive of superannuation, we apportioned superannuation expenditure to salary costs on a *pro rata* basis.

The final APHE model is represented by the identity in Eqn 3, which delineates the major expenditure drivers and their components.

$$\text{APHE per capita} \equiv \overbrace{\text{Number of APH}}^{\text{Utilisation}} \times \text{weighted activity units per capita} \times \left[\text{Number of FTE per APH weighted activity unit} \times \overbrace{\left(\begin{array}{l} \text{Average cost per APH FTE} \\ \text{Average VMO cost per APH weighted activity unit} \\ \text{Non – labour cost per APH weighted activity unit} \end{array} \right)}^{\text{Input cost}} \right] \tag{3}$$

where Average cost per APH FTE = average salary plus superannuation.

We decomposed the growth in real *per capita* APHE from the base (2006–07) to the final year (2017–18) by applying the demographic decomposition approach, in accordance with Chapter 5 of Das Gupta (1993),³⁹ to Eqn 3. The decomposition calculations, described in Supplementary File S1 available at the journal website, were performed for each input category for which APHE was reported, with the exceptions of administrative labour and non-labour for reasons explained below. Annual results were also obtained for each intervening year by applying the same method to the year-by-year change in real APHE.

The distinguishing feature of Das Gupta’s approach is that the calculated individual components of growth are completely additive, with no residual terms. It has been adopted elsewhere to decompose healthcare expenditure growth and the burden of disease where several contributing factors were identified.^{17,18,40} To assist in interpreting our results, we calculated each factor’s contributions using two other common decomposition approaches, namely variance analysis from cost accounting and the interaction approach, which are provided (along with an explanation of the differences in these methods) in Supplementary Material File S1.

We populated the expenditure and hospital activity components of Eqn 3 with publicly available SA time-series data sourced from the tables presented within Australian Institute of Health and Welfare (AIHW) publications.^{20,21,25–34,41–50} The published data were from the national databases compiled from the Public hospital establishments National Minimum Data Set (PHE NMDs) and the Local Hospital Network Data Set Specification (LHN DSS) whose collection by State and Territory governments is mandated through National Healthcare Agreements in accordance with the specifications of the National Data Dictionaries. These data are sourced from the patient and financial administrative systems of acute public hospitals (with minor exceptions), including psychiatric hospitals, drug and alcohol hospitals and dental hospitals, and excluding dedicated subacute hospitals. The individual States and Territories are primarily responsible for the quality of their own submissions, so although AIHW undertakes extensive data validation processes, it does not correct for errors or missing values.⁴¹

From the 2014–2015 financial year onwards, expenditure and FTE within the central Health Department and Local Health Networks related to acute public hospital-related administrative activities were included for the first time in the reported SA acute public hospital data.⁴² To avoid an artefactual estimate of expenditure growth resulting from these reporting changes, we excluded reported administrative labour and non-labour expenditure components and administrative FTE from our decomposition analysis. Detailed descriptions and sources for all data used in this analysis are provided in Supplementary File S2.

Results

Per capita APHE in SA grew in real terms by AU\$667, equating to a total of 45.2% growth over the 12-year period (Table 1) and an average annual compounded growth rate of 3.4%. Although expenditure on non-labour inputs grew by a considerably greater percentage (70.8%) than expenditure on labour inputs (35.2%), the latter contributed more to the total real growth in *per capita* APHE (AU\$375 vs AU\$293), due to labour costs making up a larger proportion of total expenditure.

From the results of the decomposition analysis presented in Table 2 and summarised in Figure 1, real *per capita* APHE growth over the 12-year period was largely driven by real increases in input costs per weighted activity unit (WAU), which accounted for an estimated AU\$574 (86.0%) In contrast, increases in hospital utilisation rates contributed a relatively minor AU\$93 (14.0%).

Of the AU\$310 growth in real *per capita* APHE that was from labour input costs, AU\$247 was attributable to real increases in average salaries (salary expenditure per FTE), with medical and nursing increases making up the majority (AU\$233) (Table 2). Overall, real increases in the average salaries of hospital staff contributed an estimated 37.0% of the total real *per capita* APHE growth over the 12-year period. The real increase in average nursing salaries was the most important single driver of real *per capita* APHE growth overall, contributing AU\$117 (17.6%). This was despite this rise in nursing salaries being relatively small in percentage terms (19.6% or 1.6% compounded annually) compared with that of medical staff (37.3% or 2.9% compounded annually), as shown in

Table 1. Real per capita recurrent expenditure growth in South Australian acute public hospitals from 2006–07 to 2017–18 (2017–18 prices) by input type, excluding administrative expenditure (labour and non-labour)

Source: Authors' analysis of the published data. Where numbers do not add to those in the Total row, this is due to rounding. VMO, Visiting Medical Officer. Domestic and other includes personal care staff. Growth in input type can be read across the rows. Contribution by each expenditure driver can be read down the 'Proportion of total change' column

Input type	Per capita expenditure				
	2006–07 (AU\$)	2017–18 (AU\$)	Change	% change	Proportion of total change (%)
Labour inputs					
Medical officers (includes VMOs)	337	517	179	53.2	26.9
Nurses	522	709	187	35.9	28.1
Diagnostic and allied health	100	136	36	36.2	5.4
Domestic and other	105	77	-28	-26.8	-4.2
Subtotal labour	1063	1438	375	35.2	56.2
Non-labour inputs					
Drug supplies	81	126	46	56.4	6.8
Medical and surgical supplies	107	138	31	28.6	4.6
Food supplies	11	12	2	15.9	0.3
Domestic services	34	132	97	282.3	14.6
Repairs and maintenance	49	48	-2	-3.1	-0.2
Patient transport	14	18	4	29.9	0.6
Interest payments	2	0	-1	-72.7	-0.2
Other recurrent expenditure	115	231	116	100.7	17.3
Subtotal non-labour	413	706	293	70.8	43.8
Total	1477	2144	667	45.2	100.0

Table 2. Decomposition of real per capita recurrent expenditure growth in South Australian acute public hospitals from 2006–07 to 2017–18 (2017–18 prices) by expenditure driver and input type, excluding administrative expenditure (labour and non-labour)

Source: Authors' decomposition analysis of the published data using Das Gupta's (1993)³⁹ decomposition approach described in the Methods section. Growth in input type can be read across the rows. Contribution by each expenditure driver can be read down the columns. Where numbers do not add to those in the 'Total' row, this is due to rounding. Visiting Medical Officer (VMO) costs were reported as a separate labour category because VMO FTE data were not available. Domestic and other includes personal care staff. FTE, full-time equivalent (staff); WAU, weighted activity units; Δ, change in; n.a., not applicable. All data are in AUD

Input type	Contribution to real growth in per capita total acute public hospital expenditure from:						Total
	Δ Salary per FTE	Δ input cost per weighted activity unit from:			Total Δ input \$ per WAU	Δ Utilisation rate (WAUs per capita)	
		Δ FTE per WAU	Δ VMO \$ per WAU	Δ non-labour \$ per WAU			
Labour inputs							
Medical officers (includes VMOs)	116	63	-22	n.a.	157	23	179
Nurses	117	38	n.a.	n.a.	156	32	187
Diagnostic and allied health	19	11		n.a.	30	6	36
Domestic and other	-5	-27		n.a.	-32	4	-28
Subtotal labour	247	85	-22	n.a.	310	65	375
Non-labour inputs							
Drug supplies	n.a.	n.a.	n.a.	40	40	5	46
Medical and surgical supplies	n.a.	n.a.	n.a.	24	24	6	31
Food supplies	n.a.	n.a.	n.a.	1	1	1	2
Domestic services	n.a.	n.a.	n.a.	94	94	3	97
Repairs and maintenance	n.a.	n.a.	n.a.	-4	-4	3	-2
Patient transport	n.a.	n.a.	n.a.	4	4	1	4
Interest payments	n.a.	n.a.	n.a.	-1	-1	0	-1
Other recurrent expenditure	n.a.	n.a.	n.a.	106	106	10	116
Subtotal non-labour	n.a.	n.a.	n.a.	264	264	29	293
Total	247	85	-\$22	264	574	93	667

Table 3; and reflects the high proportion of nursing staff FTE (56.7% and 58.9% respectively in the base and final years). Nonetheless, the real uplift in average medical salaries (AU\$64 355) over the 12-year period (Table 3) was sufficiently large to contribute a similar share towards real *per capita* APHE growth (AU\$116 and 17.4%) over the 12-year period (Table 2). Although the percentage growth in the average salaries of diagnostic and allied health staff over the 12-year period was similar to that of nursing staff (20.1% or 1.7% compounded annually), the former accounted for a much smaller (AU\$19 or 2.8%) share of real *per capita* APHE growth, due to their much smaller representation within the hospital workforce.

The contribution from increases in the number of clinical FTE per 1000 WAUs was AU\$85 (12.8%) over the 12-year period. The largest contribution by occupational category was from medical officers, representing AU\$63 or 9.4% of the

growth and whose FTE per 1000 WAUs increased by 22.7% or 0.87 FTE per 1000 WAUs. This was followed by nursing staff at AU\$38 or 5.7% of the growth and whose FTE inputs per 1000 WAUs increased by 1.21 (7.6%) over the period (Table 3). Diagnostic and allied health FTE per 1000 WAUs grew by a similar percentage as nursing (7.4%, from Table 3), but contributed a much smaller share (AU\$11 or 1.7%) of the total real *per capita* APHE growth (Table 2), due to their much lower FTE base. In contrast, domestic and other staff FTE per 1000 WAUs reduced over the period (Table 3), providing a small offset; albeit the real increase in the cost of domestic services per WAU contributed 14.1% to total real growth, making it the third largest single driver.

Figure 2 depicts the estimated cumulative annual contribution of utilisation rates and input cost drivers (split into labour and non-labour components) to *per capita* APHE growth over the 12-year study period. Although the year-on-year relative contributions of each of these factors varied, input costs had a substantially greater overall effect than utilisation rates.

Discussion

We found that the main contributor to real growth in total *per capita* acute public hospital recurrent expenditure in SA over the 12 years to 2017–18 was growth in the input cost per weighted activity unit, driven foremost by real increases in the average salaries of hospital staff, particularly medical and nursing. These results concur with our earlier finding that growth in the use of public hospital services has not been a major expenditure driver in SA.¹³ This is despite the population prevalence of overweight and obesity increasing from 61.6% to 69.7% of adults between 2007–08 and 2017–18, and evidence that overweight and obese individuals are relatively more frequent users of healthcare services compared with their normal weight counterparts.^{51–53}

Our main finding is also consistent with that from four recent decomposition analyses from the US and one from China, which have identified increasing average treatment costs as the most important healthcare expenditure driver.^{14–18} However, it is difficult to make more detailed comparisons with these studies because, rather than the contribution of the cost per treatment, they reported the cost per treated person, which embodies both the number of treatments per person and the cost per treatment. The former requires yearly counts of treated individuals, which are not reported in the Australian data. For the same reason, we could not further decompose throughput-related expenditure

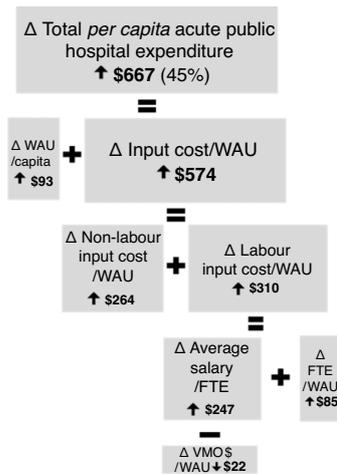


Fig. 1. Contribution of major expenditure drivers to real *per capita* acute public hospital expenditure growth in South Australia (excluding administrative expenditure and depreciation) 2006–07 to 2017–18 (2017–18 dollars). Source: Calculated from published annual data by applying Das Gupta’s (1993)³⁹ decomposition approach, as described in the Methods section. WAU, weighted activity unit. Note: The decomposition analysis is split into two periods over which consistent non-admitted activity time-series data were published: 2006–07 to 2013–14 and 2013–14 to 2017–18. For the overlapping year (2013–14), outpatient and emergency department data were published for each of the two different counting methods.

Table 3. Real change in average salaries and FTE per 1000 weighted activity units in South Australian acute public hospitals from 2006–07 to 2017–18 (2017–18 prices) by occupational category, excluding administrative staff

Source: Authors’ analysis of the published data. WAU, weighted activity units; FTE, full-time equivalent (staff); VMO, Visiting Medical Officer. Domestic & Oth. includes personal care staff. Excludes superannuation payments. Annual % change is compounded

Occupational category	Average salaries (AU\$) in 2017–18 dollars					FTE per 1000 WAUs				
	2006–07	2017–18	Change	% change	Annual % change	2006–07	2017–18	Change	% change	Annual % change
Medical officers	172 716	237 071	64 355	37.3	2.9	3.82	4.69	0.87	22.7	1.9
Nurses	85 417	102 159	16 742	19.6	1.6	15.91	17.12	1.21	7.6	0.7
Diagnostic & allied health	74 878	89 957	15 079	20.1	1.7	3.46	3.72	0.25	7.4	0.6
Domestic & oth.	55 876	53 258	–2618	–4.7	–0.4	4.89	3.55	–1.33	–27.3	–2.9

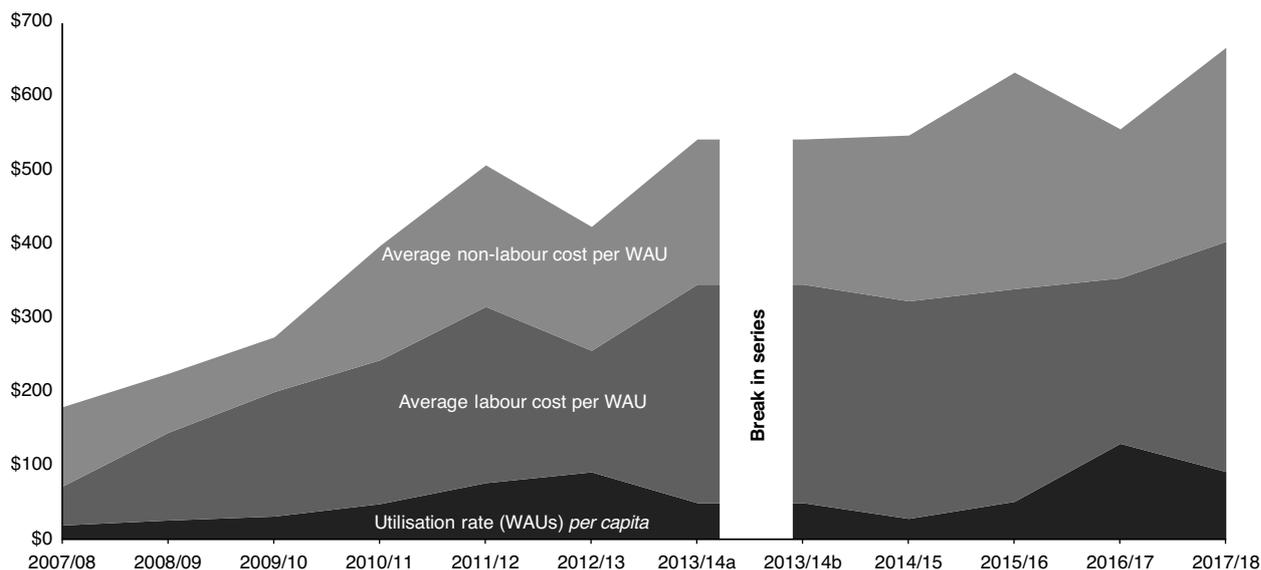


Fig. 2. Cumulative annual contribution of major expenditure drivers to real *per capita* acute public hospital expenditure growth in South Australia (excluding administrative expenditure and depreciation) 2006–07 to 2017–18 (2017–18 dollars). Source: Calculated from published annual data by applying Das Gupta's (1993)³⁹ decomposition approach, as described in the Methods section. WAU, weighted activity unit. Note: The decomposition analysis is split into two periods over which consistent non-admitted activity time-series data were published: 2006–07 to 2013–14 and 2013–14 to 2017–18. For the overlapping year (2013–14), outpatient and emergency department data were published for each of the two different counting methods.

growth into the number of persons treated and the frequency of treatments per person.

We found one Australian decomposition analysis of total hospitalisation costs for cardiovascular disease from 1993–94 to 2003–04, which reported that an increase in the average cost per healthcare episode was the largest cost driver for acute conditions and a major cost driver for chronic conditions, even without controlling for the impact of population growth.⁵⁴ However, we could find no studies in the published or grey literature that identified the contribution of labour input costs to hospital expenditure in Australia or elsewhere, with which to compare our main finding. Nonetheless, disproportionate real increases in labour costs within the healthcare industries of some Organisation for Economic Co-operation and Development (OECD) countries have been described.^{55,56}

In SA, upward pressure on labour costs has perhaps been influenced by local industrial conditions such as a strong union presence and workforce shortages, although whether this may have limited technology-enabled productivity growth is unknown. At the same time, increases in treatment complexity, combined with budgetary-related pressures for earlier discharge could conceivably have driven up the required average skill mix of hospital staff, leading to a higher-paid staffing configuration, while reducing recovery times and length of stay.⁵⁷ AIHW data suggest that over time, clinical input has been compressed into fewer days, which may well have justified greater financial compensation.^{58,59} Likewise, a recent report attributed real increases in Australian healthcare expenditure to the provision of 'new, improved and more services per person' over a period that overlapped our present study (2002–03 to 2011–12).⁶⁰

Regarding medical officer salaries, public sector employment arrangements in Australia have permitted concurrent

employment in private hospitals, at which doctors may set their own practice fees. Those seeking to match remuneration levels through the public sector enterprise bargaining process may have put upward pressure on public sector remuneration. Although this is not unique to SA, comparisons of average wages across other Australian jurisdictions indicate that SA's industrial awards for medical officers have been relatively favourable, with the average full-time medical salary in SA reportedly higher than in most other States, including 37.5% higher than in New South Wales, which has the lowest.⁶¹ In contrast, because medical officers may not always accurately document all of their hours worked in public hospitals, reported FTE may well be understated, and thus average salaries overstated. Moreover, the calculation method for historical hospital FTE data reported by government officials within the SA Health Department has been publicly questioned.⁶² Such phenomena may introduce uncertainty into our assessment of the relative contribution to real *per capita* APHE growth from salary increases versus increases in the number of FTEs per WAU. However, they do not affect our assessment of the importance of the growth in real labour costs to real *per capita* APHE growth in SA over the 12-year period examined.

It is difficult to determine with certainty from the published data the extent to which patient complexity changed over the 12-year period. Although average cost weights reflect relative resource intensity, which may be influenced by patient and treatment complexity, they are not generally accepted as a sound clinical indicator of either. Moreover, the cost weight of an individual Diagnosis Related Group (DRG) in comparison to another is influenced not just by patient complexity, but also by changes in the prices of its specific inputs and in related clinical practices over time.⁶³ In any case, the patient and treatment

characteristics accounted for when classifying cases into DRGs and subsequently assigning cost weights are relatively limited; the completeness with which such information is documented in patients' files is variable; and the quality of clinical coding can change over time.⁶⁴

It is also difficult to detect improvements in the quality of treatment or in patients' health and wellbeing from published data, which other than some rudimentary indicators of patient safety, lack patient outcome or treatment effectiveness measures, as these are not routinely recorded in Australian public hospitals. Yet, such information is needed in an aggregate form to understand the benefits from increased labour and other costs.

Notwithstanding these limitations, our findings highlight the importance of correctly understanding the relative influence of expenditure drivers and their mechanisms, and the value generated from additional public hospital expenditure, particularly given the magnitudes involved.^{65–67} They also suggest that improvements in data collections are warranted to enable the tracking of changes in the quality and outcomes of hospital care associated with changes in input prices and quantities.

Finally, although we found that increases in the rate of hospital utilisation have not been a major driver of real *per capita* APHE growth in SA, it should be noted that constrained public hospital waiting lists may have left unmet demand that has not been expressed in published hospital statistics. Similarly, we may not yet have seen the full impact of past increases in the prevalence of overweight and obesity. The extent to which overweight and obese cohorts may develop consequent health complications as children or as they traverse middle age and beyond, combined with expanded availability of treatments for obesity, such as bariatric surgery, within public hospitals, remain important considerations when projecting future expenditure growth.

Conclusion

The conventional wisdom among decision-makers about what drives public hospital expenditure influences the choice of mechanisms to control future spending.⁶ Yet, the ways in which costs have been conceptualised and reported have often provided an incomplete understanding, while pointing to policy approaches and actions that may not provide the greatest potential to contain costs, improve population health, and maximise the value gained from available resources. To correctly gauge the potential efficacy of cost containment approaches and avoid misguided resource allocation, a clear accounting of the contribution of the main expenditure drivers over time is needed and can be provided through decomposition analysis.

Our decomposition analysis presented here found that, in SA, increasing real clinical labour costs have been the most important expenditure driver, with the real growth in the average salary of clinicians accounting for the largest component, whereas changes in rates of hospital utilisation played a minor role. These findings suggest quite a different policy focus than studies that have emphasised the potential for increased demands on public hospital services from a changing population demographic and disease profile.

This analysis could be repeated in other settings for which similar data are available, using the spreadsheet templates

provided as supplemental material (Supplementary File S3). To improve the robustness of such analyses for Australian jurisdictions, it is recommended that State and Territory governments: invest in improving the quality and standardisation of FTE data; develop and publish standardised time-series data on key measures of patient complexity, hospital quality and treatment outcomes; and report condition-specific public hospital activity and cost data on a routine basis.

The data that support this study are available in published reports, of which full details are provided in Supplementary File S2.

Competing interests

The authors declare no competing interests.

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