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Human Services and
**Cost Indexation
Methodologies**
in Australia

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Professor David Gilchrist is Director of the Centre for Public Value at the University of Western Australia. He has received funding from governments, peak bodies and individual organisations for various research projects and consulting support predominantly related to the Not-for-profit human services sector, Not-for-profit financial and performance reporting, sustainability and outcomes reporting, and policy and practice related to those areas. He has been a director and chair of a number of human services and policy organisations over past years and is currently chair of two policy-focused Not-for-profits operating nationally in the education sector.

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Summary

- A cost index is a measure of change in expenditure from one period to another holding constant the standard of output. Changes to expenditure may be reactive to markets and prices or initiated by consumer preference.
- Changes in consumer preferences are based off the perceived value of goods and services with resources available. Price and accessibility alter decision making as change requires reallocation of resources.
- Consumption changes may use economic or non-economic resources which are not otherwise reflected in cost indices. We can compare the spend of money in a cost index which a consumer has judged in relation to other resources available.
- A cost index is only as good as its relevance from the sample. Indices designed for purpose may have sampling and analysis techniques which do not allow for external representation.
- Misrepresentation and misuse of cost indices may come by way of, time periods, reference groups, calculations, market basket, data collection, and weighting. These are known as biases.
- Elasticity of goods indicate what consumers are willing to substitute or opt out of consuming. Capturing substitution or changes in consumption are necessary for representative cost indices.
- Timeliness of information alters decision making capacity for consumers. Short-term and long-term price changes have varying impacts on consumer behaviour. Information empowers decision makers in appropriate and prompt responses.
- The human services sector operates differently to household and for-profit sectors in expenditure and funding requirements. Demand and supply of human services is not altered by price of services as other goods.
- Utility standards measured by a cost index in a household differs to desired utility of human services organisations. Households maximise comfort and satisfaction, human services organisation maximise providing quality services.
- Restrictions on organisations by income sources constrains long-term planning and investment risking sustainability.
- Indexation methodology by way of CPI and WPI is not appropriate for the human services sector although used in many states and territories in Australia.
- Households are the representative population of the CPI including discretionary spending and use of wealth or debt. WPI represents a state's entire workforce base wage and excludes employee on-costs.
- Laspeyres formula is used by the ABS and other statistical agencies to support timeliness and burden of data collection.
- An international example of a specific publicly funded social care services index makes use of a combination of pre-existing indices compiled to represent the sector.
- In its diversity, the human services sector requires a more robust index identified as the Ideal Fisher Index. This reduces biases and better represents changes in consumption.
- Data collection technologies are available to assist and support price collection for the human services market basket, reducing administrative burden for both organisations and analysts.



Quick Guide: Why indexation using a mix of CPI and WPI does not work

Table 1. Wage Price Index compared to REAL human services wage expenditure¹

Wage Price Index (State/Territory)		Human Services (Wage Expenditure)
✓	Wage Inflation as cost to business	✓
✗	Mandatory superannuation contribution increases	✓
✓	Represents multiple industries across the state	✗
✗	Minimum wage overrepresented (and increases)	✓
✗	Female dominated workforce	✓
✗	Business paid maternity leave	✓
✗	Workers' compensation payments	✓
✗	Recruitment and retention costs	✓
✗	Penalty rates and allowances	✓
✗	Bonuses and benefits	✓
✗	Training and personal development	✓
✗	Compliance, Training and Admin Costs	✓
✗	Increases reflected from success of outcome	✓

Table 2. Consumer Price Index compared to REAL human services consumption expenditure²

Consumer Price Index (Capital City)		Human Services (Non-Wage Expenditure)
✓	Outcome: household utility in living standards	✗
✗	Outcome: demand and quality of service provision	✓
✓	Represents capital city average household	✗
✗	Represents state Human Services organisations	✓
✓	Represents optional purchases (alcohol, take away, holidays)	✗
✗	Overrepresentation in essential items (financial services, communication, housing)	✓
✓	Elasticity in discretionary and discretionary spending	✗
✗	Business related purchases (subscriptions, PPE)	✓
✗	Timely response to market goods and prices	✓
✗	New goods and technology	✓
✗	Significant savings or investment component (land, capital goods)	✓
✗	Taxes	✓
✗	Interest Charges	✓
✗	Second hand goods	✓
✓	Subsidised by flexible wealth and debt management	✗



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What we mean when we say...

Term	What we mean
ABS	Australia Bureau of Statistics
Aggregation	Compilation of relevant or similar items for classification or analysis
Market Basket	The collection of goods and services represented in a cost index
Chain	A method in indexation which equally represents all time periods in the final index calculation
Class	A defined group of items in a basket relating to an identifying factor. Classes are mutually exclusive in organisation and all items in a basket are in a class
Consume	Purchase or use of goods or services for current or future
Consumer	An individual or entity as a household or business who consume purchase or use goods or services for current or future use
CPI	Consumer Price Index
Demand	Consumer's desire or intention to purchase goods or services at the specified price
Discretionary	Left to consumer preference or judgment. Not essential or necessary and little to no impact if not consumed
Elasticity	Ability or likelihood that demand reflects change in price. Price and demand are inverse as price reductions see demand increases and price increases see demand reductions.
Expenditure	The sum of total costs in relation to price and quantity of individual or collective items
HES	Household Expenditure Survey
Heterogeneous	Consisting of diverse or dissimilar components
HFCE	Household Final Consumption Expenditure
Homogenous	Consisting of an array of similar and comparable identifying factors
ILO	International Labour Organization
Income	Money received by an individual or entity, usually on a regular basis through paid work and may include investments. This can be shared or individual in a household
Index	A measure of relative changes in terms of a standard



Inelastic	The inability of demand for a good to change with price. Demand is consistent and the consumption remains relatively unchanged in price changes
Maximised utility	The pinnacle of satisfaction which can be reached by an allocation of resources for an individual or entity. Any change in allocation or purchase of goods or services would be of no greater benefit
Median	Value at the midpoint of frequency of a data set
Non-discretionary	Required by consumer for necessary or essential use. A reduction or elimination would have significant impacts on the consumer
Non-homogenous	Consisting of an array of differing and incomparable identifying factors
Normal distribution	A dataset which clusters toward the mean point and tapers off without skew to either extreme. The mean, median and mode averages are all equal
Outlier	Datapoints outside the population which may misrepresent or alter a dataset by its extreme value
Preference	Personal evaluation of the value of a good or service for decisions on consumption and spending
Resources	A service or asset which can be exchanged for goods or services in utility calculations. This is often considered economic by way of wealth or income, but may also be non-economic directly in time or energy and indirectly convenience or accessibility
Standard deviation	A measure of how far data points are dispersed from the mean average of a data set
Utility	The satisfaction or overall benefit of an individual or entity. Often considered in perceived value and consumption decisions of goods and services
Utility calculation	An individual or entity's decision-making process for overall benefit. Often regarding perceived value of goods and services with resources available
Wealth	Accumulated goods which can be measured in economic value, including money. This may be earned or inherited and can be shared or individual in a household
WPI	Wage Price Index
Z-score	The number of standard deviations from the mean value of the reference population and measures volatility of data



What am I about to read?

This paper has been produced to allow access to digestible information relating to cost indexation of human services. It provides descriptions of cost indices, their backgrounds and relevance and gives insight into use and appropriateness of these resources. It is a technical document and is provided to support other outputs of the Centre for Public Value.

Current and proposed methodologies are discussed for relevance to the human services sector. A human services sector specific index is supported by an international example. Detail of this index's compilation encourages a streamlined approach by index analysts.

Dynamics and frameworks of human services organisations are discussed for clarity and distinction from for-profit or household comparison. Services provided by human services organisations are not optional for individuals and communities. Hence inappropriate funding creates barriers to access hindering the wellbeing of an individual.

Challenges and opportunities for data collection for indexation are reviewed. Dependent on resources, best fit methodology and analysis are considered. Technical detail is provided for methodology. Risks, outlier removal, and weighting equations are included for reference, as well as data collection frequency requirements.

Methodologies for analysis by way of formula are reviewed by current standards. The Fisher Ideal Index is proposed as an alternative formula to best support non-homogenous sectors and remove biases otherwise distorting indices from intended representation.

Additional information and data collection requirements are identified and discussed. This is significant for measurement and monitoring of the sector and informed decision making by both policy makers and the organisations.

For any further queries on the document the authors would be delighted to further discuss for any clarity or questions which may arise in the use of this report¹.

What is a cost index?

An index measures change in the cost of maintaining a level of output in terms of quantity, quality, and timing. In ever changing economic, social, and technological environments, the amount spent to maintain productivity differs from year to year. In state government contracts for multi-year agreements, indexation is required to support the ongoing provision of the quantity, quality, and timing of services as input costs increase over time. This ensures purchasing power and delivery of services remain consistent for the level of community services and supports needed in contractual agreement.³

In economic terms, a cost index is the change in expenditure to maintain a standard of utility of an entity. In this description we also use entity to incorporate a consumer and a business or organisation, as each face changes in costs and desired outcomes.

Numerous types of indices are calculated for a variety of functions. Public and private decision makers consider indices as economic estimates of inflation. There are many different types of indices as they are created for specific purposes. It is very rare that one or a combination of

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indices created for one purpose is able to be effectively and legitimately applied to another purpose.

Import and export, lending and borrowing, building, and buying all require long term planning and responding to feedback of change in value and costs. Hence, change in these activities is estimated using specific-purpose indices. Further, indices are often used for policy purposes and for this reason alone, indices have to *...“be objective, transparent, reliable and credible”⁴*.

Consumers make utility calculations based on their preferences, and by nature aim to maximise their utility. That is, everyone makes decisions on what they value and what they are willing to give up. Maximising utility means the ideal combination of consumption quantities for that point in time.

Preferences may change based on perceived value, and an item may change in cost. Both changes would cause a consumer to recalculate their utility maximisation subject to budget constraints and action accordingly. A change in wants or prices leads to a change in purchases within our means.

Resources available in utility calculations may not only be of monetary value, but also time, energy, cognitive capacity, personal commitments, and responsibilities. Likewise, consumption we reference is based on expenditure, but an individual’s utility is also made up of non-economic consumption such as leisure, family and relationships, and self. Similarly, a business or organisation may value profit, as well as employee wellbeing, environmental impact, and social and political alignments.

Indices can provide insight into economic preferences—what choices do people make when a price increases? Decreases?; what impact does that change have on people’s purchasing preferences and then on a producer’s activities? Generally, people will decide how to react to a price increase based on their sense of value in that item—they may continue to purchase it, replace it with another item, redirect their spending, or save their money.

How indexation in human services impacts service delivery

However, in human services, service users are not in a position to forego services because of price differentials. Appropriate levels of indexation are therefore critical to ensuring sustainability of services and supports that vulnerable people and communities rely upon.

An appropriate index is important in human services not just because it indicates needed changes in funding levels, but also because it can indicate the level of risk being faced by services users. An index may be a proxy for sustainability assessment.

A few important details

An index is usually represented as percentage points of change from the previous year. However, base and reference periods must be held in context for appropriate representation and use of the index.

If Australia’s CPI increased by 7.8% for the year in December 2022, the quarterly increase may only be 1.9% as these amounts are the increase from their reference period⁵. December expenditure was therefore 107.8% of September 2021 and 101.9% of September 2022. The ABS calculates its’ most referred index – the CPI– in intervals of yearly, quarterly, and monthly.



Likewise, a quarterly CPI in December may be “1.9”, an increase of 1.9% or 101.9% of the previous quarter (September is base period and December is reference). The same December may show a CPI of “7.8” for the year, a 7.8% increase in the previous 12 months and 107.8% of expenditure of the same time the year before (2021 is initial time period and 2022 is reference). Both share valuable information providing insights, but without clarifying if ‘December CPI’ is quarterly or annually, we can be quite mistaken (Real data for Australian CPI⁶).

Certain groups of consumers may have similar preferences and hence consumption behaviour which could be targeted based on independent defining features. Features could be location, age, source of income, marital status, and number of dependents.

This can allow more representative indices for the defined groups. As much as we can gain insights from comparing the changes for these groups, it would be detrimental to expect another groups’ index to represent the same change.

This could be like comparing Perth’s annual CPI of 8.3 to Canberra’s 7.1 for the same time.⁷ It gives us insight into differences across consumer expenditure and which city had greater increases in living costs. It could be rebalancing after a lag the year prior, or as simple as variances in weather from the year prior which can translate to variances in leisure activities and spending. This is separate from housing demand, interest rates, and fuel costs alone.

Cost indices also measure change in expenditure for the time period. When comparing different time periods or groups, a higher index number does not represent a higher cost, but a higher increase for that period. If comparing Perth to Canberra, Perth’s high CPI showed the greater increase in expenditure, but overall spending may be less because people of Canberra are more likely to use public transport or convert to electric cars, while Perth’s 4WD culture and leisure activities relate to greater fuel costs.

Incorrect context of an index can have detrimental impacts on what is believed to be informed decision making. If we say, ‘Perth housing went up by 1.9% in December’ because we understood ‘Australian housing prices went up 1.9% in 2022’ and understand Perth is in Australia, December was the final month of 2022. However, Perth prices increased 12.8% in 2022 and 11.6% in December alone.⁸ While we also know that housing prices grow differently based on suburb, school district, size of house, etc. This is using unrepresentative sample by location and time frame which should not be used to inform decision making.

Overall, a cost index gives us an indicator in price increases and consumer preferences. Individuals must make decisions based on values and abilities to adapt to changing markets. Our values may also change, and our purchasing behaviours reflect this. This may be a self-initiated prompt due to change in the consumer’s needs or externally by new products emerging in the market.

What goes into an index?

Significant amounts of data are required to calculate an index. A sample must be established with the intention of representing the entire population, and a sample of the goods and services being pursued for price changes. We refer to these goods and services as a ‘market basket’ as the entire market is not relevant, items deemed representative are selected and monitored.⁹

As new products enter the market and others become irrelevant, market baskets are updated to ensure relevance of the sample.¹⁰ That means that goods no longer purchased are no longer



included and new products are introduced and prices tracked. This could be seen as the e-scooters entering the market basket, and VHS players exiting.

The market basket may also consist of multiple groups (classes) which compile associated cost items. This allows ease of organisation in analyses and better understanding of cost drivers. The CPI as calculated by the ABS consists of eleven groups (classes) for metropolitan households which include food and non-alcoholic beverages, recreation and culture, and housing.¹¹ Increases or decreases of prices and expenditure in these groups also give insight to behavioural changes.

Data must be tracked meticulously to understand expenditure changes. An index is not just an estimate of the increase in the price of the basket of goods but also of the amount of that good purchased. Therefore, calculating an index is costly and time consuming for both those providing data and analysing it.

Hence, expenditure on an item may not change, but the price has increased so the purchased amount has decreased. These three variables are intertwined, as a decrease in the expenditure of one item may mean the increase in another in substitution. That is, the price itself may change and the quantity of a particular item purchased may change as a result because people change their demand as a result of a change in what they may consider their economic priorities.

Deep details of indices share deep insight in economic preferences. Elasticity of a good indicates its importance to the buyer as non-negotiable items have little impact on quantity when prices increase, while other items may see immediate reductions in quantity to slight price increases. Indices indicate changes in price and purchasing behaviour. Income and preferences may restrict the standard to be maintained, while technological, social, and political shifts also influence change.

What isn't represented in an index?

As complex as creating and maintaining an index may seem, it excludes a number of other significant elements of funding and organisation sustainability.ⁱⁱ A change in demand and use of services is not represented in indexation, although sustainable models would require consideration for these increased costs and public need. Likewise, transitions and overheads within the organisation aimed at creating new services and long-term planning and investment also takes energy, time, and organisation away from other tasks.

While organisations face increased costs in operations, so do individuals in the community. The same rise in costs for organisations therefore indicates an increase in need of services by individuals who have not been able to sustain their own requirements under increasing economic pressure. In such changing circumstances, the needs of individuals may become increasingly complex and further translate to more costly services required by individualized services in.

Hence, an increase in costs for an organisation not only means they recalculate and draw on their own resources to meet the same standard of service delivery, the quantity and quality of services required by the community may also increase. This combination of reducing resources

ⁱⁱ See our paper "Economic Paper 5: What is Sustainability in the Context of Human Services?" Available at: <https://www.uwa.edu.au/schools/Research/Centre-for-Public-Value>



and increasing output can flatten an organisation's productivity by reducing the real income and increasing the pressures to deliver services.

Sustainable funding policies should hence include manual interventions when mandatory or uncontrolled changes increase costs of an organisation. This would include things like mandatory superannuation increase, or workforce training for NDIS services provision.

Restrictions are faced due to a lack of control and adaptability by income sources. Funding by government and voluntary donations mean organisations have few options of increasing total income. Economic resources are reallocated within the organisation in times of need, but this can be to its own detriment. Without sufficient information or funding, organisations may take more costly short-term actions with confidence instead of long-term more sustainable decisions with uncertainty and insecurity.

Indices in the context of human services?

The provision of human services is a complex industry which cannot and should not be compared to households or for-profit industries. The movements and utilities of these organisations do not operate the same as a household by preferences or in maximising the use of economic and non-economic resources and preferences.

Likewise, a for-profit business which maximises profit and reports to shareholders is completely different to organisations which provide outcomes of life-necessary services to vulnerable people, funded partially by government and donations.

Human services organisations are typically non-profit and may not have the same motivations and resources which are otherwise available to a business in a competitive market. The use of wealth or debt to invest in the organisation is not available as services are not provided for a profit, and likewise the organisation likely does not make optional purchases in times of frugality to redirect funds form.¹²

A non-profit organisation such as human services maximises its services provided to those who have requested them by identified need. Reducing the quality or quantity of these services based on associated costs would be a reduction in utility of the organisation as that is its purpose.ⁱⁱⁱ

Human services are complex and vary greatly across the types of services delivered, as do the prices. Costs associated with housing assistance differ in comparison to costs associated with offering financial advice —and even more so across regions. Additionally, an individual may need support by both services to regain independence and any other complexities which come with their circumstances.

Short-term information and a lack of transparency in Government funding and indexation hinders long-term planning and investment. Without knowing the future resources available, may lead to band-aid fixes and unsustainable decision-making because that's the most information available at the time. For the community, needs must be met, and organisations are the ones who can meet them.

ⁱⁱⁱ See our report: "Green Paper No. 6: Cost Differentials in Western Australian Disability Services Delivery" at <https://www.uwa.edu.au/schools/Research/Not-for-Profits-UWA/Publications>.



The current methodologies applied in calculating indexation

All Australian state and territory Governments fund human services to an extent and each of these Governments use some form of indexation on multi-year human services contracts. Proxies are used for indexation because the collection of data and its analysis in support of a fit-for-purpose indexation model is time consuming and expensive for the sector and for the government.

Funding for the delivery of services is indexed at either an arbitrary number decided by the Government or variations of a formula using the ABS CPI and WPI. Although these indices are indicators for the broader economy, we will discuss further below why this is not as representative as intended.

The use of the CPI and WPI to estimate human services indexation is inadequate and inappropriate. These indices are both technically sound and insightful when used appropriately. If we consider the use of CPI and WPI for human services indexation, we accept the entirety of the index to be representative of the human services sector.

When used out of context from their represented population—both in people sample and data input— these indices inspire a false understanding of the mechanisms at play. These indices are not representative as intended in human services and their funding.

Poor indexation leads to a reduction in sustainability, increased risk to service users and governments and a reduction in service quantity. As such, the inappropriate implementation of an index can have detrimental impacts on what is believed to be informed decision making.

The CPI and WPI were graphically compared in brief with human services organisations earlier in this writing. As calculated by the ABS and transparently shared through their methodology sheets widely available on their websites, the CPI and WPI are not representative of human services organisations and cost increases.

Why current indexation policies can be inappropriate

Human services organisations are not appropriately represented in any of the current ABS indexes, simply because they are not purpose-built. The sector isn't appropriately represented because it's not intended to be. Aside from the above outlined factors of human services excluded in indexation, to use the CPI and WPI is misuses both of the indexes.

Misrepresentation and misuse of cost indices may arise because time periods, reference groups, calculations, the market basket, data collection, or weighting are individually or collectively unrelated to the item sought to be measured. These are known as biases and any decisions made based on them are likely to be incorrect if used for context out of intended use—more on this later.

While it is understandable that those without statistical backgrounds may consider CPI and WPI to be relevant to assessing the extent of cost change in the delivery of human services, these two indices are not actually very relevant to the sector.

The CPI, as calculated by the ABS, is based on the household's average expenditure by each Capital city in Australia.¹³ Hence, the sample of respondents are households, and the market basket are of household purchases using prices in capital cities as the measure. Types of purchases and their quantities by private households differ significantly to human services organisations' cost bases and activity levels.



Further to that, the market basket is a combination of discretionary and non-discretionary goods and services which vary in elasticity. That is, some goods must be consumed regardless of the price (non-discretionary) while some are able to be foregone when the price gets too high (discretionary). Because producers do not have to worry as much about the effects on purchase decisions where their goods are non-discretionary, the prices for those goods increase typically greater than the prices of discretionary goods. The CPI calculation essentially strikes a value between the higher non-discretionary cost increases and the lower discretionary cost increases.

Where household goods are purchased for the delivery of human services, human services organisations are more likely to make non-discretionary purchases as they are considered essential items. Therefore, even though some components of the CPI may be argued to be relevant to human services delivery, the price increases experienced by this sector are likely to be higher than the reported CPI figure.

Expenditure weighting in CPI calculations represent the quantity of products purchased at the prices which are monitored for change. This calculation allows the ABS to determine the weighting of relevant goods in the CPI calculation. Up to date weighting is essential to capture relevant changes as new products and behaviours arise.

Reweightings for CPI calculations has been conducted annually since 2019 based on the Household Final Consumption Expenditure (HFCE) data.¹⁴ Prior to this, reweighting was based on the Household Expenditure Survey (HES) conducted every six years and is still the preferred source being a benchmark to the HFCE. Reweighting is recommended for CPI at least every 5 years, and the last HES and it's reweighting was 2017.¹⁵¹⁶

The WPI is calculated by state rather than capital city and weighted for a national figure. It can be industry specific and is intended to represent changes in the hourly base pay of the jobs it includes. A number of variations exist of the WPI and the one used for human services indexation is the *Total hourly rates of pay excluding bonuses by public and private sectors and all industries* by the state it represents. In doing this, the represented industry of human services is compiled with and represented by all other industries in the representative state.

This representative sample and equivalent market basket of paid work hours is inadequate for assessing the change in human services employee expenses. Human services organisations often operate outside of business hours paying penalty rates, employ casual workers, and are historically low paying. As a female-dominated industry, there are numerous other factors impacting workforce cost and risk that are not represented by the WPI.¹⁷ These include rates of maternity or carers leave requiring coverage in recruitment and training, and perpetuates the gender pay gap.

Further, WPI does not include changes in on-costs associated with employee wages. This means that recent increases in superannuation guarantee levy are not included in the WPI calculation which leaves a considerable gap in the assessment of cost change. Further, penalty rates, workers compensation, recruitment, supervision, and training are all outside of the scope of this index.¹⁸ As human services organisations are often required to adhere to quality standards, things such as NDIS compliance measures and training are additional to the modest paid labour budget of organisations.



More about the CPI

The CPI is based on the household's average expenditure by the capital city of Australia-also weighted for an Australian figure as calculated by the ABS.¹⁹ A household and its decision makers calculate their utility maximisation by purchasing behaviours and use of resources in line with their preferences. Dependent on income and use of wealth or debt, the CPI indicates the changes in expenditure for those areas.

Many costs to a household are not included in the CPI for various reasons. However, these are still included in the expenditure of human services which CPI is used to represent. Taxes and interest rates are large expenditures for organisations which are not represented in the CPI, for example.²⁰

Likewise, the proportions and types of goods and services consumed by households differ considerably to human services organisations. Although, one might argue that human services organisations should enjoy more trips to Bali and cocktails on Sunday afternoons, these are the types of expenses also included in the CPI designed for household expenditure.

The proportions of discretionary and non-discretionary goods and services are significant when looking at indices, as elasticity of goods is related to price increases. This means, if something is a necessary item, it's more likely to go up in price than goods that can be swapped out for other goods. Represented in both in taxes and prices set by suppliers, if consumers can go without something, they will, if they have to consume the goods, they also will.²¹

More about the WPI

The WPI is calculated by state and weighted for a national figure. It can be condensed down to represent specific industries and is overall intended to represent changes in the hourly base pay of the jobs it represents. Again, this is an excellent index for its context and a useful economic indicator for decision makers in public, private micro, and macro scales.

A number of variations exist of the WPI and the one used for human services indexation is the *Total hourly rates of pay excluding bonuses by public and private sectors and all industries*-by the state it represents. In doing this, the represented industry of human services is compiled with and represented by all other industries in the representative state.

However, human services organisations often operate outside of hours, employing many casual workers and are historically low-paying roles. A female-dominated industry and increasingly so, there are further unique factors in the human services workforce not represented by WPI as calculated.²² This includes things like paid maternity leave which requires recruitment and training for coverage, as well as any additional gaps in pay further perpetuate the gender pay gap.

Employer on-costs are excluded in the WPI calculation and may increase disproportionately to the WPI. Superannuation, penalty rates, workers compensation, recruitment, supervision, and training are all outside of the scope of the WPI.²³ As human services organisations are often required to adhere to policy standards, things such as NDIS compliance measures and training are additional to the frugal wages budget of organisations.

If the wages contribution of human services organisations expenditure adheres to their state's WPI, employee job quality severely diminished. Many employee benefits are restricted, and compensation by way of penalty rates, overtime and bonuses are not plausible. This includes



additional business paid parental leave or annual leave for the individual, and likewise sufficient staff under increased workloads.

These are the problems...

At a glance, the formula of CPI and WPI could represent wages and non-wages costs to human services organisations. The detail in the CPI and WPI sample and market basket uncovers a significant gap from the representational indices and the actual operations of human services.

In uncovering detail of these indices in reference to human services, the gap becomes clearer between what is required and what is provided. Some technical limitations further reduce the compatibility of the current methodology which can be described by way of biases.²⁴

Biases arise in many data analyses and there are methods to mitigate, with each requiring a different level of resource in information, time, or energy. In the case of the CPI and WPI, the ABS reduces several biases for their own intended use of the figures, although as we know, human services funding is not the purpose of those indices nor considered in their construction.

Literature references up to 7 types of biases which arise in cost-of-living indices each either over or under-representing the index. These biases are listed as; substitution bias, elementary aggregate bias, outlet substitution bias, quality change bias, new product bias, and inseparable property of item bias and lack of individual relevance.²⁵²⁶²⁷ Various underlying factors by analytical framework would further exacerbate these biases when comparing CPI from households to human services organisations funding requirements.

For example, working from home technologies required in recent years completely changed the landscape of office work. Disproportionately represented in workplaces over households, computers, subscriptions, and training were significant costs to businesses. New products such as these are often left out of indices until expenditure surveys are completed and weightings of expenditure groups are updated.

The CPI is based on the average expenditure by households in capital cities.²⁸ Hence, the sample of respondents are households, and the market basket are household purchases, with prices from capital cities. Household expenditure on products and quantities differ significantly to human services organisations.

The market basket is a combination of discretionary and non-discretionary goods and services which vary in elasticity-and producers are well aware. That is, non-discretionary, essential purchases are more likely to have prices increased than those which can be substituted as they would result in lost sales. This is represented in both in item specific taxes and the prices set by suppliers, as consumers make decisions in times of price changes.²⁹

Human services organisations are more likely to make non-discretionary purchases as these are essential items and hence are more likely to increase in price. While household expenditure includes optional discretionary items such as alcohol, leisure, take-away food which is less likely to increase in price as alternatives are accessible. Hence, actual price increases for human services organisations would be above the represented CPI.

Many costs to a household are not included in the CPI for various reasons. However, these are still included in the expenditure of human services organisations which the CPI is used to represent. Taxes and interest rates are large expenditures for organisations which are not represented in the CPI, for example.³⁰ Additionally, households purchase goods and services



irrelevant to human services delivery-and with varying degrees of quantity and priority. The use of CPI for human services indexation therefore excludes a significant number of elements.

Expenditure weighting in CPI calculations represents the quantity of products purchased at the prices which are monitored for change. Up to date weighting is essential to capture relevant changes as new products and behaviours arise. New items are typically more expensive when launched which may be underrepresented in outdated weightings, as are any of the expenses linked to these changes.

Reweightings for CPI calculations is conducted annually since 2019 based on the Household Final Consumption Expenditure (HFCE) data.³¹ Prior to this, reweighting was based off the Household Expenditure Survey (HES) conducted every six years and is still the preferred source and is a benchmark to the HFCE. Reweighting is recommended for CPI at least every 5 years, and the last HES and it's reweighting was 2017.³²³³

Misrepresentative weightings might as well be mis representative prices as either way, it produces misrepresentative expenditure and indexation. Allow further explanation. For the sake of simplicity, a household's fuel expenditure budget is 5% of total expenditure at \$50. When \$1.50/L, the household can purchase 33.3L of fuel within budget. As the price increases to \$2/L, the same expenditure weighting would only allow 25L of fuel. For a consumer to purchase the same amount of fuel, the cost increases to \$67, an increased weight of 33%.

Without appropriate weighing, these changes aren't suitably captured. An index may assume that a household spends \$67 on fuel and misses the possibility that they research fuel prices, purchase bicycles, use public transport, reduce other spending and any other updated behavioural changes since the last weighting. These are elementary aggregate bias, substitution outlet bias, and substitution bias.

Weighting does not only capture price changes, but behavioural as well. When we move from buying IT services for a bulk 3-year standard of coverage, to monthly or annual subscriptions with regular updates our expenditure and value of the product changes. As our consumption changes, and as technology develops so does our need for things like privacy software and cloud storage. Although we might only need 5MB of storage, 1GB may be the only available option for purchase. These are both new product bias, inseparable property of item bias and quality change bias.

Although the WPI is calculated by state and the indexation is applied for the state, there sample and equivalent market basket is not representative of human services. Intended to represent changes in the hourly base pay of the jobs it represents, a number of variations exist and the one used for human services indexation is broad and non-representative. In doing this, the represented industry of human services is compiled with and represented by all other industries in the representative state. This completely alters the growth of wages and ignores industry specific characteristics.

Not only does the use of the WPI not represent appropriate changes in costs for businesses, but it also doesn't appropriately represent the workforce of human services. Both the types of work which include penalty rates due to the nature of the work, but also the characteristics of the workforce such types of skills and female dominated.

WPI is not designed to represent total labour costs to businesses and the on-costs excluded from the WPI calculation may increase disproportionately. Any of the industry specific labour



costs as well as policy changes in mandatory labour on-costs are not represented by the state indexation formula.

To expect the WPI to represent human services labour costs would severely diminish job quality. The main reason to get this right is to ensure a sufficient amount of appropriately trained and experienced personnel are able to sustainably work in an industry which supports the community's most vulnerable individuals.

Representing human services by the current formulas slowly and surely underfunds vital services in the community. Much like the analogy of a frog in a pot of water being brought to the boil, what once may have been appropriate compensation for organisations over time turns to be dangerous under resourcing.

A few percentage points under supported in a year may perhaps have minimal impact, but year after year and in many cases decades of being left behind, the industry is surely under resourced and under supported.

What is done now?

The indices currently used to index multi-year human services agreements are produced by the ABS using excellent methodologies and techniques for the required calculations. As outlined, calculations in human services differs to those of the indices discussed, and likewise techniques required are also incompatible.

Like most statistical agencies, the ABS uses the Laspeyres formula for all price indices including CPI and WPI.³⁴ This formula uses base period fixed weights facilitating simpler data collection for accurate calculation.³⁵ This method can overestimate cost input or inflation as some biases may arise in weighting.

Theoretically, Laspeyres is a ratio of the total expenditure in the current period to the total expenditure in the base period with quantity of items held constant. This it is a ratio of how much a previous basket would cost in the reference period.

Below is the Laspeyres formula which shows the reference prices of the base period's quantities divided by the base periods price and quality of goods. In the fuel example, this would only accurately represent consumer A's petrol consumption but also misrepresent their reduction of consumption of other goods.

$$I_L = \frac{\sum_{i=1}^n p_i^t q_i^{t0}}{\sum_{i=1}^n p_i^{t0} q_i^{t0}}$$

p_i^t : the price of the individual item at the observation period

p_i^{t0} : the price of the individual item at the base period

q_i^t : the quantity of the individual item at the observation period

q_i^{t0} : the quantity of the individual item at the base period

This signifies the importance of both an accurate market basket and weightings to appropriately represent cost changes. If weightings were outdated by way of quantities in this formula, both numerator and denominator would misrepresent the change in cost of a product as simply the change in price. While a market basket which not yet includes popular items and overrepresents unfashionable items likewise would show either 0 for goods purchased or a figure for goods not purchased (think meat-free products now sold vs. plastic straws now extinct).



Price collection for the CPI of goods purchased are collected by the ABS in a variety of methods such as business visits, online search, phone surveys, administrative data and thanks to technology-web scraping.³⁶ The frequency of price collection is dependent on the frequency of price changes or purchase frequency of the goods. Data on most items are collected monthly, or less frequently if the purchase is annual such as registrations and memberships. The diverse methods of data collection represent the diversity of market operations for household consumption.

Wage information is collected by samples from the ABS Business Register. This register covers all organisations with an active ABN involved within Australia's economic territory³⁷. It hence excludes organisations below the ABN threshold (turnover < \$75,000 or < \$150,000 for NFPs).

Selected businesses are provided with questionnaires and sampling methodology to select paid job roles within their organisation. The quarterly questionnaires include information on; cash payments to employees, ordinary time earnings, overtime earnings, bonuses, and salary sacrifice (if applicable) and must be consistent regardless of position vacancies, quality and quantity of work performed.

How many indices are done like this?

The ABS calculates numerous indices which are used as economic indicators for businesses, organisations, analysts, and policy makers as well as the general public. Types of indices range from those relating to everyday life such as the CPI or housing, to industry-specific data broken down to areas such as production, imports, and wages and which aids business and political decision making.

Regular indexation is a valuable resource the ABS provides which allows the monitoring, measurement, and comparison of growth, purchasing power and potential risk to consumer or industry. Typically published on a quarterly or annual basis, these indices are specific to their sector and are to be used in context of their design with the expectation that decision makers comprehend these tools.

In industry, indices can be used to identify opportunity and risk for local and domestic economies. International Trade Price Indices measure change in import and export prices for merchandise to and from Australia.³⁸ Relevant in understanding global economies trends and markets, this index can detect changes which have diverse direct and indirect impacts.

Cost drivers in import prices can identify cost drivers in the economy and what gets passed onto business and consumers while export prices can support business opportunities grow the Australian Economy. Taxes, policies, and trade deals rely on these indicators closely to ensure sustainability and sound business and sound business and economic decision making.

Producer Price Indices (PPIs) measure the change in prices for industries producing goods and services.³⁹ Not to be misunderstood as consumer prices, the prices monitored are what the amounts the producer receives for the product and is measured from when goods or services leave the place of production or enter the production process.

Final Demand is the typical measurement for PPI's. It is the change in price of products as intended for consumption requiring no further processing.⁴⁰ The Final Demand PPI is a significant tool in supply and demand markets to understand cost drivers for domestic producers, how much consumers are willing to pay, and relevant industry specifics.



The ABS produces PPIs for construction, manufacturing, services, and mining industries. These industries are not general or economy wide as is the model for government funding indexation. The ABS likewise produces these indices for industry which could be comparable to human services as, recipients of government funding, providers of community services, and significant economic actors in employment and operations.

The Healthcare and Social Assistance Index is a subindex of the Producer Price Index. This is calculated as part of the service industries and includes its own subindices of; medical services, general practise and medical services, specialist medical services, pathology and diagnostic imaging services, other allied health services, and childcare services.⁴¹

Other services indices under the PPI are accommodation and food services, transport, postal and warehousing, rental, hiring and real estate services, professional, scientific and technical services, and higher education in education and training services.⁴² Each of these indices is also comprised of further subindices representing various cost drivers.

Also representing key cost drivers or subgroups of society, are indices such as Total Value of Dwellings⁴³ and Selected Cost of Living Indices⁴⁴. Total Value of Dwellings measures changes in the housing property markets across city, regional and state geographical areas.

Selected Cost of Living Indices represents various types of government transfer recipient and self-funded retirees as the CPI represents the average household. Cost drivers impact these groups differently to the general population and their main source of income is government funded.

What could be done?

Although the current methods and indices available don't appropriately represent human services, nor the needs in funding arrangement indexations, that is not to say that there cannot be appropriate alternatives.

Industry specific PPI's and WPI's are already developed by the ABS, hence a purpose-specific index could also be developed for the delivery of human services. The workforce considered under Health Care and Social Assistance is the biggest industry in Australia, employing 15% of Australia's total workforce— a worthwhile venture to measure.⁴⁵

With technological development and already existing non-profit and charity reporting requirements, it would not be a stretch to imagine a comprehensive, data asset which allows the calculation of an appropriate index. Technologies such as web-scraping and reporting frameworks already in use could allow easy and accessible data collection with minimal disruption or burden on both self-reporters and analysts.⁴⁶

The ABS's price collection techniques are simple for the costs represented by human services organisations which are mostly non-discretionary and basic. Although a heterogeneous group, human services organisations have similar cost requirements across Australia—not unlike the diversity of households.

Timeliness of information required for budget announcements, as well as data for analysts could be navigated by technologies and reporting. Recent years have shown the importance of access to the latest data which should be made available for decision makers in public and private sectors, analysts, and individuals.



The heterogeneity of the human services sector will always provide challenges when developing any overarching funding, policy, or regulatory proposal. This sector in its nature is not conducive to a one-size-fits all approach, however administrative burden requires simplicity and clarity. As long as there is sustainable improvement with service users at the forefront of decisions, any change is a step forward and it begins with discussions.

What do other countries do?

Australia is not alone in partial or full government funding of human services. The United Kingdom (UK) social services system could be considered similar and uses has an array of publicly funded services. Indexation for these services is compiled along with publicly funded healthcare but is still theoretically comparable.

Department of Health and Social Care (DHSC) in the United Kingdom has developed its own cost index for the increasing prices in the National Health Scheme (NHS). Known as the National Health Scheme Cost Inflation Index (NHSCII)⁴⁷ this index identifies an appropriate inflation measure for each item of spending in four extensive categories: NHS providers, general practice, prescribing and dentistry to create an overall inflation measure for the NHS.⁴⁸

Separate data sources are used in the production of indices for the pay and non-pay costs in the four sectors. The pay cost index for NHS providers uses data from the NHS Electronic Staff Record on salary and weighting unit cost growth for each staff group by expenditure on staff in that group. The non-pay costs index is created by separating expenditure into components which are then indexed by the applicable index.

These indices come from a range of sources such as subcomponents of each Producer Price Index (PPI), Services Producer Price Index (SPPI), Consumer Prices Index (CPI), Construction Output Price Indices, Retail Prices Index (RPI), and Average Weekly Earnings for professional, scientific and technical activities. The overall NHSCII is created by weighting together the four components using their relative expenditure. Other health service costs not included are represented by a residual indexed by the NHSCII⁴⁹. The NHS providers sector index is the most complex and significant in weight and construction in the overall NHSCII.

The formula for the overall NHS Inflation is the weighted harmonic mean.⁵⁰ This method weighs individual inflation indices against their expenditure proportions.

$$H. M. = \frac{W}{\sum \left(\frac{W}{X} \right)}$$

H. M. = Harmonic Mean

W = Weight

X = Variable value

Harmonic Mean is a mathematical average but is limited in its application. It is generally used to find average of variables that are expressed as a ratio of two different measuring units e. g. speed is measured in km/hr or miles/sec etc. This is a straightforward index and simple to calculate however, also tends to overweight items when their prices decrease.⁵¹



The Fisher Ideal Index

Coined the *Fisher Ideal Index* due to removal of biases and symmetry in calculation, the Fisher Index is considered the best formula for cost-of-living indices.⁵² A geometric mean of the Laspeyres and Paasache indices, it does require more data and more calculations than either alone but produces a true representative index of its data.

For context, the Paasache index is a compliment and reflection to Laspeyres. The price level can be underestimated as it uses the reference period's quantity and applies it to the base period. It represents how much a current basket would cost at base period and is more like how much consumer B's new lifestyle would cost before the fuel price increase.

$$I_P = \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^{t0} q_i^t}$$

p_i^t : the price of the individual item at the observation period

p_i^{t0} : the price of the individual item at the base period

q_i^t : the quantity of the individual item at the observation period

q_i^{t0} : the quantity of the individual item at the base period

The biases from Laspeyres and Paasache stem from having fixed baskets. Laspeyres does not recognize changes in products or consumption behaviour to the reference period and Paasache does not recognise the same changes to the base period.

You may consider Laspeyres as a person from a prior generation who doesn't consider the need for the latest iPhone, and Paasache is gen Z claiming how inexpensive life had been previously, missing all the products which were used instead at the time. Combined, they can agree that costs have changed, as have goods purchased and both sides need to be considered to find the true change in cost.

The Fisher index is symmetrically weighted as it treats the weights from the base and measured periods equally.⁵³ The biases are reduced by accounting for basket price and quantity changes over time. The market basket items will become outdated and will need appropriate attention to ensure we stop measuring the cost of a horse and cart and do include the latest iPhone.

Below is the Fisher index in basic formula form, with reference to both Laspeyres and Paasache indices. Due to its robust nature, the index is also immune to the drift often observed in chained indices and holds to several mathematical tests which neither Laspeyres nor Paasache could do alone.⁵⁴

$$I_F = \sqrt{\text{Laspeyres} \times \text{Paasache}} = \sqrt{\frac{\sum_{i=1}^n p_i^t q_i^{t0}}{\sum_{i=1}^n p_i^{t0} q_i^{t0}} \times \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^{t0} q_i^t}}$$

p_i^t : the price of the individual item at the observation period

p_i^{t0} : the price of the individual item at the base period

q_i^t : the quantity of the individual item at the observation period

q_i^{t0} : the quantity of the individual item at the base period



Chaining is not an original concept when proposed with the Ideal Fisher Index and the ABS uses it already. To chain an index simply means taking into account the periods from base to relative periods which may otherwise be skipped by a direct index.⁵⁵ This smooths the index and ensures any price volatility is not over or underrepresented.

A direct index would measure from base time to reference time using only those data points. A chained index uses multiple short-term back-to-back indices across these points and creates a time series link.⁵⁶ The short-term indices measured are multiplied from base to relative period to create the combined chained index as below.

$$I_{FC\ 0,t} = S_{0,1} \times S_{1,2} \times \dots \times S_{t-1,t}$$

$S_{0,1}$: the first short – term index from base period

$S_{t-1,t}$: the last short – term index to reference period

A Fisher chain index can either be chained from Fisher indices, or the geometric mean of already chained Laspeyres and Paasche indices. Chaining an index is more complex than a direct index, but also removes many real and potential errors.⁵⁷ Requirements on base periods are also reduced as chains better represent the respective periods and economic conditions.⁵⁸

Weights and Price Relatives

More specific to the development of a human services cost index, is the use of weights as price relatives are deemed best fit for representation of the sector's variations of size and complex characteristics. This method is also used in the calculation of the CPI, and better represents each of the quantities of items with necessary importance or meaning in non-homogenous groups.

It is hence more practical to use value shares to weight price relatives. First derive the price relatives and express the formulae. For a weighted Fisher Index, both Laspeyres and Paasche are first weighted. Expenditure weights are used when price relatives are used and if a calculation uses price data directly, then weights must only be quantities⁵⁹. See below for detail.

Price relatives are derived from the Laspeyres index by multiplying the numerator by $\frac{p_{it}}{p_{i0}}$ and rearrange for:

$$I_L = \sum \frac{p_i^t}{p_i^{t0}} \left(\frac{p_i^{t0} q_i^{t0}}{\sum p_i^{t0} q_i^{t0}} \right)$$

p_i^t : the price of the individual item at the observation period

p_i^{t0} : the price of the individual item at the base period

q_i^t : the quantity of the individual item at the observation period

q_i^{t0} : the quantity of the individual item at the base period

Where the term in brackets represents the expenditure share of item i at base period $t = 0$.

$$\text{Let weight for base period } w_{i0} = \frac{p_i^{t0} q_i^{t0}}{\sum p_i^{t0} q_i^{t0}} = \frac{e_{i0}}{\sum e_{i0}}$$



Laspeyres may now be expressed as:

$$I_{Lt} = \sum w_{i0} \left(\frac{p_{it}}{p_{i0}} \right)$$

$\frac{p_{it}}{p_{i0}}$: price relative for i th item

Similarly, the Paasche index instead multiplies the denominator by $\frac{p_{it}}{p_{i0}}$ and is rearranged for:

$$I_P = \frac{\sum_{i=1}^n p_i^t q_i^t}{\sum_{i=1}^n p_i^t q_i^t \frac{p_{i0}}{p_{it}}} = \frac{1}{\sum \frac{p_{i0}}{p_{it}}} \left(\frac{\sum p_i^t q_i^t}{p_i^t q_i^t} \right)$$

p_i^t : the price of the individual item at the observation period

p_i^{t0} : the price of the individual item at the base period

q_i^t : the quantity of the individual item at the observation period

q_i^{t0} : the quantity of the individual item at the base period

Let weight for reference period $w_{it} = \frac{\sum p_i^t q_i^t}{p_i^t q_i^t} = \frac{\sum e_{it}}{e_{it}}$

Which can be rewritten to:

$$I_P = \frac{1}{\sum w_{it} \frac{p_{i0}}{p_{it}}}$$

Also depicting the inverse of a backwards Laspeyres index as Laspeyres goes from period t to period 0 using period t expenditure weights.

Application of Chain Weighted Fisher Index

To put it all together, there are three stages to a chained Fisher index.⁶⁰ Due to the high number of cost items and classes expected in human services organisations and sector, two-stages of aggregation would be recommended. These calculations are performed after data cleaning. In these contexts, we know we are going to chain so Stage One and Two use $t - 1$ and t as the base and referenced time periods per each short-term index.

Stage One

The first stage is lower-level aggregation to from the item level to class level. This is achieved through the application of the Fisher index for each class. Below presents the Fisher index with the first term as the Laspeyres index and the latter the Paasche index.



$$P_j^{\frac{t}{t-1}} = \sqrt{\left(\sum_i \omega_{i,t-1} \frac{p_{i,t}}{p_{i,t-1}}\right) \times \left(\frac{1}{\sum_i \omega_{i,t} \frac{p_{i,j-1}}{p_{i,j}}}\right)}$$

$P_j^{\frac{t}{t-1}}$ = item class j relative price index

$\frac{p_{i,j-1}}{p_{i,j}}$ = price ratio for item i in class j, and

ω_i = total cost of item i divided by total cost of all items within class j

Stage Two

The second stage aggregation uses item class indices from stage one to aggregate classes. Item classes are treated as the individual items, meaning the item price ratio used is the class index from stage-one aggregation. To do this, the weight of the item within a class is also replaced by the weight of the class from the basket overall.

The equation used is then as below.

$$P^{\frac{t}{t-1}} = \sqrt{\left(\sum_j \Omega_{j,t-1} P_j^{\frac{t}{t-1}}\right) \times \left(\frac{1}{\sum_i \Omega_{j,t} P_j^{t-1/t}}\right)}$$

$P^{t/t-1}$ = composite relative index used to compute the chained index

$P_j^{t/t-1}$ = item class relative price index computed in the stage of aggregation, and

Ω_j = weight or expenditure share of class j from total expenditure of the basket

Stage Three

The final stage is chaining the short-term cost indices from total base to relative periods to produce a single cost index. The Chained Fisher Index is then complete at:

$$\text{Chained Fisher Index}_{0,t} = P_{0,1} \times P_{1,2} \times \dots \times P_{t-1,t}$$

Outlier detection

All data analyses require some form of outlier management. As a part of data cleaning, is important in sustaining data quality and achieving reasonable and consistent results. In doing this, the overall results are not altered by data that is not representative for the analysis or has been otherwise impacted outside of measurement variables.

An outlier is generally as data points outside the variable or population.⁶¹ However, there are unique challenges identifying outliers in variable settings such as human services. Organisation costs by quantity and combination vary considerably based on, the organisation's purpose,



location, labour use, quantity, complexity and type of service, as well as maturity of organisation and a myriad of other factors.

Hence, identifying and treating or removing an outlier are further complex and important. An identified outlier should be treated if it significantly impacts the figures of interest and is considered atypical and non-representative of the data set.⁶² In some cases, in human services, qualitative or outside knowledge is required to make these judgements.

This also represents the importance of the market basket selection and data collection techniques. These factors reduce the risk or impact of seasonality or over/ under representation of cost drivers.

As there are many types of defining outliers, there are many types of identifying and removing outliers. Z-scores are used as an indicator of how far data may be from a middle location before it is considered an outlier. If normally distributed, 95% of observations are within 2 standard deviations of the mean. In these cases, data outside 2 standard deviations of the mean is the z-score and data outside of this would be considered outliers.

Data which is not normally distributed, such as in human services organisations require similar but more robust measurements. Median Absolute Deviation (MAD) technique would be an effective approach as it is resistant to impacts from the outliers.⁶³ Defined as:

$$MAD = b \times M_i(|e_i - M_j(e_j)|)$$

b: constant based on normality of data

M_i: median of the series

e_i: expenditure of item *i*

M_j: median of the series *e_j*

e_j: original observations

A MAD value is calculated for each item series. Depending on data collection this could be done by expenditure or quantity of the items for organisations as price is universal across representative sample. Then the median of these figures is the median difference between the use or consumption of an item and the median consumption of the item by organisations.

Constant value *b* varies based on the normality of the data. In normal distributions $b = 1.4826$, and if another distribution is assumed such is the case in human services, $b = \frac{1}{Q(0.75)}$ where $Q(0.75)$ is 0.75 standard normal quantile function.⁶⁴ For these analyses the distribution is not considered normal so $b = 0.67449$ as it is not considered normal the inverse scale of standard normal quantile function 0.75 is used.

The use of *b* is important as otherwise MAD values only estimate the scale to a constant. A modified z-score is represented as $|M_i|$ for item *i*. Which aids in defining appropriate distance from the median. The use of *b* then puts in context of the rest of the data series.

Finally, parameters need to be defined for acceptable z-score values. Deviations of 3, 2.5, or 2 are typical although subjective. For the scope of this data and justifying outlier detection, a conservative value of 3.5 is acceptable due to the variability and scale of human services sector. Hence, an outlier is identified for *e_i* as:

$$M - 3.5 \times MAD < e_i < M + 3.5 \times MAD$$

Otherwise represented as:



$$\frac{|e_i - M_i|}{MAD_i} > \pm 3.5$$

So, for any datapoints (x_i), the distance from the median (M_i) relative to the item's distribution of the sample (MAD_i) must be within the thresholds defined by analysts ($|\pm 3.5|$).

Data required

Human services organisations still differ to households and for-profit industries. Data required for appropriate indexation would include the organisation's standard and additionally required expenditure, as well as information on changes in service delivery.

Service delivery fluctuations also impact costs of delivering services and are important to consider when discussing sustainability of human services delivery. However, this cannot be represented in indexation and hence must be otherwise accounted for.

Human services organisations are required to meet administrative and regulatory requirements whether majorly or minorly recipients of public funding.⁶⁵⁶⁶ Introduction of the NDIS required organisations providing such services meet training and regulatory requirements additional to standard expenditure which could not be captured.⁶⁷ Indexation does not include such increases, but an appropriate funding framework should.

These costs may be once-off or introduced as long-term obligations still use resources of organisations otherwise allocated by the organisation to something else. Additional known costs which affect a significant portion of organisations should be accounted for and reflected in funding. This would be a responsible action by a body who is both regulator, funder and contractor of a service.

Likewise, major employer changes such as superannuation increases, and award rate increases must also be taken into account for funding increases.⁶⁸⁶⁹ This may not need to be indexed, dependent on the final funding framework, but an initial calculated increase based on the weight of employee and on-costs expenditure.

Changes and updates to services must also be collected in data to measure the growth of service provision is suitably funded to meet the needs of recipients. This would look like, if a service quantity doubled in a year, there is an expectation of set overhead and reserve costs, but a significant increase should be considered dependent on the service and cost to the organisation.

Service quality and complexity changes could also be included as some service costs are much more significant than others. High labour or use of advanced technology can cause a service to be quite costly to an organisation. It's important that services can remain up to date with available resources for service users to deliver quality care in line with accepted standards of living for individuals.

Sustainability of organisations is considered in these costs by way of funding, operations, and meeting the intended service provision. Not only can organisations be monitored for meeting these objectives, but information on the necessity of using public funding on these services if not appropriate.

Although this may not be incorporated into funding indexation, data can and should be collected for reporting and monitoring of service users who cannot be provided for. That is, when individuals approach organisations and service providers seeking supports, those whose



needs are unable to be met, either because that organisation has reached capacity for service delivery, or that service is not available locally.

Information on individuals and communities who cannot be provided for in life-necessary services, need to be collected, measured, and monitored. Both local, state, and federal levels should be informed of risks to the population and resources available to reduce these risks. The appropriate decision making required by both policy makers and practitioners should be informed by representative data for opportunities in the communities.

Technical data required by organisations is dependent on data assets and data provision capacity of organisations. Until access to web scraping, internal reporting, and end of year financials is available for the development of an index, data collection is compiled by self-reporting template by organisations with resources to complete.

Relevant items would represent a class to be weighted for their significance in the calculations. Class examples would include non-pay expenses such as employee expenses, supported employee wages, facilities costs, motor vehicle costs, marketing and public relations, accounting and audit, bad debts, interest expense, depreciation, and all other expenses.

Wage costs by employer to replace the intended use of the WPI would include all employee costs and on costs. This would include things such as training, supervision, addition leave, recruitment, penalty rates, cash payments to employees, ordinary time earnings, overtime earnings, bonuses and salary sacrifice (if applicable).

Timeframes for indexation and data collection are dependent on the resources available to do so. If self-reporting is required, no more than annually would be appropriate to control administrative burden on organisations and meet requirements for government budgeting.

However, it would be ideal that data can be collected with minimal intervention or use of resources such as web scraping and readily available reporting. In this case, quarterly index reporting would be preferred and would support monitoring of the sector. This would empower informed decision making for fast, effective, and appropriate responses to risk when required.

Wrapping it up

Cost indices represent change in a specific area of an economy. Prices and behaviours drive these changes and may be determined by internal or external factors. These changes can have direct and indirect impacts on surroundings which may be captured outside the scope of the index.

Calculated in many sizes, frequencies, and samples for a variety of purposes, cost indices are designed for intended uses. Misrepresenting a cost index by way of a non-representative index could be easily expected without information on the index's data sourcing and methodologies.

Numerous indices are produced and used for a variety of reasons in an economy. They provide valuable information for decision makers of, households, business, research, and government. Up to date and representative cost indices allow sustainable and informed decisions for risk aversion and use of opportunity.

Current funding formulas for human services organisations are not reflective of the sector and hence allocate inappropriate funding increases. Use of indices such as CPI and WPI outside of their scope to represent expenditure to human services is detrimental to the sector and impacts flow onto service users.



Human services do not act as standard goods and services. In times when resources are scarce, human services may also be in higher demand. Organisations aim to meet the quality and quantity needed by individuals and regulatory standards. Neither of which are constant and this standard should be considered in funding.

Tools and resources are available to create and provide a more suitable index. This may be in conjunction with current indices provided by the ABS, or by independent analysts relating to the organisations. Understanding the framework of human services organisations is key to appropriate funding calculations.



Appendix: Links to relevant UWA Not for Profit Research Publications and Contributions

Centre for Public Value UWA Research Team Website:

<https://www.uwa.edu.au/schools/Research/Centre-for-Public-Value>

Gilchrist, D. J., Perks, B., 2022, *The Challenge of Sustainability: Queensland's Not-for-profit Sector and the Impact of Growing Financial Pressure*, Not-for-profits UWA Research Team

Available from:

<https://www.uwa.edu.au/schools/-/media/Not-for-profits-UWA/Policy-and-Economics/2022-FINAL-Queensland-NFPs-Cost-Increases.pdf>

Gilchrist, D. J., P. A. Knight and T. Emery, 2020, *Green Paper 1: Data Assets, Efficiency and the NDIS*. Not-for-profits UWA

Available from:

<https://www.research.uwa.edu.au/not-for-profits-uwa#six-years-and-counting-ndis-green-papers>

Gilchrist, D. J., 2020, *Green Paper 3: The Value of Quality Sector Analyses*, A Report of Not-for-profits UWA, Perth, Australia. Available from:

https://www.research.uwa.edu.au/__data/assets/pdf_file/0004/3640981/Green-Paper-3-Proxies-for-Risk-6-October-2020.pdf

Gilchrist, D. J., Chand, S., and Emery, T., 2021, *NDIS Green Paper 4: Demand, Supply & the NDIS—A Matter of Words?* Not-for-profits UWA

Available from: <https://www.uwa.edu.au/schools/-/media/Not-for-profits-UWA/NDIS-and-Disability-Services/Green-Paper-4-NDIS-Economic-Model-11-March-2021.pdf>

Gilchrist, D. J., Emery, T., Perks, B., 2021, *NDIS Green Paper No. 5 NDIS Industry Literature Summary A Review of the Collection of Industry, Government and Academic Reports*, Not-for-profits UWA. Available from:

<https://www.uwa.edu.au/schools/-/media/Not-for-profits-UWA/NDIS-and-Disability-Services/Green-Paper-5-Grey-Literature-Summary-18-March-2021.pdf>

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Martinov-Bennie, N., Gilchrist, D., and Tweedie, D., *Board Performance and Governance in Small Not-for-Profits: Report for Participants*.

Available from: <https://www.uwa.edu.au/schools/-/media/Not-for-profits-UWA/Regulation-and-Governance/Board-Performance-and-Governance-in-Small-Not-for-Profits---Report-for-Participants.pdf>

Chartered Accountants Australia and New Zealand, 2020, *Remunerating Not-for-profit Directors*. Available from:

https://www.uwa.edu.au/schools/-/media/Not-for-profits-UWA/External-Research-and-Resources-Contributed-To/2020---CAANZ-Remuneration-for-NFP-Directors_NFP-Insight-paper.pdf

Council of Regional Disability Organisations, 2022, *NDIS Annual Price Review 2021-22*.

Available from:

[https://www.uwa.edu.au/schools/-/media/Not-for-profits-UWA/External-Research-and-Resources-Contributed-To/CORDS-Submission---Annual-Price-Review-2021-22-November-2021-\(002\).pdf](https://www.uwa.edu.au/schools/-/media/Not-for-profits-UWA/External-Research-and-Resources-Contributed-To/CORDS-Submission---Annual-Price-Review-2021-22-November-2021-(002).pdf)



2020 Commonwealth Bank Not-for-profit Balance Sheet Tool

Available at:

<https://www.research.uwa.edu.au/not-for-profits-uwa#nfp-finances>



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