Appropriateness of Applying An Annual Population Growth Adjustment to Community Sector Contracts

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Statement of Interests

Professor David Gilchrist is Foundation Director of the Centre for Public Value at the University of Western Australia's Business School and is a professor of accounting at that institution. He has received funding from governments, peak bodies and individual organisations for various research projects predominantly related to the Not-for-profit human services sector, Not-for-profit accounting and financial reporting, sustainability and outcomes reporting, and policy and practice related to these areas. He has been a director of a number of human services organisations over past years and is currently a director of a policy-focused charity in the education area.

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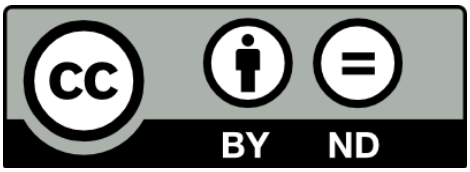

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Glossary

Community Services	A broad term that is used to describe services and supports provided to individuals and communities that are experiencing vulnerabilities or who have life needs that support them in living their lives. Community services may also be described as human services.
Community Services Organisation	Typically, a nonprofit/charitable community-based organisation that provides services and supports to vulnerable people and communities.
Comprehensive Cost	The total costs incurred by a service provider in providing the services contracted under a Service Funding Agreement. These costs include all immediate costs and accounting estimates such as employee entitlements, depreciation and in-kind contributions. Same as "Cost".
Contract	Any contract between the ACT Government and a community services organisation. These can be Service Funding Agreements or Deeds of Grant.
Contract Purchase Price	The price paid by the ACT Government for each service iteration provided under a Service Funding Agreement. Has the same meaning as "Price".
Cost	The total costs incurred by a service provider in providing the services contracted under a Service Funding Agreement. These costs include all immediate costs and accounting estimates such as employee entitlements, depreciation and in-kind contributions. Same as "Comprehensive Cost".
Deed of Grant	A funding contract between the ACT Government and a community services organisation to fund a specific purpose activity. Usually, such a specific purpose has a finite end date.
Demand	The total number of service iterations purchased by the ACT Government in a contract period.
Indexation	The application of a percentage increase to the original purchase price applied in a Service Funding Agreement designed to allow service providers to meet increasing operational costs. Indexation is usually based on an estimate of general price increases and applied annually.
Minimum Data Set	The data relating to service need experienced by service providers and returned to the ACT Government on a regular basis and in accordance with uniform formatting and timing requirements which would be set out in a Service Funding Agreement and established as a platform by the ACT Government.

Need	The number of service iterations actually needed in the community. Need and demand are two different things – see the definition of "Demand" in this glossary.
Price	The price paid by the ACT Government for each service iteration provided under a Service Funding Agreement.
Price Per Unit	The price paid by the ACT Government for a single service iteration under a Service Funding Agreement.
Program	Describes a service type. For instance, Family Domestic Violence Prevention.
Provider	Community services organisation.
Relevant Range	Used in accounting to identify the point where overheads are increased or decreased as a result of changes in outputs. For instance, if a service provider has a significant increase in service iterations to delivery, there may be increased overhead costs incurred as a result.
Service Demand	The total number of service iterations purchased by the ACT Government in a contract period.
Service Funding Agreement	Contracts between the ACT Government and a community services organisation for the purchase of community services. Usually, these services are ongoing.
Service Iteration	A single unit of service provided within a program. For instance, a bed day in a hostel or an hour of in-home care.
Service Need	The number of service iterations actually needed in the community. Need and demand are two different things – see the definition of "Demand" in this glossary.
Service Provider	Community services organisation.

Overview

The response to community service need is a critical responsibility of government. Effective and efficient service provision is primarily implemented via contractual arrangements with the predominantly nonprofit community services sector.

The ongoing financial sustainability of the community services sector has been under increasing strain in recent years. Such financial duress often results in significant negative impacts on service delivery including the likely reduction of service capacity, the reduction of the number of service types and the reduction of the number of services delivered for each service type (we call these service iterations) (Gilchrist & Perks 2025).

Additionally, strain has been felt as a result of increases in the number of people needing community services and supports as well, because many of these services and supports needs are becoming increasingly complex, adding monetary and time costs to service provision.

Generally, these services are funded via government procurement processes and the Australian Capital Territory (ACT) Government establishes contractual arrangements with the community services sector. Principally, these contractual arrangements are established in one of two ways: (1) Service Funding Agreements; and (2) deeds of grant. We will use the term "contract" when considering both of these financial instruments unless specifically noted otherwise.

In determining how many service iterations of what type of services to purchase, the ACT Government undertakes complex decision-making processes. However, the ever-changing need in the community combined with the administrative processes necessary to facilitate the deployment of resources via the community services sector means that there are significant challenges in ensuring the number of iterations of each service purchased meets the community need, especially given the ACT Government's need to contract prospectively for future need.

This document reports on a study undertaken by the Centre for Public Value at the University of Western Australia (UWA) that examined the possibility of using Australian Bureau of Statistics (ABS) published data to estimate community services need in the ACT community to support both the contracting process and to inform the structure of the contracts themselves with respect to intra-contract period quantity changes.

The study findings are summarised in the next section below. However, we currently think that a whole-of-population level change analysis using lagged data over approximately a five-year period could provide a balanced view of program needs over time and against which an assessment of actual need subsequently identified can be made. This process would require funding to be provided to the community services sector in order to support their provision of service data and to the relevant ACT Government directorates to support the collection and analysis of that data.

Key Findings

- The analysis focused on establishing the relational strength between population changes and community sector service demand, as determined by government policy and program settings, through correlative testing, trends analysis and supplementary low-bias modelling using a linear weighting method.
- Data limitations related to imprecise measurements of service demand and grant funding, generally, as well as over a sufficient historical timeframe severely constrained the options for analysis and predictive modelling capacity. Reliable forecasting and causal analysis were not able to be undertaken given the dearth of service information. While proxies were constructed, the complexity of the community service mix does not translate reliably to overly estimated approaches.
- The analysis found that total population growth when lagged by 5 years is the best predictor of service demand overall. The result was consistent across all testing stages, yet the optimal lag period could range from 4 to 7 years based on attainable estimates.
- Further analysis on the available cohort level population and service data over the period suggests that this positive finding is likely capturing underlying demographic shifts (i.e. changing age structures and cohort sizes as they relate to demand for different services).
- Population components (natural increase, overseas migration) appeared to have limited effect on service demand in the short-term.
- This suggests that population growth may serve as a broad, less precise proxy for total service demand, yet risks masking significant variance in specific service types.
- There is some evidence to suggest that a sufficiently lagged aggregate population change proxy can provide a smoothing effect when predicting demand. That is, it is less responsive to immediate demand fluctuations but may result in a smaller overall differential between predicted and actual demand values in the medium to long term.
- That said, this approach would lack the precision of a cohort-weighted approach that sufficiently captures these cohort dynamics directly.
- Preliminary findings suggest that cohort populations are strongly correlated to service types and that service utilisation and demand trends vary widely across different services. The data available for this report lacks the granularity to properly explore these variations.
- Therefore, further investigation is required on cohort-level service dynamics and to determine whether a composite can be developed that adequately reflects the variance while maintain administrative feasibility.
- If a pragmatic funding adjustment is preferred, then a lagged aggregate population growth may be sufficient to adjust community service demand at the aggregate level. However, the level of accuracy would need further modelling, particularly as other demand factors (e.g., macroeconomic and policy settings) have an impact. Alternatively,

if precision in budget appropriations is required then a weighted cohort approach should be examined in the context of isolating dominant sub-population drivers for service demand.

- The lagged population measure and cohort dynamics both require validation which can only be facilitated through access to richer data on service trends and utilisation.

Findings

1) Analyse the benefits, disadvantages and implications of applying an annual adjustment for population growth to community sector contracts.

There are benefits associated with the estimation of changes in service program needs, using an annual adjustment for population growth to community sector contracts, from one year to the next in terms of:

- Estimating the appropriation requirements of the government for the purchase of these service iterations;
- Providing service providers with the potential capacity to meet changing demand during contract periods; and
- Estimating the extent to which service need is met in the community provided appropriate post-service delivery program-level data is collected from the service providers.

In terms of disadvantages, there are a number of key issues such as:

- Ongoing analysis may be costly in time and money to both the ACT Government and the providers if program-level data needs to be collected and analysed on a recurring basis;
- A process of after-service analysis will also need to be undertaken in order to evaluate the extent the predicted demand applied to estimate the community need was materially accurate;
- While there may be a changing program need predicted in terms of a coming financial year, the sector may not be able to grow their service delivery capacity due to workforce and other restrictions, such as the time taken to grow this capacity; and
- Even if the process is found to be materially accurate in terms of program needs change year-on-year, the data and analysis will not inform the indexation rate or contract purchase price. It will only impact the appropriation estimate as the question relates to estimating the number of service iterations needed not their cost.

There are also some further implications associated with this process, viz:

- Predicted changes in service needs may not materialise (for any number of reasons) and so the ACT Government may seek an appropriation that is over- or under-resourced in terms of the services actually required to be met;
- The ACT Government may need to provide capital to service providers and purchasing directorates to support them in establishing capacity (technology, training, data collection and administration as part of pricing) over more than one financial year;
- Increased/decreasing service purchasing may change the overhead burden of nonprofit service providers thus increasing the price of services (the relevant range in accounting terms) and/or impacting the sustainability of the sector. However, the predictive data cannot forecast such changes, nor can it be used to assess the impact of a change in the quantity purchased on the required pricing needed to meet the overhead burden.
- The above problem can extend beyond a particular program to put at risk all services provided by a service provider if its overheads are not being met.
- Increased transparency over the service gap between need estimates and the quantum of service iterations delivered may increase political pressure on the ACT Government to increase its provisions relating to this sector and also place the sector itself under increased pressure.

2) Assess whether population measures that are both sufficiently accurate and timely are available to make accurate indexing possible – especially of relevant sub-populations/cohorts.

- The prediction of service/program needs in the community will not impact the capacity of the ACT Government to increase the accuracy of their indexation policies. It may assist in determining the quantum of services to be purchased and the purchase price will then assist the government in its assessment of affordability.
- Therefore, the calculation of a predictive needs change impacts the number of services to be purchased rather than the price of the purchase.
- In terms of relevant sub-populations/cohorts, generally, the smaller the cohort, the less accurate will be the predictive value of the population change data as smaller cohorts and/or specialised/niche service needs are generally unlikely to see change reflected in the population change. On the other hand, the greater the size of a particular program cohort, the greater the likelihood need change will be reflected in the analysis of population change.
- Broadly speaking, there is sufficiently accurate and timely measures of population by region, age and gender. Sub-population data is not readily available for all priority cohorts given that ABS demographic data collection is largely restricted to the Census. The required service need data would best be sourced feasibly from

services delivered through appropriate grant reporting. This data could then be compared to ABS census data and the number of each service iterations could be assessed by program against the experience reported by the service providers. Such reporting would result in the provision of a Minimum Data Set from each provider that has the same data points and format for collation and analysis by the ACT Government.

3) Model and assess whether population growth or alternative indicators may be appropriate to be applied through an indexation approach.

We have modelled population growth data and described this process in the appendix below. As discussed above, the change in need over time does not impact the price indexation rate. However, we consider that a more substantial research project focusing on richer service and funding data (to be collected by the ACT Government) would allow us to better respond to this question in terms of the extent to which population data can be used to reliably and meaningfully predict changes in program need in the community over time.

As to assessing the inherent community need for programs, alternative indicators may be more accurate but also more resource-intensive in time and money. For instance, collecting data relating to waiting lists and turned-away prospective clients can assist in assessing the extent to which need is being met and understanding the latent need in the community. This data can also be used to refine the forecasting process based on an actual versus forecast analysis process. However, this will not have predictive value in terms of what need there may be for subsequent financial years as the turned-away/waiting list cohort only represent those people who have sought services and supports; they do not represent the population itself.

Again, these processes assist in understanding latent need and, to some extent to forecast likely need into the future but they do not assist in assessing the appropriateness or otherwise of the indexation rate applied.

4) Detail costs and funding implications for assessed methods.

- It has not been possible to develop detailed costs and funding implications for the assessed methods of program need prediction due to a lack of adequate service and funding data and the resultant methodological constraints. However, the following may apply:
- ACT Government costs of data collection and analysis are likely to increase;
- The requirement for the establishment of a minimum dataset to be regularly completed and lodged by service providers to assist the government in collecting the necessary information will likely result in necessary capital injections:
    - to build human capital and system capacity, and
    - for a price increase to meet the administrative and operational costs associated with collecting such data; and

- The requirement for program-level data to assist in developing materially accurate predictions of need into the future can also have negative impacts in terms of reducing service delivery innovation and the enhancement of uniformity in the service provider cohort.
- The more uniform service delivery is between service providers, the less innovation and learning and the less possibility of service providers providing services that are aligned with user-specific needs.
- Data collection processes and minimum dataset requirements can have the effect of making service delivery uniform and preventing change associated with changing service need—the other factor of importance but which is not able to be assessed in the context of population data predictiveness.

5) Assess how any proposed population indexing would interact with currently applied community sector grant indexing (WPI, CPI and the SCHADS Award rate).

The purpose of this project has been to assess the community services need for predictive capacity inherent in population change data. In undertaking that process, it is important to note that we are not concerned with population change per se but, rather, assessing the prospective use of such predictions to drive service purchasing decisions taken by the ACT Government, vis-a-viz how many service iterations of which programs should be purchased in coming years.

Contracts for service provision can be written to have a clause/series of clauses that allow the ACT Government to increase the number of service iterations it is willing to purchase based on its findings relating to evolving need through population change-based predictions. For instance, if the ACT Government predicts a 5% increase in need next year for child protection services, this will suggest the ACT Government should purchase 5% more iterations of child protection services. If contracts are silent on how many service iterations the ACT Government wishes to purchase, this estimate is only relevant to the ACT Government establishing its appropriation for these services. If these contracts are not silent (that is, they specify how many service iterations are to be purchased), then the contract would need an adjustment clause to allow the number of service iterations to be purchased to change. In that instance, the clause could allow the ACT Government to notify the service provider of the service iteration change on, say, an annual basis.

However, this would not inform the pricing of those services to be offered to the service providers in the sub-sector except:

a) Where the increase in services requires an increase in infrastructure to deliver them and so there is an increase in capital costs and overhead costs (change in relevant range); and/or

b) Where service providers choose not to deliver the increased services because the price offered does not ensure financial sustainability (say, overheads are not fully covered as they may increase as a result of the increase in service delivery for

instance). As such, a price increase may be required in order to incentivise service providers to participate.

Importantly, the ACT Government would need to be clear as to the number of service iterations it expects to be delivered for each program so service providers do not equate an increase in funding provided as an increase in pricing per iteration. The establishment of this system would require the ACT Government to review its contractual arrangements currently in place and also identify those programs where contracts can be made based on the number of service iterations as not all services are conducive to such administrative arrangements.

Either way, the prediction process relates to likely need assessment and is not impacted by the price indexation formula (WPI, CPI and the SCHADS Award rate) save to the extent that the formula impacts supply-side decision making (i.e. whether providers expand or contract their services in accordance with the price offered).

6) Recommend an evidence-based solution.

We currently think that a whole-of-population level change analysis using lagged data over approximately a five-year period could provide a balanced view of program needs over time and against which an assessment of actual need subsequently identified can be made.

However, we recommend that the ACT Government undertake a comprehensive study of the predictive strength of cohort population change over time. Such a study would include the iterative prediction of need based on population change and the confirmative process of data collection via service providers' minimum data set submission on at least an annual basis. The compilation of service need data would be undertaken in accordance with the discussion in the appendix below. Population growth can be simply modelled using conventional methods, but adequately evidencing the appropriateness of population as a driver of community service demand requires sufficient data be compiled.

We do note that the identification of true need within the community on a cohort basis is a costly and significant undertaking.

7) Recommend whether population growth would be suitable as an interim indexation measure should any evidence-based solution presented by the report require further consideration and refinement.

We refer the reader to the comments made in response to item six above. We think it worthwhile to pursue validating a whole-of-population level change analysis using lagged data should the ACT Government wish to persevere with the idea of predicting the community service needs over time but noting that more comprehensive program-level data will need to be accessed in order to arrive at a robustly evidence-based conclusion.

Contents

Introduction

Generally, in the Australian Capital Territory (ACT), community services are purchased by the ACT Government via contractual arrangements that, amongst other things, set the price the government will pay for specific programs of services, the number of service iterations to be provided for each program of service and the contract period over which such services are to be provided. Additionally, it is usual for contracts to include reference to an annual indexation process intended to ensure the ongoing financial sustainability of service providers in the context of contracts extending over more than one financial year. Usually, this indexation figure is established by the ACT Treasury.

Therefore, there are two fundamental questions which inform government funding decisions:

1) How many service iterations of which programs should we buy? Based on the areas of need (programs) and the scale of need (iterations of service delivery) amongst other things; and

2) At what price should we buy those iterations of service today and into the future? Based on the appropriation required and subject to the many other priorities making calls on public funding.

These two questions are closely related in terms of the impact of the policy responses to them. However, their resolutions relate to two different issues. In terms of the first question, the answer depends on the quality of program-level data sourced and applied against population cohort change data. To answer this question, the ACT Government needs to understand the level of need in the community for each program type.

The second relates to the required price to be paid to ensure the services are able to be delivered and that public money is efficiently and economically applied to the needs of the ACT community. Answering this question depends on the quality of data sourced by the ACT Government relating to the comprehensive cost of service delivery.

It is the first question that is considered in this study.

However, it remains important to note that the ongoing financial sustainability of the predominantly nonprofit and charitable community service providers (the service providers) rests largely on the service purchasing arrangements adopted by the ACT Government, and the answers to the above questions become very important in responding to the financial sustainability needs of those service providers.

If providers are not financially sustainable, the services and supports needed by some of the most vulnerable people and communities in the ACT will shrink and other government services, such as primary health services, will pick up the costs at a higher level. Therefore, achieving a financially sustainable set of community services programs relies heavily on the

government's understanding of the comprehensive cost of service delivery and the change in program-specific need over time.

The ACT Government has asked the Centre for Public Value UWA to undertake a research process to determine whether there is a meaningful opportunity to utilise population data to forecast changes in program need over time for the purposes of budget development.

The remainder of this document sets out our research response below. However, in succinct terms, the data restrictions we faced in pursuing our calculations meant that we believe there is a need for a further examination of program-level data to assess program level predictability. At the population level, we consider there may be an opportunity for a predictive model to be created, using five-year lag data, that will guide the ACT Government in their analysis of program requirements annually but provided there is also an appropriate review of historical data gathered from service providers after the completion of the forecast period to assess the predictive value of calculations applied, allowing adjustments to be made further refining the predictive process.

We also note that there are costs associated with this process and that an assessment of the balance between costs and benefits was not possible as these costs will be borne by the ACT Government and service providers. Further, government's internal data collection processes and analysis capacity are likely to need to expand in order to understand better the actual service delivery composition by program after the completion of each forecasting period so that analysis can take place.

For the purposes of the budget process, there will need to be the development of an all-of government understanding of the programs and the demand prediction process so that it can respond to the analytical outcomes. This would include the development of system-wide forecasting processes that is uniformly applied by ACT Treasury and analysed against a minimum data set contributed uniformly by the service providers in the same way across all relevant programs. As such, the ACT Government would need to uniformly describe the programs and service iterations as well as collect data relating to actual services delivered, no-shows and turned-away service users to have a more complete picture of the nature of service need in the community.

This report is divided into two main sections. Firstly, a methodology overview and discussion pertaining to outcomes of the research program. The appendix provides a technical description of what we have done and what the results were.

Methodology Overview & Commentary

This project is focused specifically on the opportunities inherent in undertaking statistical analysis related to population change, to determine the extent to which such analysis can assist in forecasting community services need and, thereby, inform government funding decisions.

Examining Population Growth and the Community Sector

This section explores the appropriateness of using an annual population growth adjustment to reflect service demand changes. Population growth can be considered a broad proxy for increasing service needs, but its effectiveness as a forecasting tool requires careful evaluation.

The objective of this analysis is to undertake a preliminary investigation into the relationship between population trends, service demand, and funding allocation. It assesses whether an aggregate or composite population-based index sufficiently correlates with community services demand. And, in turn, whether it provides an appropriate index for adjusting the ACT Government's service iteration purchasing levels moving forward.

Approach Taken in this Analysis

The exploratory analysis was informed by three criteria:

Feasibility – Can the index be applied consistently with available data?

Timeliness – Does the adjustment respond quickly enough to changing service pressures?

Accuracy – Does the index reliably correlate in demand and funding needs?

The main objective of this analysis was to investigate the strengths and weaknesses of a population adjustment measure. The analysis afforded a preliminary canvasing of population measures and key demand variables that will improve understanding on focus areas and the scope of data and analytical requirements (see Appendix – Technical Analysis).

By testing population growth trends, we sought to identify whether population sufficiently predicted service demand over time. Focusing on correlative strength allows us to infer, in the first instance, the direction of further analysis regarding whether population level, or a more targeted, composite adjustment formula is necessary for effective funding allocation.

The analysis focused on understanding the relationship between population and service demand and whether population could sufficiently capture demand fluctuations. We first calculated Pearson correlation coefficients to assess the direct relationship between total population, as well as its component parts, and service demand measures. Appendix 1 provides tabled results and method explanation. The demand measures included mental health, homelessness, alcohol and drug services, and children, young people & family

services. These service demand areas represented the largest spending areas for the ACT Government on community service organisation contracts.

It was suspected that demand fluctuations may be lagged to population measures given the nature of the population component parts. Therefore, population lags were introduced to test whether population changes impact service demand with a delay or immediately. The population measures were lagged by 1 to 5 years and tested against the main service areas and a total demand composite measure. To enable us to lag the population measures by 5 years given the data limitations, additional data points were forecasted to increase statistical strength of the tests and facilitate Granger Causality testing to further support the results.

Following the correlative analysis, historical trends in population growth, service demand and health and community sector service funding agreements were plotted. Deviations, demand responses and structural lagging patterns were assessed. By analysing these patterns, we were able to better assess cohort-level population and demand trends over the period. Percentage change trends were rebased to ensure clearer plotting of relative trends.

Additional supplementary analysis was conducted on constructing some prospective index formulae weighting using the correlation calculations. The formulae represented composite measures that utilised component population, cohort and economic variables. Rather than a definitive set of indices, these provide preliminary insights into the utility of incorporating different service demand drivers.

The Data Utilised

All data was collected for the period 2013 to 2024. Population data was acquired from the Australian Bureau of Statistics' National, state and territory population dataset. Information on regional population, natural increases, overseas migration and interstate migration were collected. Also, sub-population data was collected on cohorts considered in the literature to be prominent service recipients. These sub-populations included women, people with disability, people over 65 years old, children aged 0-12, young people up to 24 years old, and single parents.

Service demand data was collected from the ACT Parliament's budget papers and ACT Government's Directorate annual reports to identify and align calculations with the dominant service types. These were found in the accountability indicators and audited performance statements and aligned with output class activities centred on children, young people and families, specialist housing and homelessness services, mental health, and alcohol and drug services. To improve testing quality, cohort prevalence information was collected from data publicly available from the Australian Institute of Health and Welfare. This captured the probable proportion of each cohort that may access services. For instance, the risk of homelessness in the population.

Government funding data was collected from the budget papers financial statements line-item grants and purchased services and output class sections that align with the dominant service types. Directorates were restricted to ACT Health and Community Services Directorate (CSD) given that these were the major government funders of community sector service funding agreements as identified by the funded organisations data supplied by the CSD.

To incorporate some alternative predictors of service demand, economic stressors, such as the Gini coefficient, the NAB financial stress index and unemployment were included in line with the literature in demand forecasting.

All data sourcing information is tabled in the appendix.

Data Issues and Limitations

Data availability and imprecision greatly limited the capacity for reliable and predictive analysis. The short span 10 years of historical data and resultant sample size denied the application of regression and forecasting methods to allow us to move beyond correlative analysis. These methods will be necessary to properly evidence the population and demand relationships moving forward. Limited data creates difficulties in training predictive models and establishing robust statistical results. Regression and forecasting methods were attempted but both were problematic and were deemed too unreliable to report on.

Overall, the data which was readily available was sub-optimal as the ACT Government does not collect sufficiently granular service purchase/iteration data relevant to assessing need in the context of population change forecasting—although it has not been necessary up to this point. While great care was taken to reduce data biases and overextension during the data collection phase, the quality issue means that all results will need further validation as controlled predictive analysis could not be reliably undertaken.

Withholding the aggregate population information, the data sourced was imprecise and not fit-for-purpose for the research question. For example, the service demand and funding allocation data sourced from the budget papers would have included spending not related to actual service recipient numbers and utilisation, or the community sector service funding agreements. The annual report service recipient information was highly susceptible to policy and program changes and breaks with information being restricted to those programs that were tied to departmental strategic objectives.

Ideally, information on service recipients, service utilisations and recipient demographics should be collected for the set of programs to be subject to forecast. More precise grant funding information should also be collected with service iteration information to avoid tracking potentially inflated expenditure values. Data gaps and inconsistencies need to be improved in future analysis to strengthen predictive testing. The data timelines and lack of availability of granulated data was the major challenge in conducting the analysis.

Environmentally, the COVID-19 pandemic shock period was obviously captured and does not support trends analysis. This further supports the need for more historical service and funding data. That said, it does provide an opportunity to observe a shock scenario and the 'tail' effects on demand. It does mean though that the trends cannot be extrapolated, however do offer insight into drivers of demand and population.

Exploratory Conclusions

The correlative results were mixed over population components and lag times. Aggregate population component parts appeared to have weak correlation to the service demand variables used and a slightly stronger correlation to funding amounts across budget sources. We experimented with various combinations and indexation calculation in order to try and determine whether there was sufficient data currently to assess the relationship between population change and community services need. We identified that further data would need to be collected to better approximate the predictive capacity of ABS population data.

A 5-year lagged population index could be an appropriate adjustment measure until more detailed data is available

A lagged population index is one that uses data from a previous period in comparison to current data. In this case, we used 5-year lagged population data to test the correlation between the population change experienced 5 years ago and the apparent community services need change in the current period. This is an appropriate relationship test as population change identified five years ago is likely to be manifesting community service needs parameters today. For instance, a baby born five years ago may be exhibiting diagnosable service needs today.

Total population appeared most appropriate when lagged by 5 years having a correlative value of 0.44 which suggests a moderately positive relationship to service demand. To further test this relationship a Granger causality test was administered and found statistically significant at the 1% threshold. Therefore, a stronger relationship between the data and expected community care needs was demonstrated. When assuming that cohort-specific demand spikes will be met with policy change, an optimally lagged total population could serve as an appropriate interim index while cohort-components and service data is made available. This should be validated to provide greater confidence in the relationship.

A larger correlation when lagging population to community services demand suggests that population changes influence service demand with a delay rather than responding to short-term fluctuations. This lag may be due to cohort effects, where services are utilised only when certain age groups reach eligibility (e.g. youth services). Additionally, migration-driven growth may delay service integration, while structural service adjustments often reflect historical trends rather than immediate needs.

Also, if the correlation increases with a lag, it could mean that population acts as a cumulative indicator of service demand, rather than responding to short-term fluctuations. This would suggest that service demand is more stable and driven by long-term demographic trends rather than abrupt population shifts, giving the adjustment a smoothing effect. The supplementary calculations in appendix E support a smoothing effect with a small average difference between predicted and actual demand values.

Cohort-specific population trends may be a more responsive fit in the short-term

Forecasting community services need is very difficult. It requires an assessment of macro- and micro-economic issues, trends in changing needs by volume and type, and to take into consideration social circumstances. We are focusing on population data as a key forecast component by seeking to determine the strength of the relationship between changes in the population as a driver of community services need. It will not be a perfect process, and differing methods and timeframes have been shown to result in differing outcomes with greater or lesser predictive value.

Our analysis indicates that cohort-based population measures better predict short-term demand trends, while total population serves as a long-term smoothing mechanism. Further preliminary Granger causality show that cohort-level changes (particularly in older persons and children & young people) significantly impact service demand at shorter lags (1-2 years), suggesting that service needs respond more immediately to shifts in their respective populations. For example, youth services align more closely with young people's population trends than with overall migration or natural increases. The trends analysis showed that there is a risk that specific service demand trends would outpace population growth and lead to underfunding in the long-term.

No evidence was found in the extant literature supporting total population growth as a standalone predictor of service demand. Instead, research overwhelmingly relies on cohort-component models, which project sub-population trends based on natural increases, mortality, and migration rates (Vanella & Deschermeier, 2020; Leslie, 1945). Forecasting in health, aged care, and welfare services consistently incorporate age structure, prevalence rates, and utilisation patterns, recognising that demand growth outpaces population growth due to shifting demographics and policy changes more so than broad population growth (Burkett et al., 2017; Howdon & Rice, 2018; Pallin et al., 2014).

In other words, it is critical to use both population growth, preferably stratified, as well as service area-specific demand trends to assess and adjust forecast estimates.

Studies emphasise the use of data-intensive, service-specific forecasting over broad population models (Monsef et al., 2023; Frederick & George, 1979). Distinctions between 'immutably driven' services (e.g. disability) and risk-based services (e.g., homelessness, youth services) highlight a distinction in the necessary adjustment parameters when considering economic and policy factors, as well as cohort characteristics in demand fluctuations. Given

the diverse forms and drivers of human service programs, aggregation is difficult and data intensive. The absence of research attention is indicative of this difficulty, as well as the non-initiative collated of disparate service types.

When taken alongside our exploratory results, a cohort-based adjustment model is the preferred option. This is due to its superior accuracy in capturing actual service trends across diverse service types and peoples. As such, it would also improve short-term accuracy when dealing with these discrete service types, while a total population measure will only smooth demand growth over a longer period (Alexander & Alkema, 2022; Senese et al., 2020). An aggregate approach will implicitly assume that prevalence rates remain constant across cohorts and service areas. Given the availability of service recipient demographic information through grant administration and management, as well as the Australian Bureau of Statistics data there is due feasibility in progressing this analysis stream and indexing approach in the medium to long-term.

As such, the ACT Government needs to conduct data collection and calculation processes over an extended period to identify the best possible methodology that serves the needs of the ACT community.

Suggested Next Steps

The next steps should include performing further analysis to validate the lagged aggregate population measure, particularly when interacting with cohort and economic parameters. Broadly, the data suggested next steps is to compile the necessary on service demand, population, community services funding and select economic indicators. Secondly, specific sub-populations and service types should be examined to determine the effect of demographic change internal to population on demand growth. To keep the analysis feasible, the largest cohorts by size and funding should be identified and prioritised to facilitate analysis rather than collect data on all funded services.

Validate the lagged population interim measure

The correlation between lagged population and service demand should be validated. This can be accomplished relatively simply if sufficient data is compiled. Without properly understanding the predictor power of population growth on a range of services, there is no means of constructing or validating the index in the immediate term or into the future.

The analysis requires several data sources to assess the relationship between population changes and service demand. Most importantly, service demand data which includes participation and utilisation rates by service type, along with annual service usage records spanning 10–20 years to examine lagged relationships and support forecasting quality. Population data will capture aggregate changes and demographic components, while historical funding contract data—covering 10–15 years—will help evaluate whether funding allocations have aligned with population-driven demand. Additionally, macroeconomic

indicators such as unemployment, poverty rates, rental affordability, and substance use will be incorporated to control for external factors influencing service demand.

If basic historical service recipient information at the contract level is not available, then a second-best proxy would be prevalence and incidence rates for the contracted services. These can be publicly sourced and could include acute mental health diagnosis, disability prevalence, homelessness rate, child protection substantiations, family violence incidents and substance abuse prevalence. Further stratified rates by at-risk sub-population would provide greater accuracy and applicability. That said, the ACT government should consider internal opportunity to improve the data functionality of any service delivery information currently being collected for the purposes contract management or acquittal procedures. Effective assessment of service demand over time is best accessed through service contract administration.

The methodology involves validating the predictive power of population measures through regression analysis. Lagged correlation analysis, using the Granger Causality Test or Rolling Window Analysis, will assess the timing and strength of relationships between variables. To model both short- and long-term effects, an Autoregressive Distributed Lag (ARDL) model will estimate whether population changes produce gradual or immediate impacts on service demand.

Explore a cohort-specific approach to funding adjustments to capture major demand trends responsively

The next steps for implementing a cohort-component approach to funding adjustments should begin with establishing baseline relationships between cohort-specific service demand and demographic trends. This involves analysing historical service utilisation data segmented by age, region, and other defining characteristics to identify patterns in service uptake over time. If this information is unavailable, a reasonable proxy would be the prevalence rates of the major service recipient cohorts. If this information is not available, then predictors of prevalence would be required to calculate each cohort's probability of receiving services. For example, the rate of family and domestic violence victim/survivors across different ages or young people from financially disadvantaged households.

Additional data on macroeconomic indicators such as unemployment, rental stress, and poverty rates should be incorporated to account for external factors influencing demand. Lastly, a review of historical grant allocations will also help determine whether past funding levels have aligned with the needs of different population cohorts or if adjustments are necessary.

Once these relationships are better understood, the next phase would involve forecasting cohort-specific demand using population projections and service utilisation trends. This requires identifying whether some cohorts exhibit more responsive demand patterns than others. Based on these insights, a composite demand index can be developed, assigning weightings to different cohorts to reflect their projected service requirements. Iterative

information collected on each service cohort could then be used to adjust the index at intervals determined by the trends observed. This index would provide a structured, data-driven basis for adjusting funding allocations, ensuring that grant distribution aligns more accurately with evolving service needs rather than relying solely on aggregate population growth.

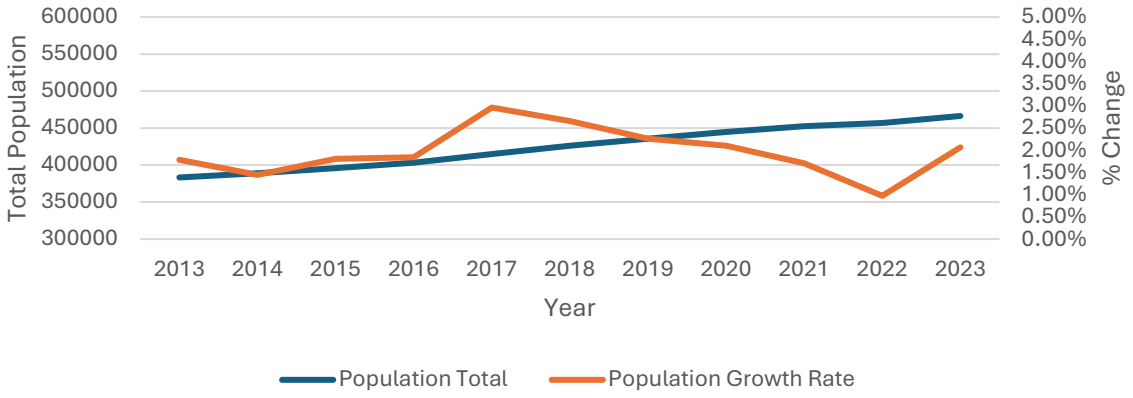
Appendix – Technical Analysis

This appendix is provided to underpin the commentary and discussion above. All questions and comments relating to this section should be directed to the report authors.

ACT Population Composition

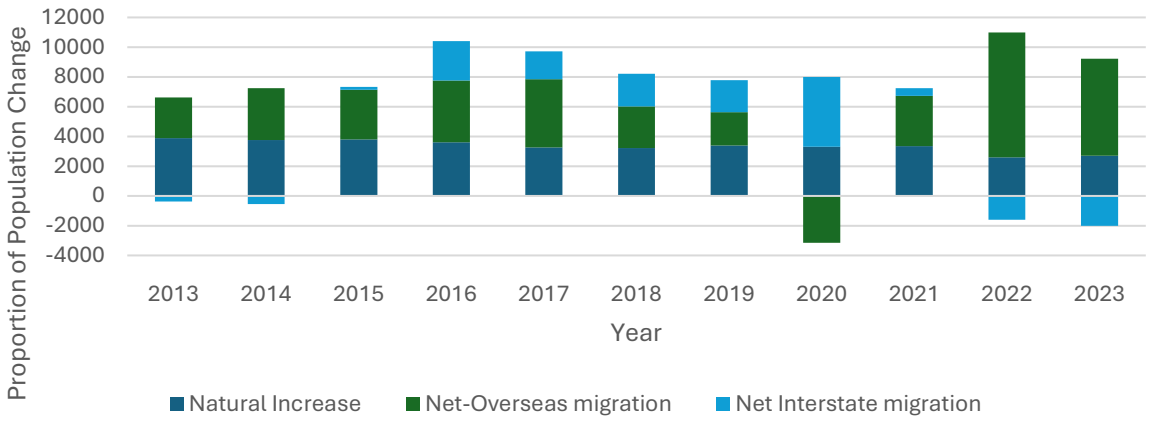
The population of the Australian Capital Territory has experienced relatively steady growth, driven by a combination of natural increase, net-overseas migration, and net-interstate migration. Figure 1 shows the total population increase from 380,000 in 2013 to around 466,000 people in 2023. The growth rate has remained stable, fluctuating around 2% from 2013.

Figure 1. ACT Population Growth 2013-2026



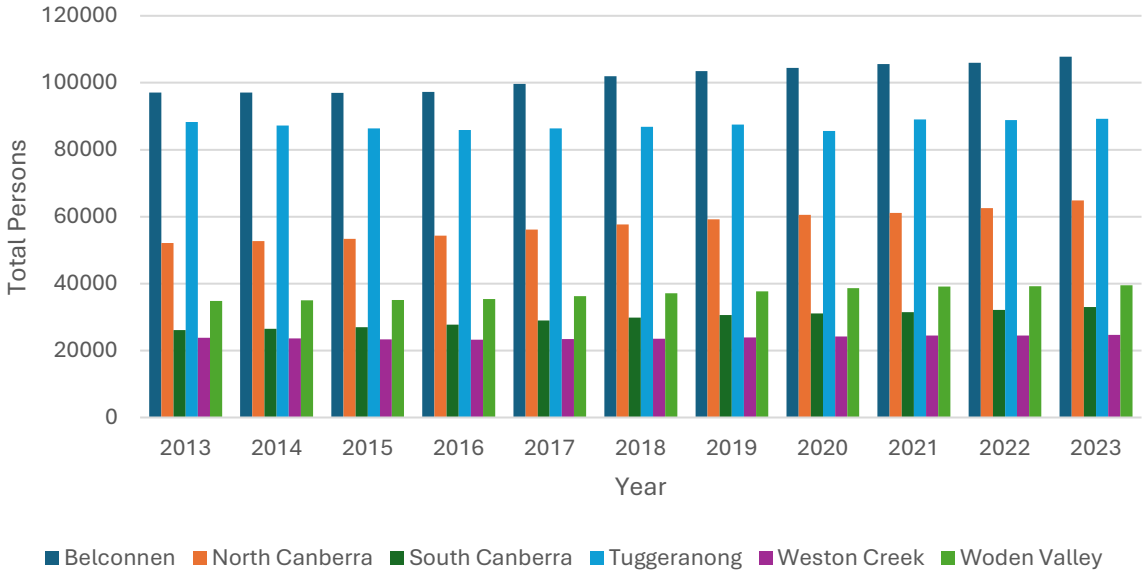
As can be seen in Figure 2, natural increase (births – deaths) and net-overseas migration constitute most of the population change over time. Interstate migration fluctuates significantly entering the negative at the tails of over the period examined. Expectedly, net-overseas and net-interstate migration display an inverse relationship during 2020-21 and subsequently recover in the following years. Otherwise, population composition has remained relatively stable year-on-year.

Figure 2. ACT Population Growth Components 2013-2023



Regional growth, omitting the least populated regions, has been relatively consistent across areas. North Canberra and Belconnen have linear growth rates around 1.7 of the other areas suggesting these areas are growing faster than the other regions. Demographic characteristics were not available at the regional level.

Figure 3. ACT Total Population Change by Region 2013-2023



Correlation Analysis

The Pearson correlation calculation was used to explore correlative relationships between population, demand and funding variables. The Pearson correlation test measures the strength and direction of a relationship between two continuous variables, producing a correlation coefficient (r) that ranges from -1 to 1. A value close to 1 indicates a strong positive relationship, -1 a strong negative relationship, and 0 suggests no linear association.

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\Sigma(X_i - \bar{X})^2} \cdot \sqrt{\Sigma(Y_i - \bar{Y})^2}}$$

Of course, correlation does not imply causation, meaning a strong correlation does not confirm a causal relationship between variables but rather an opportunity to identify avenues for further investigation. Incorporating other demand drivers would likely weaken the correlative relationship as these values are suspected to be capturing external variation. Outliers have been proportionally dampened through a simple linear estimation to factor out the pandemic as major outliers can disproportionately affect the coefficient, leading to

distorted conclusions. Given that service demand is expected to not necessarily increase in real-time with population growth, we also introduce lagged population measures to account for potential delayed effects.

The correlation values are largely consistent with service demand and funding relationships that would be expected. Broadly speaking, lagging the population factors improve the Pearson values and cross-correlation checks. However, population components, that is, natural increases and net-migration appear to have weak relationships to all service demand measures. This may suggest that total population growth is capturing age structures, as well as what modest population effect is present.

The correlation testing is expanded to cohort variables to investigate the age structure component from table 5. There are strong correlation values across cohort populations and service demand. The negative correlation with CSD funding for all cohorts, particularly for children and young people may imply a weakened proportionality of young people accessing services and overall population size. That said, it may be due to imprecise service demand measurements as the data collected was fragmented by policy changes and restricted to two reported programs.

The moderate to strong positive correlations between cohorts and service demand roughly hold for each lagged year suggesting a more responsive relationship in the shorter-term. That said, the assumption of linearity in cohort lagging would require further examination with a richer data source.

Cohort population correlations with grant funding are higher than should be expected suggesting spurious relationships with these measures of funding. The imprecision of these variables given they were compiled from budget paper line items over the period. Since the budget allocation is well understood, these values are likely indirect or biases upward.

The macroeconomic indicators are moderately correlated across the service demand categories signalling these are potential additional demand drivers that should be further examined. Those correlating reasonably strongly with service demand–income inequality, wage growth, inflation and the proportion of low-income households–each proxy household economic pressures and social barriers to participation.

The tables presented below are all the initial correlative finding using the limited sample of service demand, grant funding and population. Those reporting ACT government expenditure include the grants and purchased services values found in the budget papers from 2013 for the Community Services Directorate, the Health Directorate and ACT Housing.

The other columns denote the output class value for children, young people and families, mental health services and specialist housing and homelessness services.

Table 1: Correlation Values for Population Components and Service Demand Categories 2013/14 to 2026/27					
	Children, Young People and Families	Homelessness and Housing	Mental Health	Alcohol and Drug Services	Total Service Demand
Population Total	-0.54	0.78	0.77	-0.72	0.75
Net-Overseas migration	-0.04	0.52	0.37	-0.06	0.38
Net Interstate migration	0.01	-0.45	-0.36	-0.06	-0.37
Natural Increase	0.44	-0.86	-0.77	0.61	-0.76

Table 2: Correlation Values for Lagged Population Components and Service Demand Categories 2013/14 to 2026/27					
Total Years Lagged	Children, Young People and Families Service Demand	Homelessness Service Demand	Mental Health Service Demand	Alcohol and Drug Service Demand	Total Service Demand
Total Population					
1	-0.48	0.78	0.77	-0.68	0.75
2	-0.37	0.80	0.78	-0.61	0.76
3	-0.38	0.80	0.80	-0.51	0.78
4	-0.17	0.79	0.76	-0.45	0.75
5	-0.03	0.77	0.72	-0.34	0.79
Net-Overseas Migration					
1	-0.08	0.69	0.21	-0.13	0.23
2	-0.35	0.08	0.03	-0.39	0.01
3	-0.35	-0.03	0.08	-0.40	0.05
4	-0.15	0.04	0.17	-0.18	0.16
5	-0.08	0.11	0.15	-0.14	0.14
Net-Interstate Migration					
1	-0.10	-0.64	-0.27	0.02	-0.29
2	0.01	-0.22	-0.18	0.16	-0.18
3	0.02	-0.06	-0.21	0.06	-0.21
4	0.38	-0.04	0.04	0.22	0.04
5	0.39	-0.02	0.17	0.31	0.18
Natural Increase					
1	0.55	-0.77	-0.67	0.67	-0.65
2	0.47	-0.71	-0.63	0.73	-0.60
3	0.38	-0.65	-0.74	0.53	-0.72
4	0.13	-0.64	-0.76	0.36	-0.74
5	0.02	-0.75	-0.64	0.30	-0.63

Table 3: Correlation Values for Population Components and ACT Grant and Output Class Funding 2013/14 to 2026/27								
	CSD Grant Total	ACT Housing Grant Total	Health Grant Total	Total Grant Funding	CYF Output Funding	Mental Health Output Funding	SHHS Output Funding	Total Funding Output
Population Total	-0.35	0.83	0.77	0.58	0.94	0.83	0.87	0.96
Net-Overseas migration	0.22	0.22	0.21	0.38	0.28	-0.05	0.10	0.18
Net Interstate migration	0.19	-0.35	-0.29	-0.18	-0.25	0.20	-0.06	-0.11
Natural Increase	0.06	-0.65	-0.68	-0.67	-0.91	-0.65	-0.72	-0.86

Table 4: Correlation Values for Service Demand Categories and ACT Grant and Output Class Funding 2013/14 to 2026/27								
	CSD Grant Total	ACT Housing Grant Total	Health Grant Total	Total Grant Funding	CYF Output Funding	Mental Health Output Funding	SHHS Output Funding	Total Funding Output
Children, Young People and Families Service Demand	0.47	-0.37	0.15	0.44	-0.30	-0.51	-0.51	-0.41
Homelessness Service Demand	-0.18	0.44	0.56	0.45	0.72	0.13	0.44	0.56
Mental Health Service Demand	-0.12	0.49	0.91	0.85	0.55	0.34	0.36	0.50
Alcohol and Drug Service Demand	0.52	-0.50	-0.05	0.27	-0.48	-0.57	-0.68	-0.56
Total Service Demand	-0.07	0.46	0.89	0.85	0.53	0.30	0.32	0.47

Table 5: Correlation Values for Cohort Population and Service Demand for 2013/14 to 2026/27					
	Children, Young People and Families Service Demand	Homelessness Service Demand	Mental Health Service Demand	Alcohol and Drug Service Demand	Total Service Demand
Women	-0.55	0.78	0.77	-0.73	0.75
Children 0-12	-0.60	0.67	0.69	-0.76	0.66
Young People 12-24	-0.58	0.78	0.73	-0.72	0.71
Children and Young People	-0.60	0.73	0.72	-0.76	0.69
Aged 65+	-0.53	0.77	0.79	-0.72	0.77
People with Disability	-0.39	0.81	0.87	-0.60	0.85

Table 6: Correlation Values for Lagged Cohort Population and Service Demand for 2013/14 to 2026/27					
Years Lagged	Children, Young People and Families Service Demand	Homelessness Service Demand	Mental Health Service Demand	Alcohol and Drug Service Demand	Total Service Demand
Women					
1	-0.48	0.77	0.77	-0.68	0.75
2	-0.37	0.80	0.78	-0.61	0.76
3	-0.38	0.80	0.80	-0.51	0.78
4	-0.16	0.80	0.77	-0.45	0.75
5	-0.02	0.77	0.72	-0.34	0.71
Children 0-12					
1	-0.53	0.67	0.69	-0.71	0.66
2	-0.43	0.72	0.70	-0.65	0.67
3	-0.42	0.75	0.77	-0.51	0.75
4	-0.07	0.77	0.78	-0.40	0.76
5	0.20	0.80	0.79	-0.18	0.78
Young People 12-24					
1	-0.53	0.78	0.73	-0.72	0.70
2	-0.37	0.76	0.77	-0.63	0.75
3	-0.26	0.76	0.84	-0.44	0.82
4	-0.08	0.80	0.78	-0.33	0.77
5	-0.06	0.79	0.65	-0.30	0.64
Aged 65 and over					
1	-0.46	0.79	0.78	-0.67	0.76
2	-0.37	0.81	0.77	-0.60	0.75
3	-0.43	0.79	0.76	-0.55	0.74
4	-0.19	0.78	0.75	-0.48	0.73
5	-0.02	0.74	0.73	-0.35	0.71
People with Disability					
1	-0.33	0.84	0.82	-0.56	0.80
2	-0.25	0.88	0.81	-0.44	0.80
3	-0.31	0.74	0.68	-0.47	0.66
4	-0.25	0.68	0.59	-0.46	0.58
5	-0.23	0.52	0.53	-0.37	0.52

Table 7: Correlation Values for Cohort Populations and ACT Grant and Output Class Funding 2013/14 to 2026/27								
	CSD Grant Total	ACT Housing Grant Total	Health Grant Total	Total Grant Funding	CYF Output Funding	Mental Health Output Funding	SHHS Output Funding	Total Funding Output
Women	-0.36	0.84	0.78	0.58	0.94	0.84	0.87	0.96
Children 0-12	-0.20	0.64	0.58	0.47	0.79	0.91	0.81	0.87
Young People 12-24	-0.33	0.86	0.70	0.52	0.96	0.78	0.83	0.95
Aged 65+	-0.34	0.83	0.81	0.62	0.92	0.83	0.86	0.95
People with Disability	-0.47	0.91	0.94	0.66	0.89	0.63	0.77	0.86

Table 8: Correlation Values for Macroeconomic Indicators and ACT Grant and Output Class Funding 2013/14 to 2026/27								
	CSD Grant Total	ACT Housing Grant Total	Health Grant Total	Total Grant Funding	CYF Output Funding	Mental Health Output Funding	SHHS Output Funding	Total Funding Output
Income inequality (Gini)	-0.08	0.70	0.82	0.80	0.75	0.39	0.52	0.66
Unemployment Rate	-0.15	-0.12	0.23	0.11	-0.09	0.03	-0.13	-0.07
Wage Price Index	-0.09	0.62	0.41	0.39	0.67	0.14	0.34	0.52
Consumer Price Index	-0.15	0.70	0.68	0.61	0.76	0.51	0.67	0.73
Financial Stress	-0.28	-0.02	-0.10	-0.29	-0.32	-0.58	-0.31	-0.41
Low Income Households	-0.34	0.83	0.77	0.58	0.94	0.84	0.87	0.96
Single Parent Households	-0.32	0.15	0.28	0.06	0.26	0.20	0.28	0.26

Table 9: Correlation Values for Macroeconomic Indicators and Service Demand Categories 2013/14 to 2026/27					
	Children, Young People and Families Service Demand	Homelessness Service Demand	Mental Health Service Demand	Alcohol and Drug Service Demand	Total Service Demand
Income inequality (Gini)	0.15	0.68	0.77	0.05	0.77
Unemployment Rate	0.06	-0.22	0.33	0.21	0.32
Wage Price Index	-0.13	0.65	0.25	-0.20	0.25
Consumer Price Index	-0.04	0.62	0.58	-0.10	0.58
Financial Stress	0.32	0.03	-0.05	0.28	-0.05
Low Income Households	-0.36	0.57	0.55	-0.54	0.52
Single Parent Households	-0.42	0.54	0.47	-0.63	0.44

Granger Causality Results

To apply further analysis to these correlations given the data constraints, Granger causality tests are applied to select relationships. The Granger causality test is a method used to determine whether past values of a cohort variable help predict future values of service demand. The test is denoted as follows:

$$Y_t = \alpha + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{i=1}^{p} \lambda_i X_{t-i} + \epsilon_t$$

Granger causality does not imply true causation, only statistical predictability. The test is sensitive to structural changes, different demographic change speeds and unobserved variables that may also influence demand which are not captured in this test. This means that the results should be interpreted as supplementary information that guides future analysis. Despite these limitations, the findings show support for using lagged population growth and cohort-based indicators for medium-term and short-term service demand forecasting respectively. When the p-value, as stated in the tables presented below, is 0.1 or under this suggests that the historical data used is can predict future demand levels to a statistically significant degree of accuracy holding other factors constant. Statistically significant findings have been greyed to distinguish them from insignificant findings.

The results find that lagged total population growth Granger causes an increase in total service demand in a 3 to 5-year lead time. The high F-statistic is a promising signal that the predictive power is reasonably strong irrespective of endogenous demand factors, such as changes in economic circumstance, policy settings or family structures.

Cohort-level data exhibited stronger short-term predictive power (1–3-year lags) compared to total population, which better predicted longer-term effects (4-5+ years). Each table provides the estimated coefficients by lagged year and service and funding type as stated.

Table 10: Granger Causality Test for Lagged Population on Total Service Demand

Population	Lag (Years)	F-Statistic	P-Value
Total	1	0.278	0.605
Total	2	0.475	0.631
Total	3	4.408	0.029
Total	4	8.365	0.006
Total	5	66.864	0.000

Table 11: Granger Causality Test for Lagged 65 Years and Older on Service Demand Categories			
Demand Variable	Lag (Years)	F-Statistic	P-Value
Total Service Demand	1	0.080	0.782
	2	2.884	0.108
	3	49.345	0.000
Mental Health Service Demand	1	0.094	0.764
	2	4.602	0.042
	3	42.159	0.000
Homelessness Service Demand	1	7.081	0.021
	2	2.727	0.119
	3	1.638	0.278
Children, Young People and Families Service Demand	1	0.020	0.891
	2	2.054	0.184
	3	2.050	0.208
Alcohol and Drug Service Demand	1	0.452	0.514
	2	2.798	0.113
	3	50.056	0.000

Table 12: Granger Causality Test for Lagged Children 0-12 on Service Demand Categories			
Demand Variable	Lag (Years)	F-Statistic	P-Value
Total Service Demand	1	0.061	0.810
	2	0.839	0.463
	3	1.167	0.397
Mental Health Service Demand	1	0.030	0.865
	2	0.702	0.521
	3	1.196	0.388
Homelessness Service Demand	1	3.657	0.080
	2	8.841	0.008
	3	10.555	0.008
Children, Young People and Families Service Demand	1	0.166	0.691
	2	0.157	0.857
	3	0.288	0.833
Alcohol and Drug Service Demand	1	0.006	0.937
	2	0.268	0.771
	3	0.580	0.650

Table 13: Granger Causality Test for Lagged People with Disability on Service Demand Categories			
Demand Variable	Lag (Years)	F-Statistic	P-Value
Total Service Demand	1	7.563	0.018
	2	14.044	0.002
	3	7.337	0.020
Mental Health Service Demand	1	2.795	0.120
	2	7.381	0.013
	3	5.346	0.039

Homelessness Service Demand	1	0.097	0.761
	2	0.690	0.526
	3	0.678	0.597
Children, Young People and Families Service Demand	1	3.152	0.101
	2	1.906	0.204
	3	2.409	0.166
Alcohol and Drug Service Demand	1	14.781	0.002
	2	12.722	0.002
	3	5.654	0.035

Table 14: Granger Causality Test for Lagged Women Cohort on Service Demand Categories

Demand Variable	Lag (Years)	F-Statistic	P-Value
Total Service Demand	1	0.211	0.654
	2	0.411	0.675
	3	2.409	0.165
Mental Health Service Demand	1	0.970	0.344
	2	0.530	0.606
	3	3.144	0.108
Homelessness Service Demand	1	2.559	0.136
	2	4.946	0.036
	3	2.496	0.157
Children, Young People and Families Service Demand	1	0.343	0.569
	2	0.642	0.549
	3	2.430	0.093
Alcohol and Drug Service Demand	1	0.033	0.859
	2	0.498	0.624
	3	2.289	0.178

Table 15: Granger Causality Test for Lagged Young People 12-24 on Service Demand Categories

Demand Variable	Lag (Years)	F-Statistic	P-Value
Total Service Demand	1	1.722	0.214
	2	0.901	0.440
	3	0.951	0.473
Mental Health Service Demand	1	2.474	0.142
	2	1.038	0.393
	3	1.336	0.348
Homelessness Service Demand	1	1.157	0.303
	2	1.040	0.392
	3	2.165	0.193
Children, Young People and Families Service Demand	1	8.288	0.014
	2	6.172	0.021
	3	4.255	0.062
Alcohol and Drug Service Demand	1	0.423	0.528
	2	0.645	0.547
	3	0.496	0.699

Trend Analysis

This section presents a trend analysis to inform the population adjustment index. By examining percentage changes over time, we identify patterns and fluctuations that impact funding allocations. The COVID period complicates the analysis due to its disruptions but also offers insights into how shock scenarios affect population trends, aiding in more resilient funding adjustments. Figure 4 illustrates this predicament, showing large peaks in response to the pandemic and its recovery. Unfortunately, the funding data available would likely have captured a lot of government response spending that fell outside of community sector service delivery.

Figure 4. Total Population, Total Service Demand and Government Funding 2013/14-2026/27

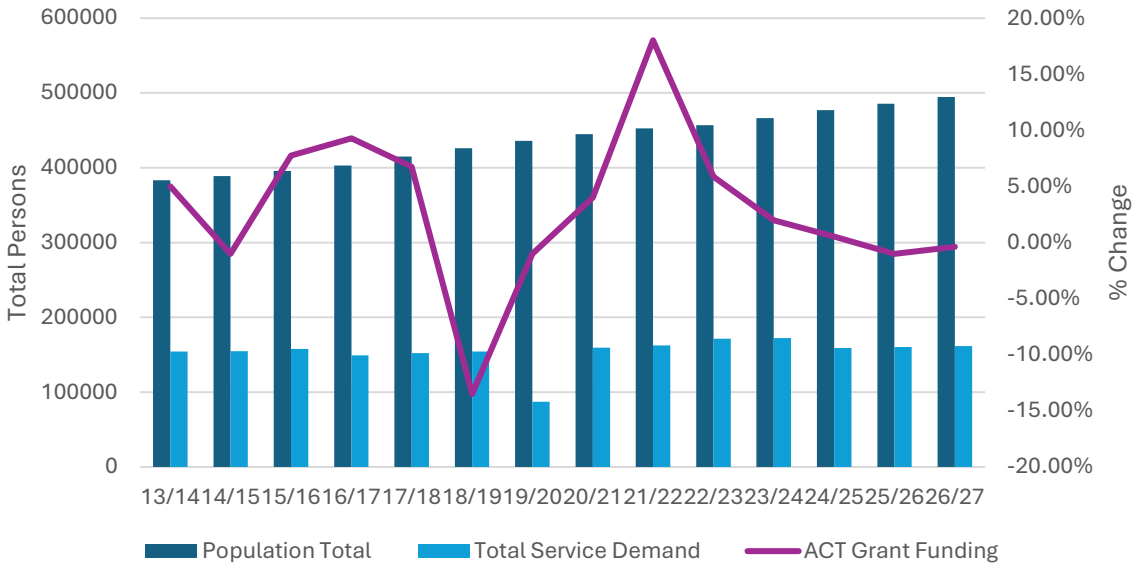


Figure 5 shows the rebased–a process that sets all values to 100 to support trend comparisons–trends of each population components. In relative terms, interstate migration, the most volatile population component, does not have the magnitude to influence total population change meaningfully. That said, interstate migration would offer the most immediate impact on service demand assuming that overseas migration demand would be dependent on eligibility outside of housing support and broader health services. Given the strong influence of migration patterns, demand for social services may be highly variable.

Figure 5. ACT Population Change By Component 2013-2026

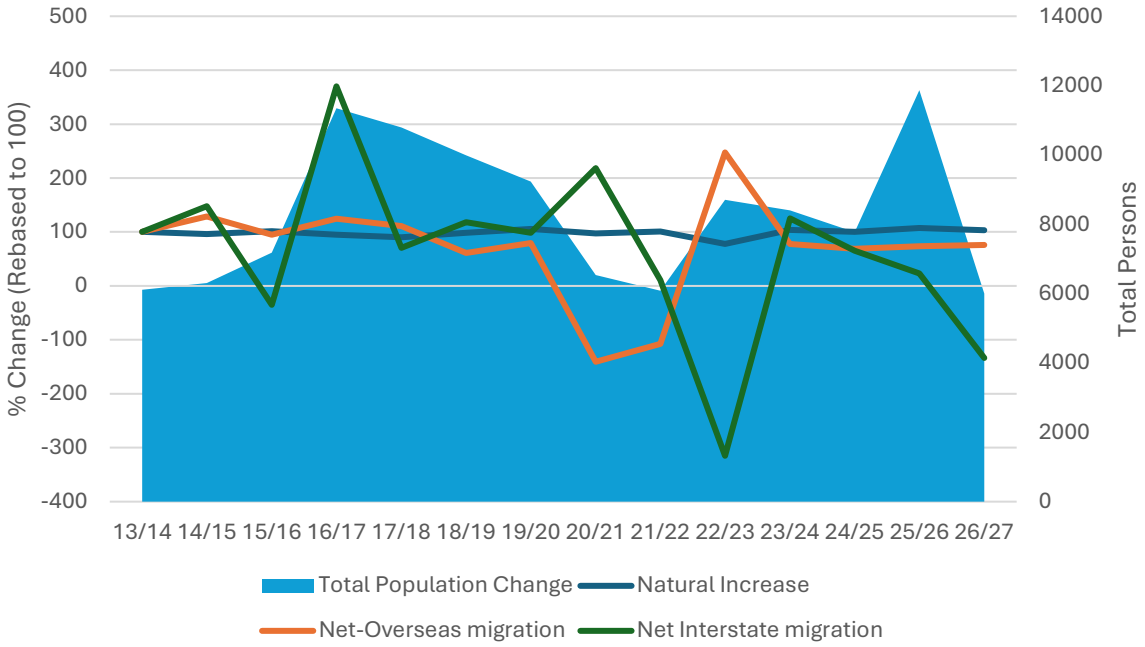
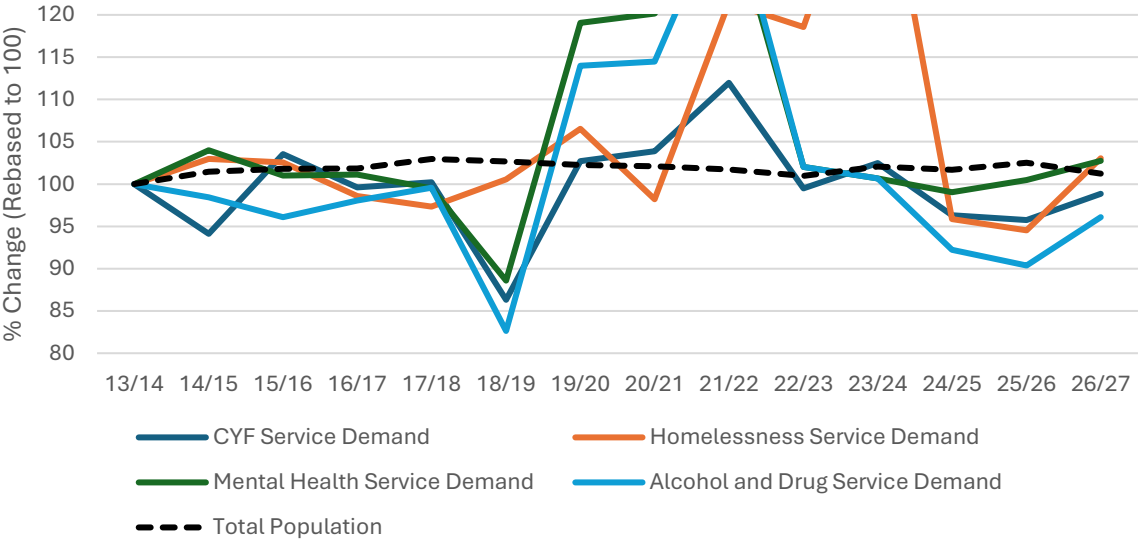


Figure 6 shows the rebased trends for each service demand category and the population growth from 2013/14 to 2026/27. While a longer service demand timeframe is needed, the early negative deviation of three service types raises an important concept when considering population adjustment. Service demand being defined through policy and program settings within a budget cycle may distort demand trends and population effects.

Figure 6. Averaged Deviations of Population and Services 2013/14-2026/27



This signals the importance of implementing an indexing process that is responsive to non-population driven changes in service demand, such as, endogenous policy changes, economic cycles or the increasing complexity of different social needs.

Following on, the changing prevalence of need among different population cohorts illustrates why an aggregated population measure may be masking the social dynamics driving demand. A pertinent example of which is the exponential year-on-year growth of the prevalence of mental health risk. Figure 7 shows rebased percentage changes for select cohort populations and estimated service utilisation in those populations, denoted as 'need'. Note that in this case women 'needs' relate to family services and domestic and family violence. As illustrated, need outpaces the cohort populations in all cases, with children and young people having the most modest deviation. While these trends say nothing about proportional changes, there does seem to be an upward trend that is counter to the stability seen in the cohort population growth. Understanding the utilisation rates for each service type will provide a strong foundation for developing a responsive demand index in response to changes in prevalence among cohorts. A first step to understanding service utilisation, would be for government to collect information on service recipient numbers and basic demographic information. Regarding prevalence rates, these are often made available through the Australian Institute of health and Welfare or relevant industry research reports. Figures 8 and 9 display service demand per capita over the 2013/14 to 2023/24 period. Both figures show that per capita ratios stay quite steady for the duration giving credence to a lagged population index. This would prioritise a potential smoothing of demand funding adjustments over the medium term leaving short-term funding decisions to the budget cycle deliberations and economic context.

Figure 7. Cohort Population and Need In ACT 2013-2026

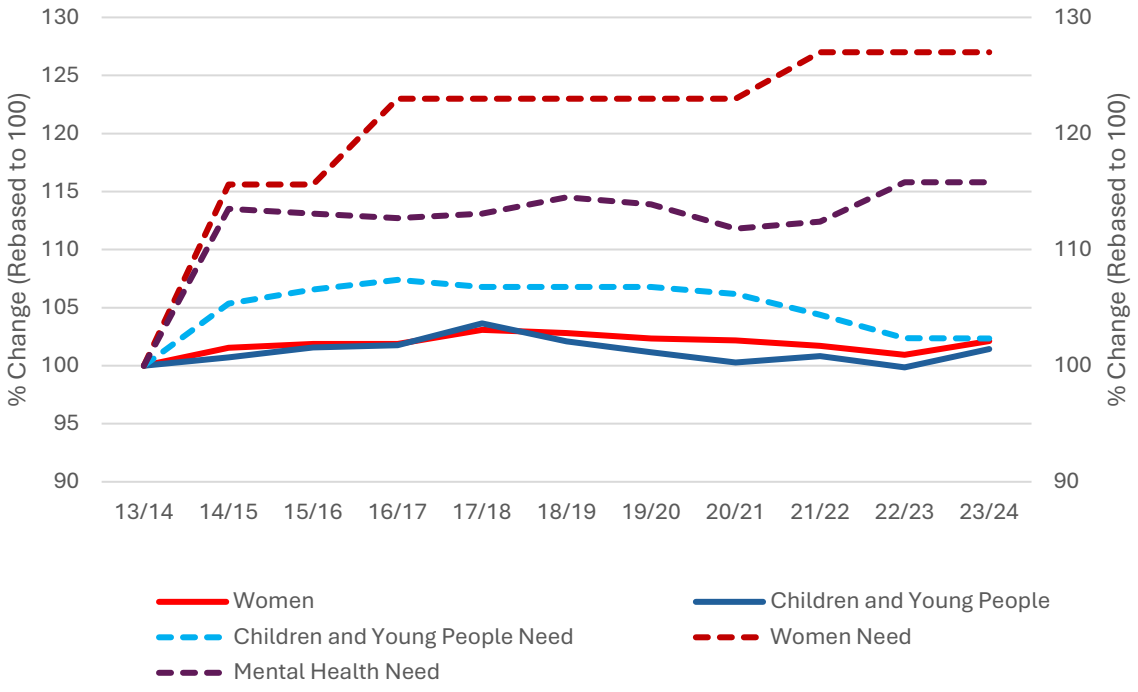


Figure 8. ADS and Mental Health Demand Per Capita 2013/14-2023/24

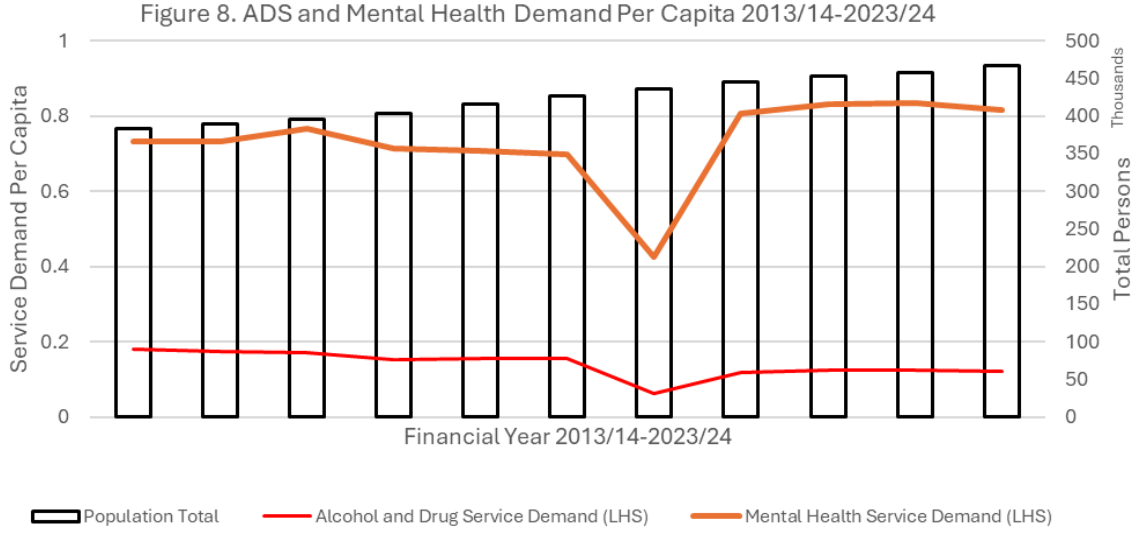
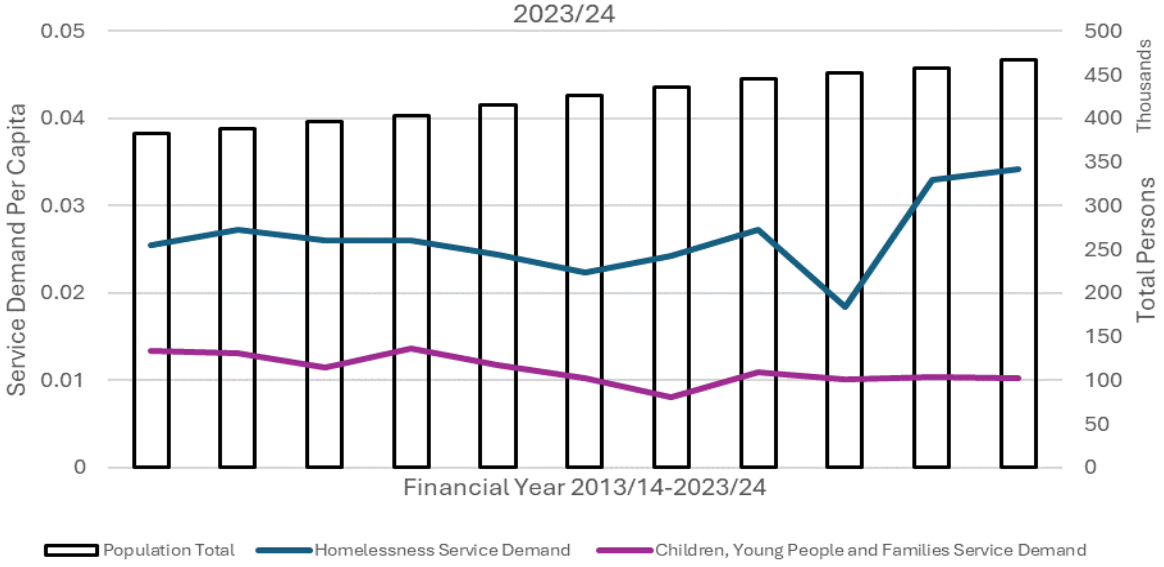


Figure 9. CYF and Homelessness Service Demand Per Capita 2013/14-2023/24



Exploratory Analysis of Composite Measures

The preliminary correlative and trend analyses suggest that broad population adjustments may be appropriate in smoothing out medium to long-term demand fluctuations in conjunction with more responsive short-term budgeting decisions. To explore some other suspected drivers of service demand, we constructed composite measures of macroeconomic and cohort sub-population variables and tested the how differently weighting composite index values may align with the actual values collated for the analysis.

The macroeconomic and cohort variables are easily available and support demand intuitively. The weightings applied to each index component were determined by the

relative correlation and Granger results using a simple weighted sum approach wherein weights (denoted as w) equalling 1 are assigned based on relative importance. The cohort and macroeconomic variables are limited to those included in this analysis. Of course, there are other priority cohort and prevalence rates that require consideration, as well as economic demand factors that fell outside of the scope of this work. The regional, macroeconomic and cohort composite measures are denoted as follows:

$$Regional\ Composite\ Index\ (RCI) = w_1 \mathrm{R}_{\mathrm{Belconnen,t}} + w_2 R_{CanberraEast,t} + w_3 R_{NorthCanberra,t} + w_4 R_{Tuggeranong,t} + w_5 R_{WestonCreek,t} + w_6 R_{WodenValley,t} + w_7 R_{SouthCanberra,t} + w_8 R_{Gungahlin,t}$$

$$Regional\ Composite\ Index\ (RCI) = w_1 \mathrm{R}_{\mathrm{Belconnen,t}} + w_2 R_{CanberraEast,t} + w_3 R_{NorthCanberra,t} + w_4 R_{Tuggeranong,t} + w_5 R_{WestonCreek,t} + w_6 R_{WodenValley,t} + w_7 R_{SouthCanberra,t} + w_8 R_{Gungahlin,t}$$

$$Macroeconomic\ Composite\ Index\ (MCI) = w_1 Incomeinequality_t + w_2 PoveryRate_t$$

This is a supplementary section to provide a preliminary insight into how a composite index may be constructed if a population adjustment is found to be insufficient in the long-term and other demand drivers need to be incorporated while maintaining the preferred simplicity and accessibility of the index.

Table 16. Composite Index Formula Cases

Index 1	$0.4(TotalPopulation_t) + 0.6(RCI_t)$
Index 2	$0.4(IM_t) + 0.3(OM_t) + 0.3(NI_t)$
Index 3	$0.4(CCI_t) + 0.6(MCI_t)$
Index 4	$0.25(TotalPopulation_t) + 0.75(CCI_t)$
Index 5	$0.25(TotalPopulation_{t-3}) + 0.5(CCI_{t-3}) + 0.25(MCI_{t-3})$
Index 6	$P\Delta = \frac{(P_{t+1} - P_t)}{P_t}$
Index 7	$RCI^* = \frac{RCI_{t+1}}{RCI_t}$

t denotes the time of value use, t-3 states a lag of 3 years. IM denotes net-interstate migration, OM denotes net-overseas migration and NI denotes natural increase (birth – deaths).

Table 17. Composite Index Case Results and Actual Service Demand Change 2014 to 2024										
Formula	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
Index1	1.7%	2.1%	2.1%	3.3%	2.9%	2.4%	8.1%	-3.8%	1.0%	2.2%
Index2	5.9%	0.4%	5.0%	2.0%	-6.4%	-1.6%	-11.8%	-10.7%	6.4%	-2.4%
Index3	-0.5%	-2.1%	0.6%	-6.9%	5.9%	1.8%	0.2%	7.5%	2.1%	1.6%
Index4	3.8%	4.2%	-0.1%	-0.7%	1.4%	5.0%	4.5%	2.0%	-0.1%	3.2%
Index5	2.2%	2.7%	2.3%	4.2%	3.7%	6.6%	4.8%	7.4%	6.1%	4.7%
Index6	1.4%	1.8%	1.8%	3.0%	2.7%	2.3%	2.1%	1.7%	1.0%	2.1%
Index7	1.9%	2.4%	2.2%	3.6%	3.1%	2.6%	12.0%	-7.5%	1.1%	2.3%
Actual Change	3.2%	2.3%	1.5%	-0.3%	-10.8%	13.4%	13.2%	27.8%	4.0%	6.6%

Table 18. Composite Index Case Annual Difference from Actual Service Demand Change 2014 to 2024											
Formula	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	r score
Index1	-1.5%	-0.2%	0.6%	3.6%	13.7%	-10.9%	-5.2%	-31.7%	-3.0%	-4.3%	-0.38
Index2	2.6%	-1.9%	3.6%	2.3%	4.4%	-14.9%	-25%	-38.5%	2.4%	-9.0%	-0.61
Index3	-3.7%	-4.4%	-0.9%	-6.6%	16.7%	-11.6%	-13.1%	-20.4%	-1.9%	-5.0%	0.33
Index4	0.5%	1.9%	-1.6%	-0.3%	12.2%	-8.4%	-8.8%	-25.8%	-4.1%	-3.4%	0.35
Index5	-1.0%	-1.9%	0.8%	4.5%	14.5%	-6.7%	-8.5%	-20.5%	2.1%	-1.9%	0.83
Index6	-1.8%	-0.5%	0.4%	3.3%	13.4%	-11.1%	-11.2%	-26.1%	-3.0%	-4.5%	-0.30
Index7	-1.3%	0.1%	0.8%	3.9%	13.9%	-10.8%	-1.3%	-35.4%	-2.9%	-4.2%	-0.37

The results are mixed and are complicated by the demand shock from the pandemic. However, it does appear that those cases that incorporate composite index formula factoring in other demand drivers in a simple weighting appropriation approach perform better than standalone population cases. A composite funding adjustment model may be necessary to achieve best fit for budget responsiveness to demand changes. As many of the variables used above are publicly available, administrative feasibility would be largely dependent on the availability of cohort-level service usage or community need prevalence data.

Index 5 was the best performing case and used a lagged composite measure of population, cohort and macroeconomic indicators. Further forecast validation is required to demonstrate these results, but this is out of scope of the data available. To enable validation, the data needs outlined under the Next Steps section would be required alongside a broader historical set of economic and social variables that would be expected to drive demand of the major government-funded service types.

Data Notes

The dataset was developed using multiple sources to estimate historical and current funding allocations to community sector organisations (CSOs) in the ACT. The following steps outline the data compilation and processing approach:

Grant Funding Data

To estimate funding levels for previous fiscal years, a combination of budget outlooks, budget statements, and annual reports from the Community Services and Health Directorates were used. Cross-referencing budget papers and annual reports sources helped refine estimates, though gaps in public reporting meant funding allocations required approximation in minor case regarding the Output Classes. These would have had minimal impact on the fundings reported.

While efforts were made to improve accuracy through source triangulation, publicly available expenditure data limited precision at a unit level. This is particularly relevant for smaller funding streams and administrative expenses not fully itemised in reports. To ensure comparability across years, all financial values were deflated to real terms using 2013 as the baseline year, accounting for inflationary effects.

Service Demand Data and Estimation

Service demand variables were compiled from ACT Government Budget Papers (2012/13–2024/25) and annual reports from the Community Services Directorate and ACT Health. The dataset primarily relied on Output Class accountability and performance statements, as no other reliable service demand data source was available. Policy and program changes over time complicated data continuity. To estimate prevalence or risk levels in key cohort populations, publicly available datasets from the Australian Institute of Health and Welfare (AIHW) were used. This included data on aged care, disability prevalence, youth and child health, social risk factors, family violence, substance abuse, and homelessness. Where missing data existed, values were filled using linear interpolation for short gaps (1–2 years) and cubic spline interpolation for longer gaps, ensuring smooth trend estimation without excessive distortion.

Short-term forecasting to enable longer lagged testing was generated using historical trend analysis and linear regression modelling. Baseline trends (2013-2023) for population growth, homelessness, mental health services, drug and alcohol services and children and family services were used to project future values to 2028/29. Linear estimation models, with year as the predictor, were applied to mitigate data bias while assuming stable demand growth. Economic indicators (unemployment, wage price index, financial disadvantage) were used to contextualise demand variations when they deviated from expected trajectories. Due to data quality issues, forecasted numbers were used sparingly and need to be validated to affirm the results. The quality concerns would be rectified by using a historically larger and more detailed dataset that prioritises reliable service usage and

participation data in the first instance. Again, if service usage data is unavailable then risk prevalence would be the most suitable proxy for community service need across policy areas.

Exclusions and Omissions

Certain funding categories were excluded due to data limitations. Specifically, emergency services funding was omitted as reliable disaggregated data was unavailable. Total expenditure levels were instead derived from budget output classes and grants reported in financial statements under the grants and purchased services line item It was assumed that community sector organisation grant funding trends aligned proportionally with overall expenditure increases in these budget categories, though variations in specific allocations may exist.

Much of the necessary service demand and regional granularity was not available or easily accessed which greatly limited the options for analysis in the project. Future analysis will require high quality service participation, cohort factors and utilisation data to produce high quality conclusions.

Methodology for Estimation and Projections

To ensure balanced and reliable forecasts, statistical smoothing techniques were applied, reducing volatility and preventing over-extrapolation. Funding and service demand projections were generated using an exponential smoothing model with a damped trend, which captures recent trends while limiting excessive forward projection. Missing cohort and output class values between 2016 and 2021 were filled using linear interpolation, calculating annual increases between known data points and distributing them accordingly. These missing values were due to changes in categorisation and Directorate structuring between the budget years. For prevalence measures, a non-linear cubic spline interpolation was applied to create a smooth estimation over time. Values outside available data periods (2013/14 to 2015/16 and 2021/22 to 2023/24) were estimated using extrapolation based on the average annual growth rate from 2016-2021.

The forecasts were calculated using a combination of historical trend analysis and linear regression modelling. First, historical data from 2013 to 2023 was used to establish baseline trends for population growth and service demand variables, including homelessness, mental health services, and children and family services. Due to the significant data quality limitations, linear estimation models were fitted to each variable, using year as the predictor to project future values from 2024 to 2028 for select tests to limit the overall data bias and unreliability. This method assumes a linear continuation of past trends, making it useful for stable demand growth but less responsive to sudden economic or policy shifts. Additionally, economic indicators such as unemployment, wage price index, and financial disadvantage were examined to contextualise demand variations.

Adjustment for Inflation and Demand Smoothing

To maintain comparability across years, all financial values were inflation-adjusted using the weighted average Consumer Price Index (CPI) for all capital cities. This method ensures that the analysis reflects real-term changes, accounting for macroeconomic conditions and supply chain cost fluctuations. Additionally, moving average smoothing was applied to service demand variables, addressing short-term fluctuations and inconsistencies in reporting while preserving underlying demand trends.

Changing Program Structures

Over time, new funding programs were introduced while others were discontinued, making direct comparisons across periods challenging. Notable changes were the reduction in disability service funding with the introduction of the NDIS and the restructuring of the family and youth services. Adjustments were made where feasible to align funding trends, but structural inconsistencies remain a limitation in the dataset. These changes affect the continuity of funding and service allocations, requiring careful interpretation when analysing long-term trends.

Limited Historical Data

Some funding allocations and service demand metrics were not consistently reported, necessitating the use of interpolation and extrapolation techniques to fill data gaps. While these methods provide reasonable estimates, they introduce some uncertainty, particularly where policy shifts or external economic factors may have influenced actual funding levels.

Estimation Uncertainty

In cases where precise historical figures were unavailable, estimates were derived from budget documentation, financial statements, and related reports. While these sources offer the best available data, variations in reporting standards, classification methods, and funding structures introduce a margin of error in the final estimates.

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