Development of Reference Ranges for Aged Care Quality Indicators

Prepared for the

Department of Health

Aged Care Branch
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Executive Summary

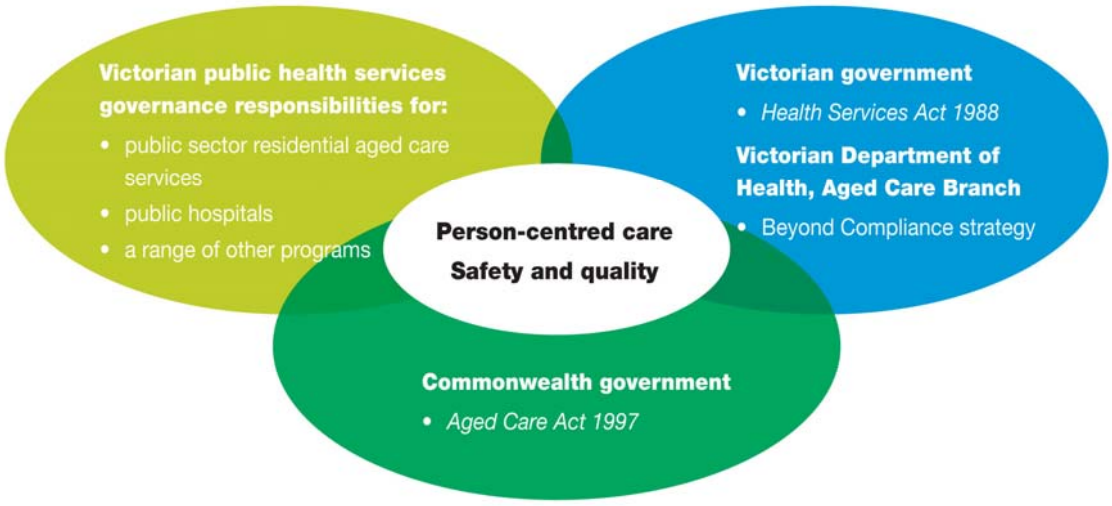
Context

A key feature of residential aged care services in Victoria is the significant role played by the State Government. The public sector comprises 23 per cent of all Victorian residential aged care services. These state aged care facilities are operated by public health services that also operate acute health services and other programs. Within this operating context, the Board and executive management of all health services need to have regard for residential aged care services as part of their overall governance responsibilities as required under the *Victorian Health Services Act 1988*. As a consequence, the demonstration of quality outcomes for residents in Public Sector Aged Care Services (PSRACS) sits within the broader context of a health service that has a range of programs with competing priorities. This context is unique to PSRACS compared to other aged care providers.

Additionally residential aged care service provision in Australia is primarily funded and regulated by the Commonwealth Government under the *Aged Care Act 1997*. As a condition of recurrent Commonwealth funding, all residential aged care services must achieve the Commonwealth aged care accreditation that provides a minimum standard of care and services for residents.

Therefore any proposed quality improvement approaches such as the introduction of reference ranges need to align with existing systems and approaches adopted for enhancing the safety and quality in health services and Commonwealth aged care accreditation requirements.

Figure 1: Governance of care delivery in PSRACS



Governance context of public sector residential aged care services (Department of Health).

Background

Campbell Research & Consulting was commissioned by the Victorian Department of Health (DH) Aged Care Branch to develop reference ranges for the quality indicators that have been collected for PSRACS in Victoria since June 2006. Under the present system, PSRACS are provided with detailed numeric data presented for each indicator for the service; as well as state rates and rates for different types of services.

The reference range project was commissioned under the Beyond Compliance strategy that targets risk management and performance improvement in PSRACS. It builds on existing practices related to the quality indicators, including data collection and the quality indicator dataset.

The objectives of the project were to:

- Develop aspirational, realistic and achievable consensus reference ranges for the aged care quality indicators
- Demonstrate effective sector engagement with the development of reference ranges
- Provide options and directions for the future of reference ranges for indicators in PSRACS.

The methodology - sources of evidence

The development of the reference ranges drew on a wide range of evidence comprising:

- A review of the recent literature to identify reference ranges being used for quality systems in the health and aged care sector
- Analysis of the data collected by the DH from health services operating PSRACS since July 2006 for five quality indicator domains with eleven indicators comprising:
    - Descriptive analysis of the shape of the data
    - Multivariate analysis by the University of Melbourne Statistical Consulting Centre
- Two expert roundtables with researchers who specialised in each of the quality indicator domains measured by the quality indicators (expert roundtables)
- A workshop with health service executives and quality managers, PSRACS managers and staff involved in collecting or using the quality indicator data (referred to as the PSRACS quality workshop).

The draft report was circulated to the Quality in PSRACS Reference Group for review.

Reference ranges

The reference ranges have been developed to identify a target and upper limit. A 'zero tolerance' reference range indicates that *any* incidence or prevalence of a particular event may be significant and require review and appropriate response. The recommended reference ranges are presented in Table 1.

Table 1: Recommended reference ranges

Indicator	Lower Target Rate (per 1,000 occupied bed days)	Upper Limit Rate (per 1,000 occupied bed days)
Pressure ulcers		
Stage 1	0	1.2
Stage 2	0	0.8
Stage 3 and 4	0 (zero tolerance)	0 (zero tolerance)
Falls		
Falls	3.3	11
Falls resulting in fractures	0 (zero tolerance)	0 (zero tolerance)
Restraint		
Restraint A	0 (zero tolerance)	0 (zero tolerance)
Restraint B	0 (zero tolerance)	0 (zero tolerance)
Polypharmacy		
9+ Medicines	2.1	3.5
Unplanned weight Loss		
Significant weight loss	0.2	1.0
Consecutive weight loss	0	1.0

The reference ranges have been developed based on the evidence from the available literature, experts in the aged care sector, health service and PSRACS management and staff and analysis of data reported by PSRACS for each indicator.

Campbell Research & Consulting reviewed the sets of reference ranges nominated by the participants at the PSRACS quality workshop and those nominated by experts. This revealed that both sets showed a reasonable fit with fluctuations in rates over time; experts and participants at the PSRACS quality workshop agreed on appropriate reference ranges for some indicators; and that participants at the PSRACS quality

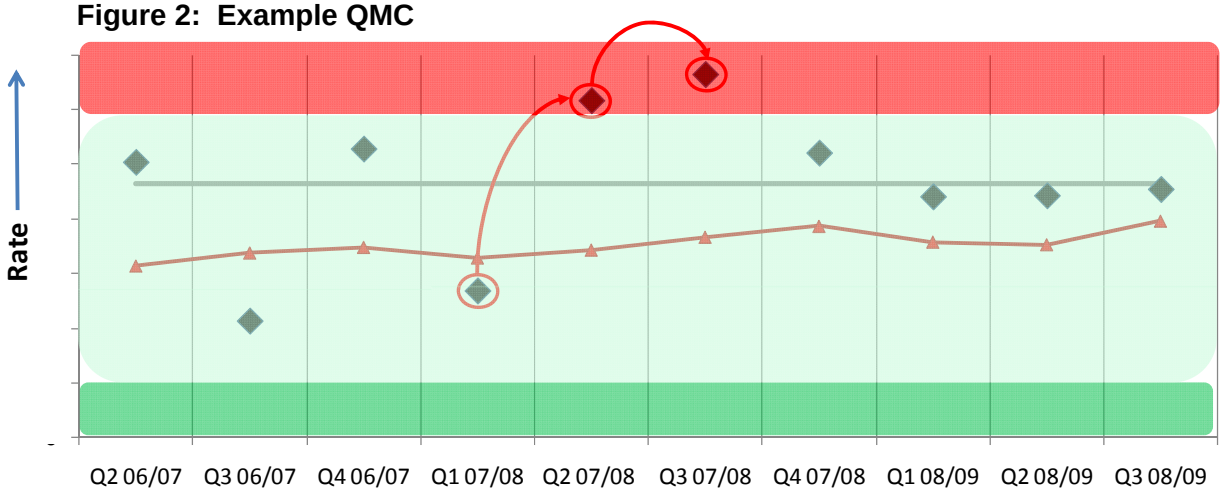
workshop had a propensity to set more challenging and aspirational targets for their service(s) compared with the reference ranges recommended by the experts.

Reporting rates and reference ranges

Campbell Research & Consulting suggest that the quality indicator data, in the context of reference ranges, for individual PSRACS be presented using **quality monitoring charts (QMC)** (Figure 2). The concept of the QMC was tested with a range of stakeholders including Directors of Nursing (DoN), quality managers, health services executives and some of the experts consulted for this project. This simple, parsimonious and visual approach to displaying the quality indicator data was well received by the field.

In Figure 2, time is plotted on the horizontal axis at the bottom of the chart. The rates are plotted on the vertical axis at the left of the chart. Each point in the body of the chart represents a rate for a single quality indicator for a single period. Fluctuation in rates over time is tracked from left to right.

Figure 2: Example QMC



A number of features are built into the QMC that will *indicate* positive or negative trends:

- A rate within range is shaded light green
- The target rate is shaded in dark green
- Above the upper limit rate is shaded in red
- A comparison rate is shown as a red line that changes over time
- The average rate for the service over time is shown as a straight grey line
- Trigger points (circled in red) can act as a prompt for review or action, and they include:
  - Points that are above the upper limit of the reference range
  - Three or more consecutive increases or decreases.

The QMC is designed to present key information in a simple, parsimonious manner that can identify areas for review and/or action to improve quality processes and recognition of success in achieving improvement.

Table 2: Acronyms

ACHS	Australian Council on Healthcare Standards
DH	Department of Health
DoN	Director of Nursing
PSRACS	Public Sector Residential Aged Care Services
Q1 – Q4	Quarters of the calendar year used for graphing the rates over time
QMC	Quality Monitoring Chart

Acknowledgements

Campbell Research & Consulting was contracted by the Aged Care Branch in the Department of Health to undertake the *Development of Reference Ranges for Aged Care Quality Indicators* project.

Campbell Research & Consulting gratefully acknowledges the contribution of the health service executives and quality managers, PSRACS managers and staff involved in collecting or using the quality indicator data who participated in the workshop chaired by Dr Heather Wellington from DLA Phillips Fox and the contribution of the experts who participated in the roundtables:

Ms Jenny Bacon	Dietitian- Nutrition Services for Aged Care
Dr Cathy Balding	Principal Consultant, Qualityworks
Professor Joseph Ibrahim	Australian Centre for Evidence Based Aged Care at La Trobe University, Faculty of Health Sciences
Professor Keith Hill	National Aging Research Centre
Dr Susan Hunt	Office of Aged Care Quality & Compliance, Department of Health and Aging
Dr Susan Koch	Principal Research Fellow, Helen Macpherson Smith Institute of Community Health Royal District Nursing Service
Associate Professor William McGuiness	La Trobe Alfred Clinical School

The Department of Health's Quality in PSRACS Reference Group provided valuable comment on the draft report and at presentations during the course of the project.

Contributors

Consultation, data analysis and development of the reference ranges was undertaken by David Spicer, Ros Lording prepared the literature review, Associate Professor Ian Gordon, Statistical Consulting Unit, University of Melbourne undertook the multivariate analysis. Stephen Campbell was responsible for overall direction and the final report.

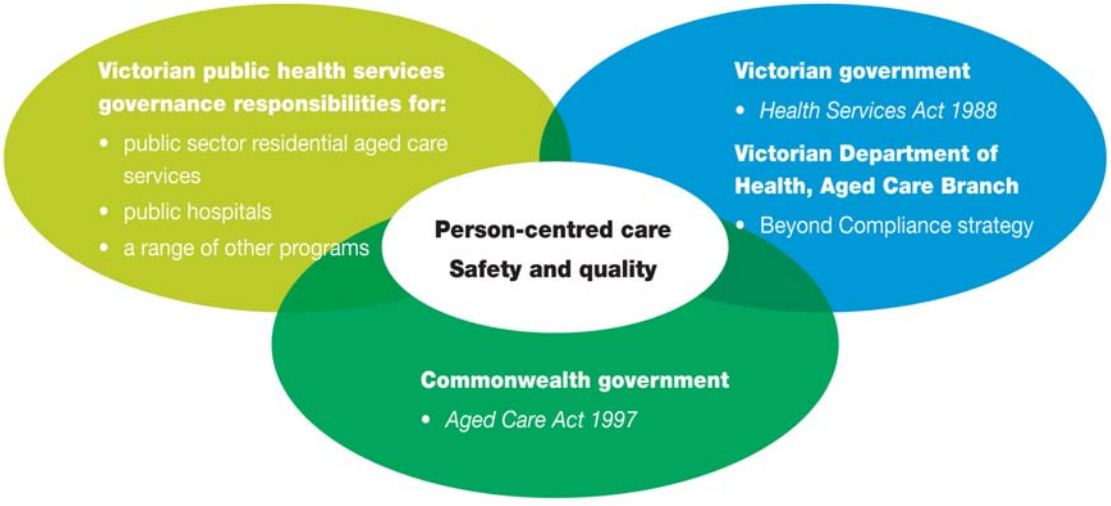
1. Context

A key feature of residential aged care services in Victoria is the significant role played by the State Government. The public sector comprises 23 per cent of all Victorian residential aged care services. These aged care facilities are operated by public health services that also operate acute health services and other programs. Within this operating context, the Board and executive management of all health services need to have regard for residential aged care services as part of their overall governance responsibilities as required under the *Victorian Health Services Act 1988*. As a consequence, the demonstration of quality outcomes for residents in Public Sector Aged Care Services (PSRACS) sits within the broader context of a health service that has a range of programs with competing priorities. This context is unique to PSRACS compared to other aged care providers.

Additionally residential aged care service provision in Australia is primarily funded and regulated by the Commonwealth Government under the *Aged Care Act 1997*. As a condition of recurrent Commonwealth funding, all residential aged care services must achieve the Commonwealth aged care accreditation that provides a minimum standard of care and services for residents.

Therefore any proposed quality improvement approaches such as the introduction of reference ranges need to align with existing systems and approaches adopted for enhancing the safety and quality in health services and Commonwealth aged care accreditation requirements.

Figure 3: Governance of care delivery in PSRACS



Governance context of public sector residential aged care services (Department of Health).

Campbell Research & Consulting was commissioned by DH to develop reference ranges for the quality indicators that have been collected for PSRACS in Victoria since June 2006. Under the present system, PSRACS are provided with detailed numeric data presented for each indicator for the service; as well as state rates and rates for different types of services.

2. Background

The Victorian government is committed to and has a focus on delivering quality services to older Victorians. The framework for quality improvement in PSRACS is the Beyond Compliance strategy. The Beyond Compliance strategy was developed to support and build the capacity of PSRACS to deliver high quality care to residents.

In 2003, DH commissioned the Gerontic Nursing Clinical School of La Trobe University to develop a set of "Quality of Care Performance Indicators" for PSRACS in Victoria. The objective of this project was to identify and recommend a set of evidence-based quality indicators, based on robust evidence to assist in monitoring and improving the quality of care for residents. Data for five quality indicator domains with a total of eleven indicators have been collected since July 2006. These domains are:

- Pressure ulcers stages 1 - 4 (four indicators)
- Falls and fall-related fractures (two indicators)
- Use of physical restraint (two indicators)
- Residents using nine or more medicines
- Unplanned weight loss (two indicators).

The establishment of this set of measures enabled PSRACS to track quality over time and target specific areas for improvement.

The Victorian public sector comprises almost 200 PSRACS, caring for in excess of 6500 residents. Due to these numbers, a large amount of data has been collected over the duration of the quality indicators. The volume of data collected enables a comprehensive review and analysis of these data, leading to a desire to see the development of reference ranges for use by PSRACS.

2.1 Development of reference ranges for aged care quality indicators

The project: *Reference Ranges for Aged Care Quality Indicators* delivers a set of recommended reference ranges for the quality indicators used in PSRACS in Victoria.

The objectives of the project were to:

- Develop aspirational, realistic and achievable consensus reference ranges for aged care quality indicators
- Demonstrate effective sector engagement with the development of reference ranges

- Provide options and directions for the future of reference ranges for indicators in PSRACS.

2.2 The methodology - sources of evidence

The development of the reference ranges drew on a wide range of evidence comprising:

- A review of the recent literature to identify reference ranges being used for quality systems in the health care sector
- Analysis of the data collected by DH from health services operating PSRACS since July 2006 for the five quality indicator domains with eleven indictors comprising:
  - Descriptive analysis of the shape of the data
  - Multivariate analysis by the University of Melbourne Statistical Consulting Centre
- Two expert roundtables with researchers who specialised in each of the quality indicator domains measured by the quality indictors (expert roundtables)
- A workshop with health service executives and quality managers, PSRACS managers and staff involved in collecting or using the quality indicator data (referred to as the PSRACS quality workshop).

The draft report was circulated to the Quality in PSRACS Reference Group for review.

2.3 Quality indicators, reference ranges and rates

Data for the quality indicators are presented as **rates**. Rates allow for levels of quality as measured by the quality indicators to be compared independently to the size or type of PSRACS.

The rates are calculated by summing the number of instances for each indicator recorded at a PSRACS (for example, a fall), then dividing by the number of occupied bed days for the service, multiplied by 1,000. Dividing by the number of bed days standardises rates to enable comparison across services of different sizes and to control for changes in the number of operational beds at a facility over time.

2.3.1 Some definitions

- Reference range – a range of rates, within a target and limit rate, which establishes realistic goals to monitor and measure quality improvement over time.
- Target rate – an aspirational, realistic and achievable rate of performance.

- Limit rate – the upper limit of the reference range.
- Zero tolerance – a rate that is higher than zero when the target rate and limit rate for the reference range are both set at zero.

2.3.2 Reference ranges in the context of continuous improvement

Reference ranges can be used to monitor and drive continuous quality improvement in the operational context when an individual service has a rate:

- Within the reference range – identify and acknowledge what interventions are working.
- Above limit rate – trigger for review and possibly further action.
- Trends that are within the reference range but are increasing towards the limit rate – trigger for review and possible further action.
- Zero tolerance – needs to be considered as significant and may require review and appropriate response.

2.4 Using reference rates to improve quality

The reference ranges in this report are presented in charts with accompanying text that explains the calculation and rationale of the target and upper limit rates that form the reference range.

The lower target or aspirational rate and the upper limit rate are illustrated in Figure 4. An example chart is provided in Figure 5.

Figure 4: Overview of a reference range

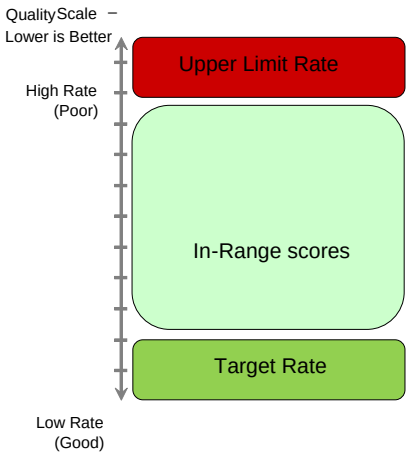
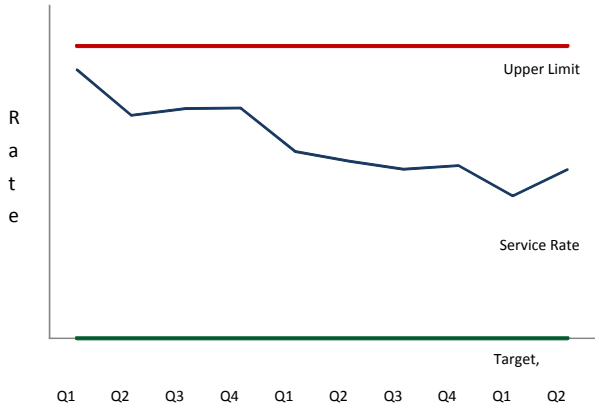


Figure 5: Example reference range chart



In this chart:

- Rates per 1,000 occupied bed days for an indicator are plotted vertically on the y-axis
- Time series (by quarter) is plotted horizontally on the x-axis
- The recommended reference range is represented by the target rate (in green) and upper limit rate (in red).
- The actual rate for each quarter is shown as a solid blue line.

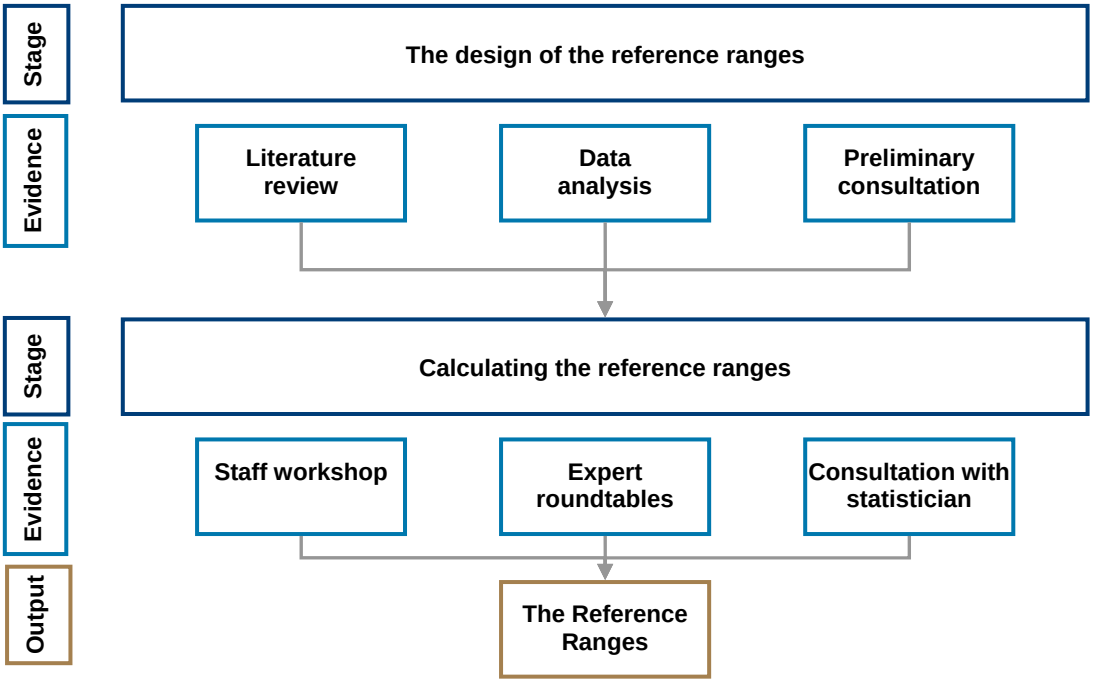
3. Key findings in the design of the reference ranges

The project drew on a wide range of evidence sources to design and subsequently calculate the reference ranges. The two key stages in the development of the reference ranges were:

- Designing the approach to the reference ranges based on a literature review and data analysis
- Calculating the reference ranges based on input from experts in the aged care sector, and specific target and limit rates nominated by participants at the PSRACS quality workshop.

The target and upper limit rates demonstrating the best fit with historical data and available evidence were selected to form the reference range. This approach is summarised below (Figure 6).

Figure 6: Sources of evidence for the design and calculation of the reference ranges



3.1 Key findings from the literature review

Campbell Research & Consulting conducted a review of existing quality indicator suites and benchmarking techniques to inform the development of reference ranges.

The literature review identified a diverse range of indicators in use in residential aged care both in Australia and overseas with none universally applied. The domains of care measured by other indicator suites are similar to the system used for PSRACS in Victoria in some cases. However, the methods of calculating and reporting these are generally incompatible with the quality indicators in use in Victoria.

The method of calculating benchmarks typically focuses on *proportions of residents* with particular outcomes, rather than the *rate-based system* used in Victoria. Rates identify the number of events (e.g. falls, pressure ulcers) and focus on the incidence or prevalence of the events over time (e.g. unplanned weight loss). Indicators based on percentages tend to identify the prevalence of conditions (e.g. pressure ulcers). The PSRACS quality indicator suite is also based on occupied bed days to provide a base for calculation grounded in the occupancy load over a period.

Benchmarks and reference ranges from these systems cannot be directly incorporated into the aged care quality indicators used in Victorian PSRACS.

Three bodies of work stand out as being of particular relevance in the development of reference ranges for PSRACS in Victoria:

- The work of Wilkes[1] in the United States who pioneered a data driven approach to benchmarking, and defined a number of over-arching principles of quantitative benchmarking
- The indicators used by the Australian Council on Healthcare Standards (ACHS)[2] framework in the acute care sector. The purpose, calculation and reporting of these indicators and benchmarks informed the development of the current project. In particular, the use of the 80th and 20th centiles as boundaries for a reference range has been used as the basis for analysis of the quality indicator data for PSRACS.
- In Queensland, Courtney et al have developed a Clinical Care Indicators Tool comprising 24 indicators and implemented the Tool for 107 residents[3].

A common method for presenting data for a reference range is the Statistical Control Chart. Few other effective methods of reporting reference range data were identified. The use of Statistical Control Charts has been recommended for the reporting of the reference ranges for PSRACS in Victoria. However, the term QMC is used as it

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1 Allison, J., C.I. Kiefe, and N.W. Weissman, *Can data-driven benchmarks be used to set the goals of healthy people 2010*? Am J Public Health. 89(1): p. 61-5.

2 ACHS, *Australasian Clinical Indicator Report: 2001 – 2008 Determining the Potential to Improve Quality of Care*. 2008.

3 Courtney, M., O'Reilly, M., and Hassall, S (2010) *Benchmarking clinical indicators of quality for Australian residential aged care facilities* Australian Health Review 1010 34 93-100

focuses on the purpose of the reporting and because the small sample sizes at PSRACS level make the reference to statistical testing inappropriate.

3.1.1 Implications for the design of the reference ranges

The reference ranges were designed from the ground up.

Review of the literature did not identify any reference ranges or methods of benchmarking that could be directly applied to the quality indicator suite used by PSRACS. Owing to the lack of relevant or compatible clinical evidence or benchmarks to underpin the reference ranges, they have instead been developed by analysis of quality indicator data from PSRACS in Victoria, advice from experts in the field, and consultation with health service executives, quality managers, PSRACS managers and staff. The empirical evidence from the experience of PSRACS was tested with the experts and group of health service executives, quality managers, PSRACS managers and staff to test their validity. This consultation focussed on the achievement of realistic, achievable and aspirational goals.

Percentiles with ranges set at the 20th and 80th percentile were used as the basis for the ranges as these percentiles are used in the ACHS quality indicator suite. As this recognised statistical method provides congruency and maintains comparability across the broader health service.

3.2 Key findings from the data analysis

Campbell Research & Consulting compiled the PSRACS quality indicator data provided by DH and analysed reported rates across all reporting periods to determine:

- The shape or spread of PSRACS performance against each indicator
- The drivers of high or low performance in terms of demographic variables such as service size, location and high/low care resident mix
- Change in state-wide rates over time.

The analysis was supported by more complex multivariate analysis performed by Associate Professor Ian Gordon from the University of Melbourne Statistical Consulting Centre.

Campbell Research & Consulting and the Statistical Consulting Centre worked with the dataset provided by DH to so that the resulting dataset was considered to be sufficiently robust and reliable for the analysis presented in this report.

The distribution of rates reported across all PSRACS for each indicator did not demonstrate a normal (or ‘bell-shaped’) distribution. All indicators showed moderate to severe skew towards lower rates. That is, the majority of PSRACS reported low rates

(indicating better performance) with very few reporting high rates (indicating poorer performance).

Resident mix (the proportion of high and low care residents) is the primary demographic driver of variation in reported rates. PSRACS designated as low care consistently reported lower rates for each Indicator compared with services designated as high care. Inconsistent differences were noted between metropolitan and regional services and between small and large services. None of the variation observed for different service types was considered to be a 'strong' driver of variation in rates.

3.2.1 Key implications for the development of the reference ranges

The effect of PSRACS type on variation in quality was not considered strong enough to warrant risk adjustment to the reference ranges for different types of services. Variations in rates were in part driven by demographic factors, most notably for service type (high/low care), however as noted, these differences were not considered large enough, or were statistically significant, to warrant risk adjustment for the recommended reference ranges.

3.3 Key findings from the consultation with key stakeholders

Campbell Research & Consulting consulted with key stakeholders in the sector to inform the development and implementation of the reference ranges.

3.3.1 PSRACS quality workshop

Campbell Research & Consulting conducted a workshop with approximately 80 health service executives and quality managers, PSRACS managers and staff involved in collecting or using the quality indicator data in PSRACS.

Campbell Research & Consulting asked personnel attending the PSRACS quality workshop to nominate reference ranges for their services based on raw counts of the incidence or prevalence of the indicators. These raw counts were collated and used to calculate rates for an aspirational target, and zero tolerance or limit rates for the reference ranges. These calculated reference ranges were used to inform the final reference ranges documented in this report[4].

Participants at the PSRACS quality workshop generally had little difficulty in specifying targets and upper limits for most indicators (e.g., based on the *number* of falls). Engagement with stakeholders revealed that most were familiar with the incidence or prevalence data associated with the indicators and were therefore comfortable in specifying what would become a reference range for their service.

[4] Referred to as participants at the PSRACS quality workshop.

While participants at the PSRACS quality workshop were able to nominate reference ranges based on 'real numbers', most were uncertain about the actual meaning of the quality indicators when reported as rates. The transformation of an actual event (e.g., a fall) into a rate per 1,000 occupied bed days does not provide information which is meaningful to people engaged in everyday management and delivery of care. Some PSRACS quality managers were able to interpret and use the reported rates to monitor and improve quality. However, many were overwhelmed by the quantity, abstraction and complexity of the data provided to them in the current quality indicator reports.

3.3.2 Expert roundtable

Campbell Research & Consulting convened two expert roundtables attended by experts who specialised in each of the five areas represented by the quality indicators used in PSRACS (pressure ulcers, falls, restraint, unplanned weight loss and polypharmacy).

The attending experts were also presented with the state-side results for each indicator. Based on this information and their existing knowledge of quality management and measurement in aged care, the experts were asked to nominate reference ranges for their respective fields of expertise.

Experts at the roundtable suggested one of two methods of calculation for the reference ranges indicator:

- Calculate a mean based on state data, and then calculate two standard deviations above and below the mean to form the target and upper limit rates, thus forming a reference range. This approach was nominated for stages 1 and 2 pressure ulcers, falls, unplanned significant weight loss and unplanned consecutive weight loss.
- A zero tolerance approach to some indicators, including stage 3 and 4 pressure ulcers, falls resulting in fractures, all restraint.

  Using this zero tolerance approach, both the target and upper limit are set to zero. Thus a PSRACS should aim to have zero instances of restraint, and any instance of restraint be considered significant and may require review and appropriate action.

Experts initially suggested using the mean plus/minus two standard deviations to generate the reference range. However, using a mean/standard deviation approach to describing data assumes that the dataset demonstrates a normal 'bell-curve' distribution. The skew observed in the data meant that taking the mean and adding/subtracting the fixed value of a standard deviation led to negative rates, which produces negative rates which are not meaningful.

Following consultation with the Melbourne University Statistical Consulting Centre, Campbell Research & Consulting used the median and the top and bottom 20% as the basis for calculating the reference range. This approach is congruent with that used for the ACHS indicator suite.

3.3.3 Implications for the reference ranges for PSRACS

Campbell Research & Consulting reviewed the two sets of reference ranges: those nominated by the participants at the PSRACS quality workshop and those nominated by experts at the roundtable for each indicator.

The reference ranges nominated by the experts and those nominated by participants at the PSRACS quality workshop were considered in the analysis of trends in the state-wide data. This comparison revealed:

- That the nominated reference ranges from both participants at the PSRACS quality workshop and experts showed a reasonable fit with fluctuations in rates over time
- Experts and participants at the PSRACS quality workshop agreed on reference ranges for some indicators
- Participants at the PSRACS quality workshop had a propensity to set more challenging and aspirational targets for their service(s) compared with the reference ranges recommended by the experts.

3.4 Calculating the reference ranges

The reference ranges are therefore based on a combination of calculations recommended by experts at the roundtables or values identified by participants at the PSRACS quality workshop.

The reference ranges recommended in the workshop and roundtables were reviewed against the historical trends in the data. An assessment of the reference range that would best fit with current practice and best available evidence. That reference range was then selected for this report.

The reference ranges recommended in the following sections provide a basis for achievable and aspirational goals for PSRACS.

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4. Reference ranges for pressure ulcers

The pressure ulcers indicator set includes indicators for stage 1, 2, 3 and 4 pressure ulcers.

4.1 Stage 1 pressure ulcers

Stage 1 pressure ulcers are observable pressure related alteration of intact skin as compared to the adjacent or opposite area of the body. These may include changes in one or more of the following: skin temperature (warmth or coolness), tissue consistency (firm or boggy feel) and/or sensation (pain, itching). The pressure ulcer appears as a defined area of persistent redness in lightly pigmented skins, whereas in darker skin tones, the pressure ulcer may appear with persistent red, blue or purple hues.

Reference range

Limit rate:	1.2 stage 1 pressure ulcers per 1,000 occupied bed days
Target rate:	Zero stage 1 pressure ulcers per 1,000 occupied bed days

Source of evidence underlying the calculation of the reference range

Campbell Research & Consulting recommended a reference range based on input from the experts at the roundtable.

Participants at the PSRACS quality workshop nominated a target rate of 0.9 stage 1 pressure ulcers per 1,000 occupied bed days and an upper limit rate of 2.2. These rates do not represent a good fit with the statistical analysis for stage 1 pressure ulcers.

It is recommended that the rates based on the calculations from the expert roundtable are adopted as the reference range for stage 1 pressure ulcers.

4.2 Stage 2 pressure ulcers

Stage 2 pressure ulcers are defined by partial thickness skin loss involving epidermis and/or dermis. The pressure ulcer is superficial and presents clinically as an abrasion, blister or shallow crater.

Reference range

Limit rate:	0.8 stage 2 pressure ulcers per 1,000 occupied bed days
Target rate:	Zero stage 2 pressure ulcers per 1,000 occupied bed days

Source of evidence underlying the calculation of the reference range

Campbell Research & Consulting recommended a reference range based on input from the experts at the roundtable.

Participants at the PSRACS quality workshop nominated a target rate of 0.64 stage 2 pressure ulcers per 1,000 occupied bed days and an upper limit rate of 1.60. As is the case for stage 1 pressure ulcers, these rates do not represent a good fit with the statistical analysis for stage 2 pressure ulcers.

It is recommended that the rates based on the calculations from the expert roundtable are adopted as the reference range for stage 2 pressure ulcers.

4.3 Stage 3 and 4 pressure ulcers

Stage 3 pressure ulcers entail full thickness skin involving damage or necrosis of subcutaneous tissue that may extend down to but not through underlying fascia. The pressure ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.

Stage 4 pressure ulcers entail full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone, or supporting structures (for example, tendon or joint capsule). Undermining and sinus tracts may also be associated with stage 4 pressure ulcers.

Reference range

Limit rate:	Zero Tolerance
Target rate:	Zero tolerance

Experts at the roundtable recommended zero-tolerance for stages 3 and 4 pressure ulcers. A zero tolerance policy entails a target rate of 0 stage 3 and 4 pressure ulcers per 1,000 occupied bed days, and a limit rate that is also zero.

Target and upper limit rates specified by participants at the PSRACS quality workshop ranged from moderate to low:

- Stage 3 pressure ulcers: 0.13 target and 0.83 upper limit
- Stage 4 pressure ulcers: zero target rate and 0.6 upper limit rate.

Upper limit rates specified by participants at the PSRACS quality workshop were higher than the zero tolerance approach specified by experts at the roundtable. Target limits specified by workshop participants were very near zero, similar to the zero tolerance level specified by the experts.

It is well known that pressure ulcers are preventable, therefore from a practice perspective; experts at the round table expressed the opinion that any incidence of stage 3 or 4 pressure ulcers should be considered as significant and may require review and appropriate action.

A zero tolerance policy where the target and upper limit rates are both zero is recommended.

5. Reference range for falls

The falls indicator includes falls, and falls resulting in fractures.

5.1 Falls

A fall is an event that results in a person coming to rest inadvertently on the ground or floor or other lower level.

Reference range

Limit rate:	Rate of 11 falls per 1,000 occupied bed days
Target rate:	Rate of 3.3 falls per 1,000 occupied bed days

Source of evidence underlying the calculation of the reference range

Campbell Research & Consulting recommended a reference range based on input from the experts at the roundtable.

Participants at the PSRACS quality workshop nominated a target rate of 2.1 falls per 1,000 occupied bed days and an upper limit rate of 6.3. This target rate specified is more ambitious than those specified by the experts and reflect a trend seen throughout the PSRACS quality workshop specifying very challenging targets and upper limits.

While such challenging targets may represent an opportunity to drive aspirationally high levels of quality, the rates based on the expert roundtable are more realistic and attainable.

5.2 Falls resulting in fractures

A **fracture** is traumatic injury to a bone whereby the continuity of the bone tissue is broken. The indicator measures fractures that have resulted from a fall.

Reference range

Limit rate:	Zero Tolerance
Target rate:	Zero Tolerance

Source of evidence underlying the calculation of the reference range

Campbell Research & Consulting recommended a reference range based on the method of calculation recommended by experts at the roundtable together with consideration of the very low targets and upper limit rates specified by participants at the PSRACS quality workshop.

Experts at the roundtable recommended zero-tolerance for falls resulting in fractures: with a target rate of zero, and a limit rate (a flag for review/action) of zero. Target and limit rates specified by participants at the PSRACS quality workshop were very low (0.04 and 0.43 respectively). The majority of participants at the PSRACS quality workshop specified a target and upper limit rate of zero.

Zero tolerance, where the target and upper limit rates are both zero is recommended.

Any incidence of a fall related fracture should be considered as significant and may require review and appropriate action.

6. Reference range for physical restraint

Restraint A: “The intentional restriction of a resident’s voluntary movement or behaviour by the use of a device, or removal of mobility aids, or physical force for behavioural purposes is physical restraint. Physical restraint devices include but are not limited to lap belts, tabletops, posey restraints or similar products, bed rails, and chairs that are difficult to get out of such as beanbags, water chairs and deep chairs.”

Restraint B is use of bedrails, chairs with locked tables, shackles, manacles, and seat belts other than those used during active transport and/or safety vests.

Reference range

Limit rate:	Zero restraint (all forms) per 1,000 occupied bed days
Target rate:	Zero restraint (all forms) per 1,000 occupied bed days

Source of evidence underlying the calculation of the reference range

Campbell Research & Consulting recommended a reference range based on input from the experts at the roundtable.

Experts at the roundtable each expressed a strong objection to all forms of restraint. The experts recommended a zero tolerance policy for both restraint A and restraint B, where both the target and upper limit rates are set to zero.

The majority of participants at the PSRACS quality workshop specified a zero or very low rate of restraint. For each form of restraint:

- Restraint A: target rate of 0.15, limit rate of 0.56
- Restraint B: target rate of 0.16, limit rate of 0.22

It is recommended that a zero tolerance approach is taken to all forms of restraint and that both target and limit rates are set to zero. Any incident of restraint should be considered as significant and may require review and appropriate action.

7. Reference range for 9+ medicines

Medicine is defined as a chemical substance given with the intention of preventing, diagnosing, curing, controlling or alleviating disease or otherwise enhancing the physical or mental welfare of people. It includes prescription and non-prescription medicines, including complementary health care products, irrespective of the administered route.

Reference range

Limit rate:	3.5 residents on 9+ medicines per 1,000 occupied bed days
Target rate:	2.1 residents on 9+ medicines per 1,000 occupied bed days

Source of evidence underlying the calculation of the reference range

Campbell Research & Consulting recommended a reference range based on recommendations by participants at the PSRACS quality workshop.

The expert in polypharmacy at the expert roundtable was not aware of evidence supporting a specific number of medications influencing resident outcomes. Consequently they were not able to provide an evidence base to inform the reference range for this indicator.

The evidence in the field has focussed on identifying *inappropriate* polypharmacy. A benchmark for polypharmacy has been documented in the literature, though the method of calculating the benchmark is not compatible with the quality indicator data maintained by DH.[5]

Participants at the PSRACS quality workshop nominated a very challenging reference range for the 9+ medicines indicator as seen above. This reference range is not only narrow, but is challenging when considered in conjunction with the statistical analysis. However, due to the lack of available evidence with regards to this indicator and the willingness of the sector to embrace challenging reference ranges, Campbell Research

[5] See: Rantz, M.J., G. F. Petroski, and et al., *Setting Thresholds for Quality Indicators Derived from MDS Data for Nursing Home Quality Improvement Reports: An Update*. Journal on Quality Improvement, 2000b. 26(2): p. 101–10. The method employed by Rantz is based in the mental health sector and uses the resident as the denominator for the indicator. The quality indicator set maintained by DH uses bed days.

& Consulting recommends that this reference range is considered for the indicator based on the rates recommended in the PSRACS quality workshop.

It is important to note that the purpose of this indicator is to provide a trigger point for services to investigate the prescription of nine or more medicines; however it does not speak to the necessity of these medicines. For many residents, more than nine medicines are appropriate and required.

8. Reference ranges for unplanned weight loss

There are two indicators for unplanned weight loss: unplanned significant weight loss (three kilograms over the quarter), and unplanned consecutive weight loss (repeated weight loss of any amount for each of the three months of the quarter).

8.1 Unplanned significant weight loss

Unplanned significant weight loss is defined as weight loss equal to or greater than three kilograms over a three-month period.

Reference range

Limit rate:	1.0 incidents of unplanned significant weight loss per 1,000 occupied bed days
Target rate:	0.2 incidents of unplanned significant weight loss per 1,000 occupied bed days

Source of evidence underlying the calculation of the reference range

Campbell Research & Consulting recommended a reference range based on recommendations by participants at the PSRACS quality workshop.

Experts at the roundtable and participants at the PSRACS quality workshop nominated similar target and limit rates for the unplanned significant weight loss indicator. However, participants at the PSRACS quality workshop nominated slightly more challenging targets for the unplanned significant weight loss indicator compared with the targets nominated by the expert group. Participants at the PSRACS quality workshop also nominated a lower limit rate than the expert roundtable.

Participants at the PSRACS quality workshop nominated a target rate of 0.2 and a limit rate of 1.0. The expert roundtable recommended a target rate of 0.4 and a limit rate of 1.2.

Campbell Research & Consulting recommends the more challenging targets and limits set by the PSRACS workshop be adopted as the reference range for weight loss.

8.2 Unplanned consecutive weight loss

Unplanned weight loss is weight loss where there is no written strategy and ongoing record relating to planned weight loss for the individual. Consecutive weight loss reflects any weight loss that is consistent over a three-month period.

Reference range

Limit rate:	1.0 unplanned consecutive weight loss per 1,000 occupied bed days
Target rate:	Zero unplanned consecutive weight loss per 1,000 occupied bed days

Source of evidence underlying the calculation of the reference range

Campbell Research & Consulting recommended a reference range based on recommendations by participants at the PSRACS quality workshop.

Like the unplanned significant weight loss indicator, experts at the expert roundtable and participants at the PSRACS quality workshop nominated similar target and limit rates for the unplanned consecutive weight loss indicator. Again, participants at the PSRACS quality workshop nominated slightly more challenging targets for the unplanned consecutive weight loss indicator compared to the targets nominated by the expert roundtable. Participants at the PSRACS quality workshop also nominated a lower limit rate than the expert roundtable.

Participants at the PSRACS quality workshop nominated a target rate of 0.2 and a limit rate of 1.0. The expert roundtable recommended a target rate of zero and a limit rate of 1.8.

Given these very similar target and upper limit rates, Campbell Research & Consulting recommends that the target rate is rounded to zero and the more challenging upper limit rate set by the PSRACS workshop of 1.0 is adopted.

9. Future reporting

The reference ranges emphasise the purpose of the aged care quality indicators as 'indicators' only. That is, they do not purport to measure every minutiae of every aspect of care. The purpose of the indicators it to provide a signal that quality processes should be looked at and the review should be undertaken with a broad vision.

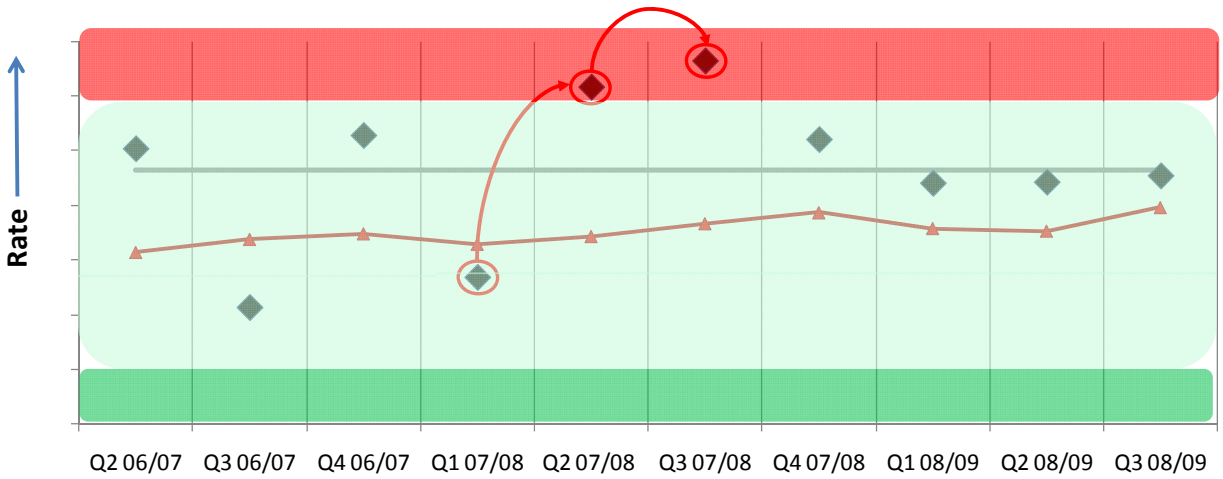
Indicator results outside the reference ranges do not necessarily mean that the quality of the service provided is poor. Quality is made up of more than the eleven indicators. However, the eleven indicators in the context of the reference ranges provide one tool that may ***indicate*** that something is happening which may require review. Such a review then calls into action an appropriate response.

9.1 Reference ranges and reporting rates in quality monitoring charts (QMCs)

Campbell Research & Consulting suggest that QMCs are used to present quality indicator data for each PSRACS. The QMCs provide a simple representation of rates and reference range for each indicator (noting that the detail will always be accessible to enable more detailed analysis).

The QMC serves as a visual aide to detect trends for an individual organisation or service. An example of a QMC is provided in Figure 7. This chart is based on example data for a single PSRACS. These charts provide the history of performance for the PSRACS on an indicator, changes over time and trigger points or action by the quality system.

Figure 7: Example QMC



The QMCs are based on process control charts that are commonly used in presenting performance indicators for health systems and organisations.[6] QMCs were tested with a range of stakeholders (participants at the PSRACS quality workshop, content experts, managers in the aged care industry). The simple, parsimonious and visual approach to displaying the quality indicator data was well received by the field.

In the example provided (Figure 7), time is plotted on the horizontal axis at the bottom of the chart. The scale for the rates is plotted on the vertical axis at the left of the chart. Each point in the body of the chart represents a rate for a single quality indicator for a single period. Fluctuation in rates over time is tracked from left to right.

A number of features are built into the QMC that will *indicate* positive or negative trends:

- A reference range of acceptable quality is shaded green
- The target rate is shaded in dark green
- The upper limit rate is shaded in red
- A comparison rate is shown as a red line that changes over time
- The average rate for the service over time is shown as a straight grey line
- Trigger points (circled in red) can act as a prompt for review or action, and they include:
    - Points that are above the upper limit of the reference range
    - Three or more consecutive increases or decreases.

The QMC is designed to present key information in a simple, parsimonious manner that can identify areas for action to improve quality processes and recognition of success in achieving improvement.

The QMC for the PSRACS depicted in Figure 7 shows performance for a service for a single indicator. The chart shows that the measures for the service have been higher than the comparison rate except for two periods. That is, the performance of the service has been below the average performance of other services in the state. In two periods the rates were higher than the limit rate, **indicating** the need for review and possible action.

The use of 'rates per 1,000 occupied bed days' as a measure for the quality indicators is not well understood by many in the sector. In addition, participants at the PSRACS

[6] See for example Victorian Quality Council (2008) *A guide to using data for health care quality improvement* accessed at www.health.vic.gov.au/qualitycouncil and ACHS, *Australasian Clinical Indicator Report: 2001 – 2008 Determining the Potential to Improve Quality of Care*. 2008.

quality workshop demonstrated a limited understanding of how to interpret the specific numeric values of the rates for their service.

The QMC does not necessarily need to include reference to 'rates', nor display specific values for each rate. The QMC relies on a visual representation of the rate for the PSRACS in relation to the reference range.

It is noted that the QMCs do not necessarily provide statistically significant differences. Owing to the very small sample sizes, statistical significance is unlikely to be detected. While the indicators are used to drive quality processes, this limitation is considered acceptable. Clearly statistical significance is preferable and future work should continue to derive appropriate measures in this regard.

9.2 Summary

In summary, the project: *Reference Ranges for Aged Care Quality Indicators* delivers a set of reference ranges for the quality indicators used in PSRACS in Victoria.

Campbell Research & Consulting, in alignment with the aims of this project, developed the reference ranges from an evidence base including:

- a review of the recent literature
- analysis of the data collected by health services operating PSRACS and reported to DH
- effective engagement with experts and PSRACS staff .

The reference ranges recommended by Campbell Research & Consulting are presented in Table 1. These reference ranges are based on input from experts in the aged care sector, input from participants at the PSRACS quality workshop (sector representatives including a significant number of senior clinicians) and analysis of reported data from PSRACS for each indicator provided by DH. They identify the lower and upper reference points for each indicator.

A 'zero tolerance' reference range indicates that *any* incidence or prevalence of a particular event (for example restraint of residents) may warrant review and appropriate response.

The reference ranges will provide realistic goals against which PSRACS can monitor and improve care and services time.