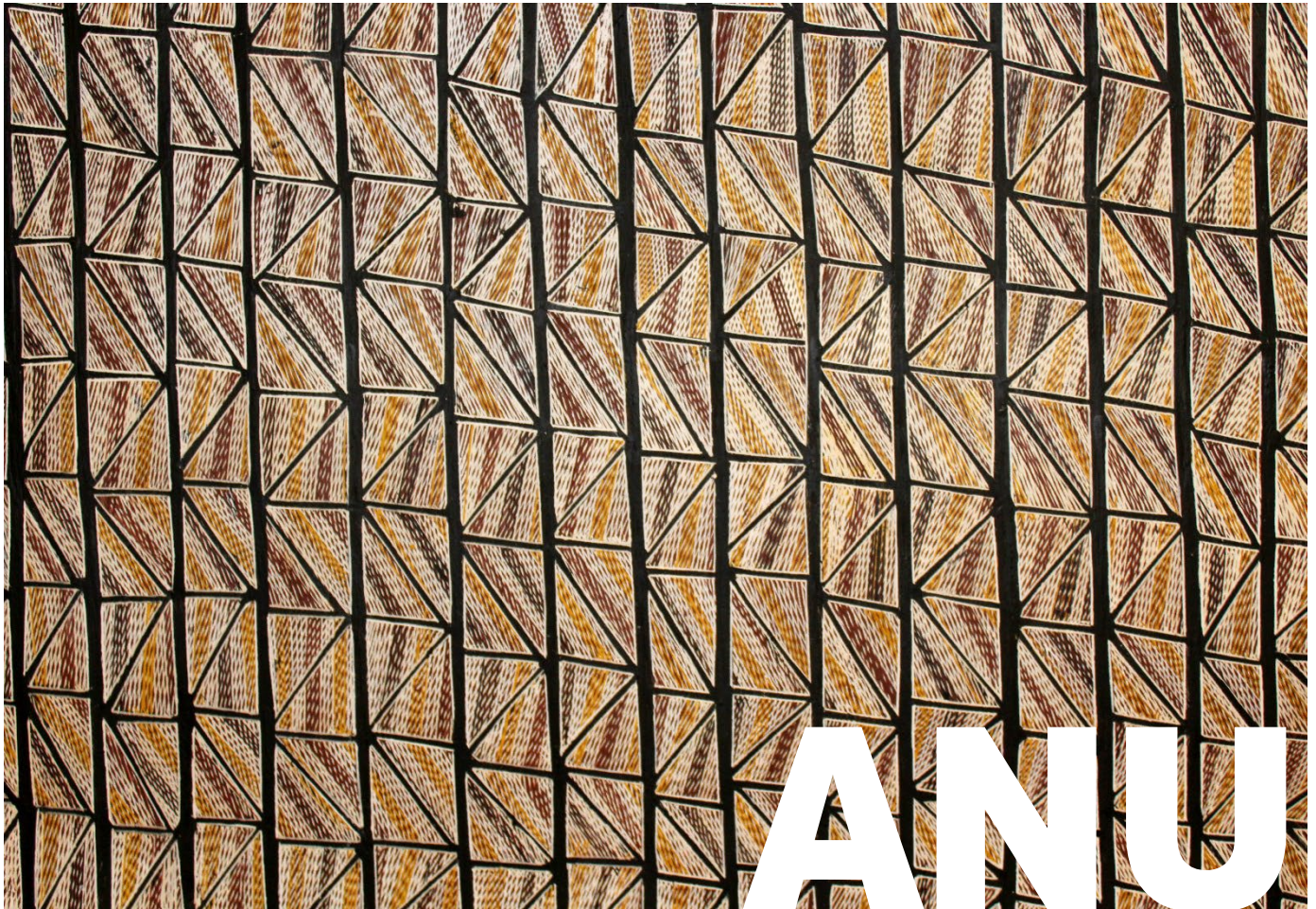




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A REVIEW OF METHODS FOR ASSESSING
PROGRESS TOWARDS CLOSING THE GAP:
FINAL REPORT

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Centre for
Indigenous Policy
Research,
POLIS: The Centre for
Social Policy Research

CIPR COMMISSIONED REPORT NO. 9/2024

Series note

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A review of methods for assessing progress towards Closing the Gap: Final Report

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Abstract

This report describes a review of the methods used by the Productivity Commission to assess progress towards targets under the National Agreement on Closing the Gap. The primary objectives of the study were to evaluate the current methodology used to track progress towards national targets, develop a framework for assessing the contributions of states and territories, and test the revised method and proposed approach using existing data.

A significant finding of the report concerns the shortcomings in data used for assessing progress. These limitations relate to both the efficacy of the data for monitoring progress, as well as the cultural suitability of the data. The study highlights issues such as substantial data gaps, infrequent data collection and delayed reporting, which lead to outdated information being published, hampering effective monitoring and undermining accountability. Moreover, inconsistencies in data sources lead to substantial revisions in observed data, affecting the reliability of progress assessments.

In addition to these key findings, the report suggests various improvements to the methodology of assessing progress, particularly regarding the confidence in these assessments. While these are important, they are considered secondary to the issues with data identified.

Lastly, the report presents four options for assessing the adequacy of state and territory contributions to meeting national targets. We recommend a specific method which we believe is both most effective and most closely aligned with the principles of the National Agreement on Closing the Gap. This recommendation comes after assessing the performance of all four proposed options on jurisdictional data.

Acknowledgments

The authors thank the Productivity Commission for their assistance, and for their request to undertake this important piece of research, and Hilary Bek for her assistance with copyediting.

Acronyms

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AEDC	Australian Early Development Census
AIATSIS	Australian Institute of Aboriginal and Torres Strait Islander Studies
AIHW	Australian Institute of Health and Welfare
ANU	Australian National University
ATSIC	Aboriginal and Torres Strait Islander Commission
CAEPR	Centre for Aboriginal Economic Policy Research
CAGR	compound annual growth rate
CHINS	Community Housing and Infrastructure Needs Survey
CIPR	Centre for Indigenous Policy Research
COAG	Council of Australian Governments
CSRM	Centre for Social Research and Methods
ERP	estimated resident population
IBNOT	improving but not on track (Table 9)
LR	Likelihood Ratio (test)
NATSIHS	National Aboriginal and Torres Strait Islander Health Survey
NILS	National Indigenous Languages Survey
NIRA	National Indigenous Reform Agreement
NPDC	National Perinatal Data Collection
OLS	ordinary least-squares
PLIDA	Person Level Integrated Data Asset
PWG	Partnership Working Group
UNDRIP	<i>United Nations Declaration on the Rights of Indigenous Peoples</i>
YBFS	Year Before Full-time Schooling

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Executive Summary

The Centre for Indigenous Policy Research was commissioned by the Productivity Commission to conduct a thorough examination of the methods used to assess progress towards the targets established under the National Agreement on Closing the Gap. The aims of this examination were to:

1. evaluate the effectiveness and robustness of the current methodology, identifying areas for improvement, and proposing revisions where necessary.
2. develop a comprehensive framework for determining adequate contributions of individual states and territories required achieve the national targets.

Under articles 88 and 89 of the National Agreement, the Productivity Commission is tasked with 'reporting on targets' to 'show progress to close the gap'. The purpose of this public monitoring is to 'help inform whether parties are on track to meet the targets'. In reporting on progress, the Productivity Commission publishes statistical assessments of whether targets are 'on track' to be met at the national level. This is crucial to the 'independent oversight and accountability of progress' of the National Agreement (article 115), with parties committed to 'undertaking actions if a target is not on track to be achieved' (article 91).

Findings: Data issues are key

We found that the data used to monitor progress are not fit for purpose for many of socio-economic targets in the National Agreement. Specifically:

- Many targets and/or data collection methods are not culturally relevant or culturally safe.
- Data for several targets are not updated frequently, meaning there is no accountability during for periods of years (article 115). Accordingly, actions to get progress back on track will not be triggered as per article 91.
- Certain targets are unmeasurable due to a lack of systematic data collection, meaning progress cannot be monitored and actions to get progress back on track will not be triggered.
- The Dashboard may report impossible outcomes. For example, the Dashboard currently reports that '101.8% of Aboriginal and Torres Strait Islander children in the Year Before Fulltime Schooling (YBFS) age cohort were enrolled in a preschool program'.
- Data are often not reported at regional and local geographical scales or among policy relevant subgroups which are useful to Indigenous communities.

Required action

If the agreement is to provide real accountability, these data issues need to be urgently addressed, as outlined in Recommendations 1, 2, 4, 5, 6, 7, and 8. The data issues are much more significant than the issues identified with the statistical method used for assessing progress. However there is still room for the statistical method to improve:

- To meet best practice principles, the assessment of progress should be undertaken by a new Bureau of Indigenous Data (Recommendation 3).
- There is a serious disconnect between government policies and the Productivity Commission's method for measuring that progress. All jurisdictions should include in their implementation plans a clear, quantified connection between how and when their actions will contribute towards meeting the targets. This would allow for a more direct form of monitoring that can be used to hold parties to account for the success or failure of their policies in meeting the targets.
- There is often so little data available for a target that the assumptions of the current statistical method for measuring progress are not met. Improving data quality and collection frequency would mitigate this problem. However, tweaking the current method would go some way to improving this limitation (Recommendation 9).
- Our proposed alternative method presents a substantive improvement over the current method by making fewer assumptions about the data and better communicating uncertainty around whether current progress is

likely to result in the targets being met (Recommendation 10). Improving shortcomings with data should be prioritised, however.

- There is considerable room for improvement in how progress is communicated to the public via the Dashboard. To enhance accessibility and accountability, there should be greater emphasis on the likelihood that a target will be met in the target year. There should accordingly be a reduction in the visual complexity of the Dashboard landing page (Recommendation 11).
- We provide several options for calculating adequate state and territory contributions towards meeting the national targets and describe a specific method that we think is most suitable for this goal (Recommendation 12).

Recommendations

Recommendation 1: That a process for auditing the cultural relevance and safety of target data and data collection processes be undertaken as part of the first Independent Aboriginal and Torres Strait Islander-led review of the National Agreement on Closing the Gap.

Recommendation 2: That the Partnership Working Group consider the suitability of the current disaggregations for representing the diversity of Indigenous circumstances. That the Partnership Working Group consider requesting that the Productivity Commission assess the adequacy of progress towards meeting targets among different disaggregated Indigenous population groups.

Recommendation 3: That Parties to the National Agreement on Closing the Gap commit to establishing a Bureau of Indigenous Data with responsibilities including the work of assessing progress towards meeting socioeconomic targets under the National Agreement, including reporting and data governance.

Recommendation 4: That parties to the National Agreement leverage existing data sources to monitor Targets 3, 10, 11, and 12 using via the Person Level Integrated Data Asset to avoid the biased and at times mathematically impossible observations that result from the numerator–denominator mismatch.

Recommendation 5: That the ABS consider producing estimates of Indigenous life expectancy more frequently than every five years.

Recommendation 6: That parties to the National Agreement leverage existing data sources to monitor Targets 5, 6, 7, 8 and 9A annually using the Person Level Integrated Data Asset to increase the currency of assessments of progress

Recommendation 7: That the Australian Government resource data collection for Target 4 at least biennially.

Recommendation 8: That the Australian Government urgently address the collection of data for Targets 9B, 13, 16 and 17, including the provision of appropriate resourcing.

Recommendation 9: That, if the current method is retained, the Productivity Commission change the statistical test used to determine if a target is changing over time.

Recommendation 10: That the Productivity Commission consider adopting the alternative approach to assessing progress towards meeting targets that can better represent the uncertainty of the assessment and that can take advantage of additional information about variation in the measure.

Recommendation 11: That the Productivity Commission consider a visual redesign of the Dashboard and Annual Data Compilation Report be undertaken. If the alternative method is used, then focus on the probability of a target being met in the target year. If the current method is retained: gives a greater visual prominence to the confidence levels of the assessment, and to the currency of the assessment; represents assessments visually with greater consistency; and includes both the assessment and confidence in a single visual icon.

Recommendation 12: That the ‘equal relative improvement with constrained outliers’ option is used to devise state and territory contributions and trajectories, weighting populations according to official 2021 population estimates.

Preface

Under the National Agreement on Closing the Gap, signed by all Australian governments and the Coalition of Peaks in July 2020, the Productivity Commission has certain obligations for monitoring progress towards the Closing the Gap targets. These obligations include making and publishing assessments of progress against these targets:

- at the national level, to inform Parties to the Agreement on whether they are on track to meet the targets (clause 88)
- at the state and territory level, to monitor each jurisdiction's progress and their contribution to achieving the national targets (clause 89).

Publishing assessments of whether targets are 'on track' requires a method for assessing whether progress to date is consistent with the target being met in some future target year. Accordingly, the Productivity Commission has developed – and then further refined – a method for making this assessment, working in consultation with the Joint Council on Closing the Gap through the Partnership Working Group (PWG).

Following a competitive tendering process, in July 2023 a team from the Centre for Aboriginal Economic Policy Research (CAEPR) and the Centre for Social Research and Methods (CSRM) at the Australian National University (ANU) — now the Centre for Indigenous Policy Research and POLIS: The Centre for Social Policy Research — was commissioned to provide a report to the Productivity Commission on the suitability of this method, and on options for monitoring each jurisdiction's contribution to achieving the Closing the Gap targets. The terms of reference for the ANU were to:

1. Review/assess the current method against key criteria to identify if any revisions are needed.
2. Develop an approach to measure the contribution of the states and territories to meeting the national targets.
3. Use existing data for the targets to test any identified revisions to the current method and the proposed approach to measure state and territory contributions to meeting the national target.
4. Document the outcomes of work under elements 1 to 3 in a report with findings and recommendations and respond to any feedback on this documentation.

The ANU team provided a draft report was provided to the Productivity Commission on 14 December 2023. That draft was circulated for feedback from the Joint Council on Closing the Gap through the PWG and Data and Reporting Working Group, as well as from the Productivity Commission and the Australian Bureau of Statistics (ABS). Written feedback was received by the ANU team on 16 May 2024. This included comments by the Productivity Commission; the Coalition of Peaks secretariat; the Secretariat of the National Aboriginal and Islander Child Care; the ABS; the National Indigenous Australians Agency; the Victorian Department of Premier and Cabinet; the Queensland Government Statistician's Office; the Australian Institute of Health and Welfare; and the West Australian Department of the Premier and Cabinet.

In all, over 110 comments were made on the draft report. The ANU team considered comments and has revised this report accordingly.

Beyond commissioning the research, while we are grateful to the Productivity Commission for helpfully clarifying the scope of research, providing their target data, and for answering our many questions, the Productivity Commission has had no role in our deliberations against the study's terms of reference, in our analysis, in the interpretation of data, or in the writing of the report. The decision to publish this report on the

Productivity Commission website was made by the Productivity Commission prior to reviewing its content. The views expressed in this report are those of its authors, not those of the Productivity Commission, or the Joint Council on Closing the Gap or any of its members. Any errors or omissions are those of the authors.

Conflicts of interest

Francis Markham and Yonatan Dinku were part of the team commissioned by Commonwealth Department of Communications and the Arts in 2019 to conduct research for the third National Indigenous Languages Report (Department of Infrastructure, Transport, Regional Development and Communications et al., 2020; Dinku et al., 2020), which they co-authored. This report included the results of the third National Indigenous Languages Survey (NILS), a collection which is used to measure progress towards Target 16A and 16B. They were not part of the team which conducted the third NILS itself. Nor have they sought or received funding to conduct the fourth NILS.

None of the other authors have any conflicts of interest to declare, whether real or perceived.

Chapter 1: Introduction

Closing the Gap

Background to the development of targets for ‘Closing the Gap’

The 2020 National Agreement on Closing the Gap, a pivotal milestone in Australian Indigenous policy, emerged as a response to the need for a comprehensive re-thinking of the Closing the Gap framework, originally instituted in 2008 and for the active engagement of representatives of Aboriginal and Torres Strait Islander people in this policy. The original Closing the Gap framework was formalised through the National Indigenous Reform Agreement (NIRA), which was agreed by the Council of Australian Governments (COAG) in November 2008 (COAG, 2008). The NIRA laid the foundation for the Closing the Gap policy framework, a significant Indigenous policy initiative from 2008 to 2018. While the initial NIRA was between the Australian, state and territory governments, the 2020 National Agreement on Closing the Gap included local government, the Coalition of Peaks – national and state and territory non-government Aboriginal and Torres Strait Islander Peak bodies, and certain independent statutory authorities.

The original National Indigenous Reform Agreement (NIRA) (2008–2020)

The original NIRA codified the six Closing the Gap targets relating to life expectancy; child mortality rates; universal remote preschool access; reading, writing and numeracy; Year 12 attainment; and employment (COAG, 2009a). It also established a series of National Partnership Agreements, significantly augmenting funding for Indigenous programs. This investment exceeded \$16 billion over 10 years, primarily sourced from the Commonwealth, while program delivery largely rested with the states and territories. A notable innovation introduced by the NIRA was the provision of extended multi-year funding commitments, with some programs allocated a decade of funding, underpinned by a COAG-endorsed national agreement.

In the pursuit of accountability, the Prime Minister was required to present an annual report on the progress made towards the Closing the Gap targets. In addition, the NIRA – described as a ‘living document’ (COAG, 2008, p. 8) – was updated over time to specify indicative straight-line trajectories between the baseline and the target, one for each target. A version of the agreement finalised in February 2009 noted that changes to outcomes were unlikely to follow the linear trajectories that were to be negotiated in 2009 (COAG, 2009a).

In July of that year, COAG updated the NIRA with more details. Every year, the COAG Reform Council would assess if outcome indicators had changed in a statistically significant way and ‘using the trajectories, assess whether the pace of change, if maintained, is sufficient to meet the target’ (COAG, 2009b, p. 15). The updated NIRA included a set of agreed indication national linear trajectories, one for each target. These trajectories were calculated to provide an ‘understanding of the likely and required rates of progress in order to achieve the targets in the timeframes set by COAG’ (COAG, 2009b, p. 15). A set of ‘trajectories for each jurisdiction where data are available’ were promised for a future agreement (COAG, 2009b, p. 15). While a set of state and territory trajectories were provided to the COAG Reform Council in December 2010 (Steering Committee for the Review of Government Service Provision, 2011, p. 42), the Prime Minister’s Closing the Gap Report in 2018 was the first to include a ‘scorecard’-like report of whether state and territories were ‘on track’ to meet each target under the agreement (Department of the Prime Minister and Cabinet, 2018). These trajectories were not made public in a published version of the NIRA.¹

¹ In May 2020, just prior to the abolition of COAG and the publication of the National Agreement on Closing the Gap, the version of NIRA published on the website of COAG’s Council on Federal Financial Relations had not been amended since September 2012.

These targets and trajectories, originally formulated in recognition of the gradual nature of change, were themselves subject to change and encountered mixed success. New targets were added, with COAG agreeing in May 2014 to a new target to 'close the gap between Indigenous and non-Indigenous school attendance within five years' by 2018 (COAG, 2014). The earliest target to expire – focused on universal remote access to preschool – was unmet in the target year of 2013. COAG reformulated the target in December 2015 to codify an ambition that '95 per cent enrolment for all Indigenous four year olds by 2025' (COAG, 2015, p. 2). The final Prime Minister's Closing the Gap Report published under the NIRA in 2020 reported that only two out of seven targets had been met or were on track for achievement (National Indigenous Australians Agency, 2020).

In December 2016, with four out of the seven targets due to expire in 2018 and with few targets on track to be met, COAG initiated a process 'to work together and with Indigenous leaders, organisations and communities to refresh this [Closing the Gap] agenda' (COAG, 2016). The Australian Government initially embraced a discourse emphasising strengths-based narratives in Indigenous policy, seeking to move away from the framing of Indigenous citizens as inherently disadvantaged (COAG, 2017). However, by early 2018, it became apparent that this approach alone would not suffice. Consequently, the government pivoted towards a stronger emphasis on partnership and collaborative decision-making in the Closing the Gap refresh.

Developing and establishing National Agreement on Closing the Gap (2018 onwards)

In February 2018, a meeting of Indigenous representatives convened by the Commonwealth advocated for an increased role for the Indigenous community in program design and implementation, as well as clarified accountabilities between different levels of government (Special Gathering of prominent Aboriginal and Torres Strait Islanders, 2018). Instead of proceeding as planned in February (COAG, 2018) and endorsing the refreshed Closing the Gap framework prepared through COAG processes for its December 2018 meeting, a decision was made to agree to Indigenous representatives' request that this new Closing the Gap framework be discarded and instead enter into a new formal partnership with Indigenous representatives (COAG, 2018; Paterson et al., 2018). A Partnership Agreement on Closing the Gap was formalised in March 2019 establishing the Joint Council of Australian Governments and Aboriginal and Torres Strait Islander People on Closing the Gap, co-chaired by the Minister for Indigenous Australians and the Chief Executive Officer of the Coalition of Peaks (Coalition of Aboriginal and Torres Strait Islander Peak Organisations & COAG, 2019; Joint Council on Closing the Gap, 2019).

On 27 July 2020, the National Agreement on Closing the Gap (hereafter the 'National Agreement'; Coalition of Aboriginal and Torres Strait Islander Peak Organisations & Australian Governments, 2020) came into effect, formalising the commitment of the Commonwealth, state, and territory governments to work in partnership with Indigenous Australians to address the ongoing disparities faced by Indigenous communities. This agreement represents a pivotal shift towards a more collaborative, community-driven approach to Indigenous policy in Australia.

Compared with NIRA, the new National Agreement contained not only a wider array of socioeconomic targets, but also four priority reforms. The parties agreed that governments need to not just increase their efforts if targets were to be met. They also need to change their structures and processes significantly. Consequently, the parties established four priority reforms to change how governments collaborate with Aboriginal and Torres Strait Islander people, organisations and communities. These reforms aim to transform the structures and systems that impact life outcomes, focusing on making these changes to improve results. The priority reforms are:

- Priority Reform 1: Formal partnerships and shared decision-making
- Priority Reform 2: Building the community-controlled sector
- Priority Reform 3: Transforming government organisations
- Priority Reform 4: Shared access to data and information at a regional level.

Reporting and measuring progress towards targets in the 2020 National Agreement on Closing the Gap

The latest revision to the National Agreement on Closing the Gap contains specific targets relating to 17 socioeconomic outcome areas. Targets, according to Article 82, provide ‘a specific, measurable goal that Parties are accountable to meet over the next decade’. A total of 19 targets across 17 socioeconomic areas are listed in Table B of the National Agreement. For each outcome area, Table B specifies a number of requirements, including but not limited to:

- a target measure (e.g. ‘the proportion of Aboriginal and Torres Strait Islander babies with a healthy birthweight’)
- a target value (e.g. ‘increase... to 91 per cent’), and
- a target year (e.g. ‘by 2031’).

Further specifications of these targets such as the baseline year against which progress is to be tracked, the trajectories required for national progress to be considered ‘on track’, and the data sources used to assess progress, are not included in the National Agreement itself. Instead, these have been agreed by the Joint Council on Closing the Gap operating through the Partnership Working Group (PWG).

The targets in the current agreement are national in terms of their specification, although measurement also takes place for states and territories where possible.² State and territory governments have committed to taking action if targets are not on track to be met. However, there is a recognition in the National Agreement that progress towards meeting targets will not look the same in each state and territory. Specifically, Article 83 states that ‘Government Parties agree that targets are designed to be met at a national level, while recognising that starting points, past trends and local circumstances differ so jurisdictional outcomes may vary.’

The Productivity Commission has a specific role in reporting and measuring progress on targets. Articles 88 and 89 commit the Productivity Commission to monitoring progress towards via an online Dashboard. Specifically:

88. The reporting on targets will show progress to close the gap, relative to non-Indigenous Australians. National trajectories for each numeric target will be published on the Closing the Gap website on commencement of this Agreement and subsequently on the Productivity Commission Dashboard following its development. These will show the expected rate of progress and help inform whether parties are on track to meet the targets.

89. Available baseline data for each state and territory will be published on the Closing the Gap website on commencement of this Agreement and subsequently on the Productivity Commission Dashboard following its development to enable monitoring of each jurisdiction’s progress and contribution towards achievement of targets under this Agreement. The Productivity Commission will also publish baseline data for any new target agreed under this Agreement.

² For some measures, such as life expectancy, reliable estimates for some jurisdictions with smaller Indigenous populations are not currently available.

It is noted that reporting the dashboard is limited to those targets and indicators for which there is available data.

Project task

This report has been written to assist the Productivity Commission to meet its obligations under the National Agreement. Specifically, this report describes the result of an exercise conducted by a team at the Australian National University to:

1. Review/assess the current method against key criteria to identify if any revisions are needed.
2. Develop an approach to measure the contribution of the states and territories to meeting the national targets.
3. Use existing data for the targets to test any identified revisions to the current method and the proposed approach to measure state and territory contributions to meeting the national target.

In undertaking the first task, the Productivity Commission supplied detailed criteria which are listed in box below.

Key criteria for assessment of method

4. The method is culturally relevant and safe
 - a) Does the method adequately assess progress against the targets in a manner that takes account of, promotes, and does not diminish the cultures of Aboriginal and Torres Strait Islander people (clause 21 of the National Agreement)? This criterion is included as a safeguard to identify any issues with the method in terms of its cultural relevance or safety (there may be none).
5. The method is fit for purpose and technically robust
 - a) Is the current method fit for purpose and technically robust?
 - i. Is the overall approach to assessing progress at the national level fit for purpose – that is, according to four categories (worsening, no change, improvement not on track, improvement on track).
 - ii. Is the current use of regression analysis to show trends in the outcomes (and account for fluctuations in the data year on year) the right approach, especially given the small number of current and potential data points (maximum up to 10 data points by 2031)?
 - iii. Is the current approach to determine no change versus change the right approach and technically robust – that is, using the Likelihood Ratio (LR) test and the associated p -value benchmarks?
 - iv. Is the current approach to assign a level of confidence to the assessment once there are five or more data points the right approach, especially given some targets will not have five data points over the life of the Agreement. And is the method to determine the level of confidence in the assessment when there are five or more data points (high or low) robust?
 - (1) for all state and territory and the national no change or worsening assessments, the current approach is to use a likelihood ratio test and associated p -value benchmarks
 - (2) for national assessments where there is an improvement (on track or not on track), the current approach is to use the

confidence intervals (CIs) around the regression line at the target year

- b) Should a different approach be used where the data source for a target has variability bands or confidence intervals (for example, for some annual administrative data and survey data), to those targets where these bands or intervals are not available?
6. The method is understood and meaningful to a broad audience, so the targets can be used to hold governments to account for progress
- a) Are there other approaches to using regression analysis, likelihood ratios and associated *p*-value benchmarks and confidence intervals (as outlined in (a)i–iii), that would be understood by a broader audience? If yes, what are the trade-offs in using a different method?

Underlying the method: Data and policy context

The core focus of this project was to report on the technical aspects of the current methodology for assessing progress. In our work to complete this task, we independently identified additional central issues with respect to the methodology that we wish to highlight. While these are arguably beyond the scope of the project, we believe that they are important as they are crucial to the capacity of the Productivity Commission to report on progress, and the cultural relevance and safety of that reporting. These are:

- the capacity of the available data to enable this reporting to be undertaken in a meaningful way
- the cultural relevance and safety of the data that are being reported on, and
- an inadequate policy framework specifying how targets are to be achieved.

Our perspective is that while the Productivity Commission has pursued a path of seeking to develop a high-quality technical approach to the assessment of progress, this at best only addresses one small aspect of measuring progress. Even the best statistical tools can provide little insight when suitable data are lacking. Much of the challenge faced by the Productivity Commission in their work stems from the challenges created by the other three dimensions. Accordingly, this report also includes an appraisal of the three issues identified above.

Structure of this report

This report is structured into sections focusing on different themes.

- Chapter 2 summarises the current approach, including the targets and the Productivity Commission's method for assessing progress.
- Chapter 3 reviews the existing method assessing progress using both a culturally-informed approach and a statistical and policy focused approach, including examining the capacity of the underlying data sources and indicators can sustain the measurement of progress towards achieving the targets.
- Chapter 4 explores an alternative statistical method for assessing progress towards targets.

- Chapter 5 provides four options for assessing the adequacy of state and territory contributions to meeting the national targets, referring to Appendix 1 and 3 where existing data for the targets are used to test the options for measuring state and territory contributions
- Chapter 6 summarises the findings and makes recommendations.

Chapter 2: The current method for assessing change

This section describes on the current method used by the Productivity Commission to assess whether national socioeconomic targets are on track to be met by the target year, as per Article 88 of the National Agreement. Before doing so, this section summarises the 19 targets across 17 socioeconomic outcome areas, and briefly describes the data used to assess progress towards these targets.

The Closing the Gap targets and the data sources used for their measurement

The 19 targets across 17 socioeconomic outcome areas, along with their baseline and target values and years, are listed in Table 1. Although the National Agreement is framed in terms of closing gaps, all but two of the targets are specified in terms of targets for change within the Indigenous population without reference to the non-Indigenous population. This makes the task of monitoring progress easier, because in most cases the targets for the Indigenous population will not change over the agreement period as the relevant measure in the non-Indigenous population changes. At the same time, depending upon the specific target values and changes in outcomes for non-Indigenous Australians, this approach may not necessarily lead to the gap being closed. The exceptions to this are Target 1 (life expectancy) and Target 17 (digital inclusion), both of which are specified in terms of Indigenous and non-Indigenous parity.

While most of the targets have agreed baseline and target values and years, this is not uniformly true. In the case of Target 14 (suicide), the National Agreement itself does not specify an unambiguous quantitative value in the target year, instead requiring a 'significant and sustained' reduction in suicide rates. The same is true for Target 16A and 16B (language use), which respectively require a 'sustained increase' in the number of languages being spoken, and spoken strongly. In other cases, this is due to a lack of suitable available data. For example, there is currently no data collection which measures Target 9B (relating to community essential services) and so the baseline value is unknown, and no baseline year has been agreed upon. Similarly, Target 17 (parity in digital inclusion) is currently specified in terms of identical rates of internet access at home for Indigenous and non-Indigenous people. However, because there is currently no dataset that measures home internet access consistently between Indigenous and non-Indigenous people, the current 'gap' is unable to be estimated and no trajectory towards eliminating that gap can be drawn.

The Productivity Commission's method for assessing progress

Article 88 of the National Agreement stipulates that 'national trajectories for each numeric target will be published on the Closing the Gap website on commencement of this Agreement and subsequently on the Productivity Commission Dashboard following its development', for every target where both baseline data and a numerical future target are agreed. Each national trajectory currently charts a straight line between the value measured in the baseline year, and the target agreed to for the target year. If a target indicator consistently improved by the same amount each year so that in the target year, the target was exactly met, then it would precisely follow the national trajectory calculated by the Productivity Commission. If the target indicator improved by a greater amount than required to meet the target, it would exceed its national trajectory over the course of the National Agreement. Conversely, if the target indicator worsened or did not improve sufficiently to meet the target, it would fall short of its national trajectory. The target trajectories are intended to provide markers of whether the average progress since baseline (measured as by a straight-line trend in the direction and speed of change in an indicator) is sufficient to achieve the target should it be continued, assuming that the rate of change in the indicator is consistent between the baseline and target year.

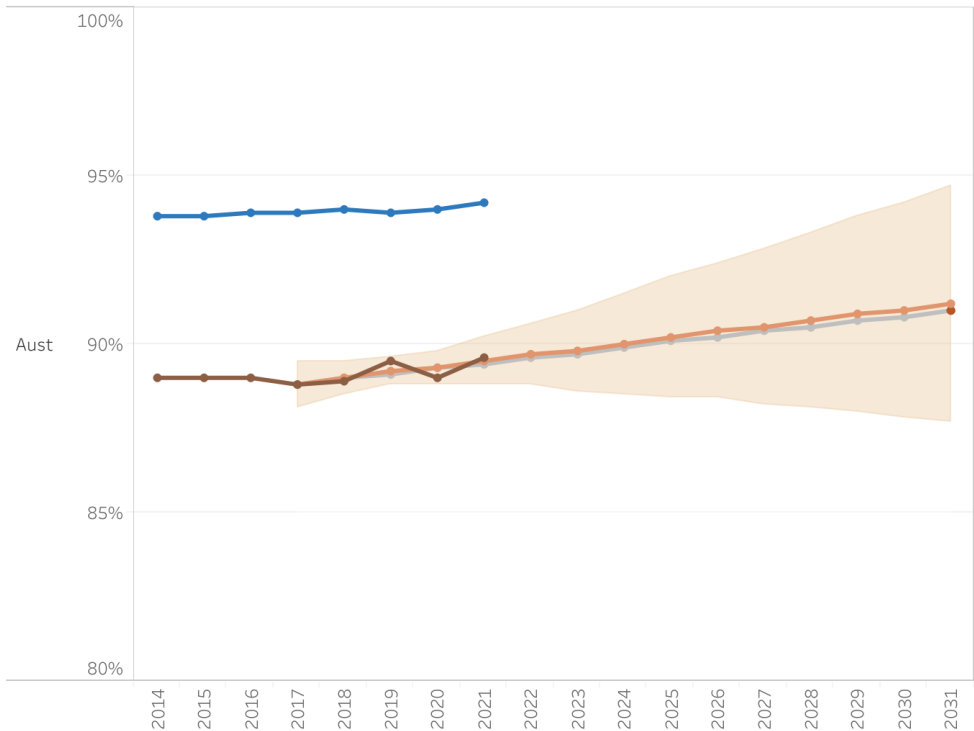
Table 1: The 19 Closing the Gap targets for 17 socioeconomic outcome areas, July 2023

Target	Baseline year	Baseline value	Target year	Target value
1 Close the Gap in life expectancy within a generation, by 2031.	2006	Females: 8.6 yrs Males: 11.4 yrs	2031	0.0 years (both sexes)
2 By 2031, increase the proportion of Aboriginal and Torres Strait Islander babies with a healthy birthweight to 91 per cent.	2017	89.0%	2031	91.0%
3 By 2025, increase the proportion of Aboriginal and Torres Strait Islander children enrolled in Year Before Full-time Schooling (YBFS) early childhood education to 95 per cent.	2016	76.7%	2025	95.0%
4 By 2031, increase the proportion of Aboriginal and Torres Strait Islander children assessed as developmentally on track in all five domains of the Australian Early Development Census (AEDC) to 55 per cent.	2018	35.2%	2031	55.0%
5 By 2031, increase the proportion of Aboriginal and Torres Strait Islander people (age 20–24) attaining Year 12 or equivalent qualification to 96 per cent.	2016	63.2%	2031	96.0%
6 By 2031, increase the proportion of Aboriginal and Torres Strait Islander people aged 25–34 years who have completed a tertiary qualification (Certificate III and above) to 70 per cent.	2016	42.3%	2031	70.0%
7 By 2031, increase the proportion of Aboriginal and Torres Strait Islander youth (15–24 years) who are in employment, education or training to 67 per cent.	2016	57.2%	2031	67.0%
8 By 2031, increase the proportion of Aboriginal and Torres Strait Islander people aged 25–64 who are employed to 62 per cent.	2016	51.0%	2031	62.0%
9A By 2031, increase the proportion of Aboriginal and Torres Strait Islander people living in appropriately sized (not overcrowded) housing to 88 per cent.	2016	78.9%	2031	88.0%
9B By 2031, all Aboriginal and Torres Strait Islander households: i) within discrete Aboriginal or Torres Strait Islander communities receive essential services that meet or exceed the relevant jurisdictional standard ii) in or near to a town receive essential services that meet or exceed the same standard as applies generally within the town (including if the household might be classified for other purposes as a part of a discrete settlement such as a 'town camp' or 'town based reserve').	–	–	2031	100%
10 By 2031, reduce the rate of Aboriginal and Torres Strait Islander adults held in incarceration by at least 15 per cent.	2019	2,142.9 per 100,000	2031	1,821.5 per 100,000
11 By 2031, reduce the rate of Aboriginal and Torres Strait Islander young people (10–17 years) in detention by at least 30 per cent.	2018–19	32.0 per 10,000	2030–31	22.3 per 10,000
12 By 2031, reduce the rate of overrepresentation of Aboriginal and Torres Strait Islander children (0–17 years old) in out-of-home care by 45 per cent.	2019	54.2 per 1,000	2031	29.8 per 1,000
13 By 2031, the rate of all forms of family violence and abuse against Aboriginal and Torres Strait Islander women and children is reduced at least by 50 per cent, as progress towards zero.	2018–19	8.4%	2030–31	4.2%
14 Significant and sustained reduction in suicide of Aboriginal and Torres Strait Islander people towards zero.	2018	25.1 per 100,000	2031	6.3 per 100,000*
15A By 2030, a 15 per cent increase in Australia's land mass subject to Aboriginal and Torres Strait Islander people's legal rights or interests	2020	3.91 million km ²	2030	4.50 million km ²
15B By 2030, a 15 per cent increase in Australia's sea waters subject to Aboriginal and Torres Strait Islander people's legal rights or interests	2020	90,252 km ²	2030	103,790 km ²
16A By 2031, there is a sustained increase in number of Aboriginal and Torres Strait Islander languages being spoken.	2018–19	123	2030–31	> 123
16B By 2031, there is a sustained increase in number of Aboriginal and Torres Strait Islander languages being strongly spoken.	2018–19	14	2030–31	> 14
17 By 2026, Aboriginal and Torres Strait Islander people have equal levels of digital inclusion.	2014–15	–	2026	0% gap

[Table 1] Source: Productivity Commission Closing the Gap Dashboard, data retrieved July 2023.

Note: *Target 14 has no specified Target value in the National Agreement. The Productivity Commission on their Dashboard present a trajectory towards 6.3 per 100,000. They explain that: *A trajectory of a 75 per cent reduction in the suicide rate is presented here. This trajectory was one of four (20 per cent, 25 per cent, 50 per cent and 75 per cent) developed through National Agreement processes and is presented here as it the most ambitious of the target trajectories.*

Figure 1 shows the Productivity Commission’s visualisation of these components for measuring progress, taken the Dashboard for Target 2 (healthy birthweight). The straight grey line from 2017 to 2031 shows the national trajectory from the baseline observation in 2017 to the target in 2031. The maroon line from 2014 to 2021 shows the path of actual observed data over the period during which data are available. The orange line from the baseline 2017 to the target year 2031 shows the linear trend in the observed data since baseline (2017) to the latest observed year (2021) and the extrapolation of that trend until the target year (2031). The shaded light orange band shows the 95% confidence interval around the Productivity Commission’s trendline and its extrapolation to 2031.



Source: Productivity Commission, Closing the Gap dashboard, table CtG2A.1

(a) Targets and trajectories are only available nationally.

- Aboriginal and Torres Strait Islander children, Actual
- Aboriginal and Torres Strait Islander children, Linear regression estimates
- Aboriginal and Torres Strait Islander children, Target
- Aboriginal and Torres Strait Islander children, Trajectory
- Non-Indigenous children, Actual

Figure 1: Example of the Closing the Gap Dashboard visualisation of national target, national trajectory, national observed data (Target 2, healthy birthweight), as of 1 August 2024

Classifying assessments of progress

As well as providing a graphical assessment of progress relative to the national trajectory, the Productivity Commission also make a categorical assessment of progress. For each national target where data are available, progress is categorised into one of four possible states, with each assigned an indicator graphic:

-  improvement and target on track to be met
-  improvement but target not on track to be met
-  no change
-  worsening

This classification is undertaken automatically using a procedure we have summarised in Figure 2 below. First, trends in indicators are estimated using ordinary least-squares (OLS) linear regression, such as:

$$\text{Indicator}_t = \alpha + \beta \text{Year}$$

where Indicator_t is the value of the indicator for any given year (t), α is an intercept (to be estimated), β is an estimate of the trend, and Year is the value of the predictor associated with the estimated β coefficient. This model provides the orange trend line visible in Figure 1.

This ‘full model’ ($\text{Measure}_t = \alpha + \beta \text{Year}$) is then compared against the nested ‘flat line’ model which constrains the β coefficient to 0 ($\text{Measure}_t = \alpha + 0 \text{Year} = \alpha$), using a statistical test known as the Likelihood Ratio (LR) test. The hypothesis being tested here is whether the addition of the β coefficient in the full model provides a better fit to the data over the flat line model, with the LR test taking the form,

$$LR(\chi^2(k-1)) = 2(L_1 - L_0)$$

with L_1 being the log-likelihood of the full model and L_0 being the log-likelihood of the flat line model. The resulting statistic has a $\chi^2(k-1)$ distribution which is used to generate the resulting p -value. There are then several steps that follow that determine how progress toward a target is classified.

If the p -value from the LR test is greater than 0.5, then progress is classified as ‘No change’. If the p -value from the LR test is less than or equal to 0.5 then the Productivity Commission classifies this as a change in the indicator and further categorises the change as follows:

- *Improvement*, when the indicator is moving toward the target value.
- *Worsening*, when the indicator is moving away from the target value.

For assessments at the national level that are improving, the linear regression estimate of a trend line is then used to project what the value of the indicator would be in the target year. At the national level only, classifications of ‘improvement’ are further classified into:

- *Improvement but not on track*, where the p -value of the LR test is less than or equal to 0.5 and the trend is in the right direction but not sufficient to meet the target.
- *Improvement and on track*, where the p -value of the LR test is less than or equal to 0.5 and the trend is in the right direction and would meet or exceed the target.

For assessments of progress at the state and territory level, there are no current targets or trajectories. Accordingly, where the p -value of the LR test is less than or equal to 0.5 and the trend is in the right direction, an assessment of *Improvement* is made without reference to being on or not on track.

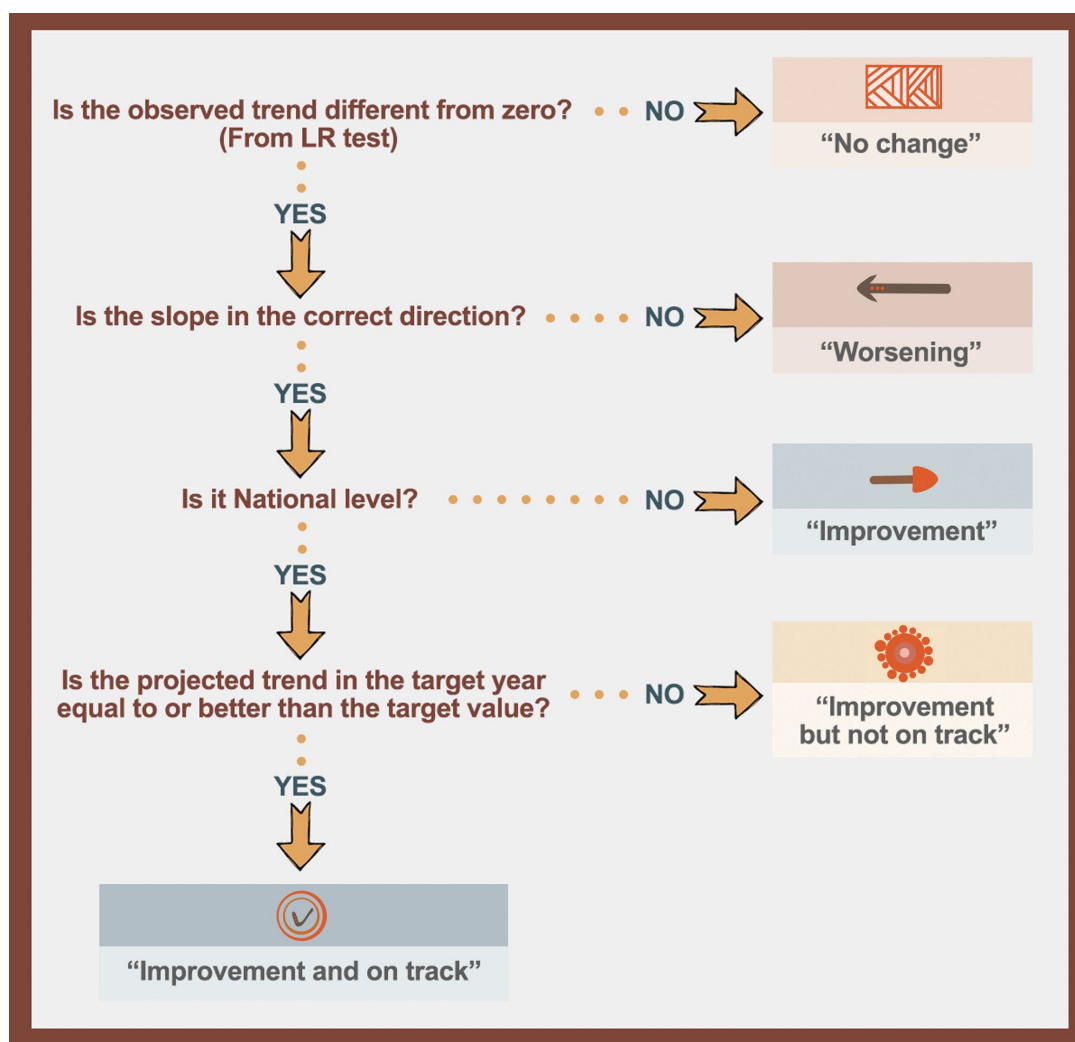


Figure 2: Summary of the Productivity Commission's method for assessing progress

How confidence in the assessment is measured

In addition to the four classifications for outcomes, a level of confidence in the classification given to a measure is provided. When there are fewer than five observations used to generate the classification, 'use with caution' is assigned. Classifications based on five or more observations are assigned either a 'low' or 'high' level of confidence.

For targets reported at the national level with at least five observations, the level of confidence is derived from both the LR test mentioned previously and the linear regression projections to the target year. For national level targets only, 95% confidence bands around the linear regression projection are used to provide a level of confidence in the two 'improvement' classifications. Criteria for assigning a high or low level of confidence for national level targets are:

- No change

- High – LR test p -value ≥ 0.95 .
- Low – LR test p -value greater than 0.5 and less than 0.95.
- Worsening
 - High – LR test p -value less than or equal to 0.05.
 - Low – LR test p -value greater than 0.05 and less than or equal to 0.5.
- Improvement but not on track
 - High – Linear regression trend line projection does not meet or exceed the target value and the 95% confidence band does not include the target value or the baseline value.
 - Low – Linear regression trend line projection does not meet the target value and the 95% confidence band includes either the target value and/or the baseline value.
- Improvement and on track
 - High – Linear regression trend line projection exceeds the target value, and the entire 95% confidence band does not include the target value.
 - Low – Linear regression projection meets or exceeds the target value, and the 95% confidence band includes the target value.

For targets with at least five observations in states and territories, confidence for 'worsening' targets is calculated the same way as above. However, in cases of 'improvement' the confidence is based only on the p -value from the LR test. A p -value greater than 0.05 and less than or equal to 0.5 is assigned 'low confidence' and a p -value less than or equal to 0.05 is assigned 'high confidence'. With small numbers of observations, which is the case for many targets, the LR test performs poorly in distinguishing between change and no change in cases where change is in fact occurring. This requires the Productivity Commission to use a p -value of 0.5 as its threshold for making a 'no change' assessment, rather than the standard threshold of 0.05. The following flow diagram provides an overview of the steps involved in the assessment of the level of progress.

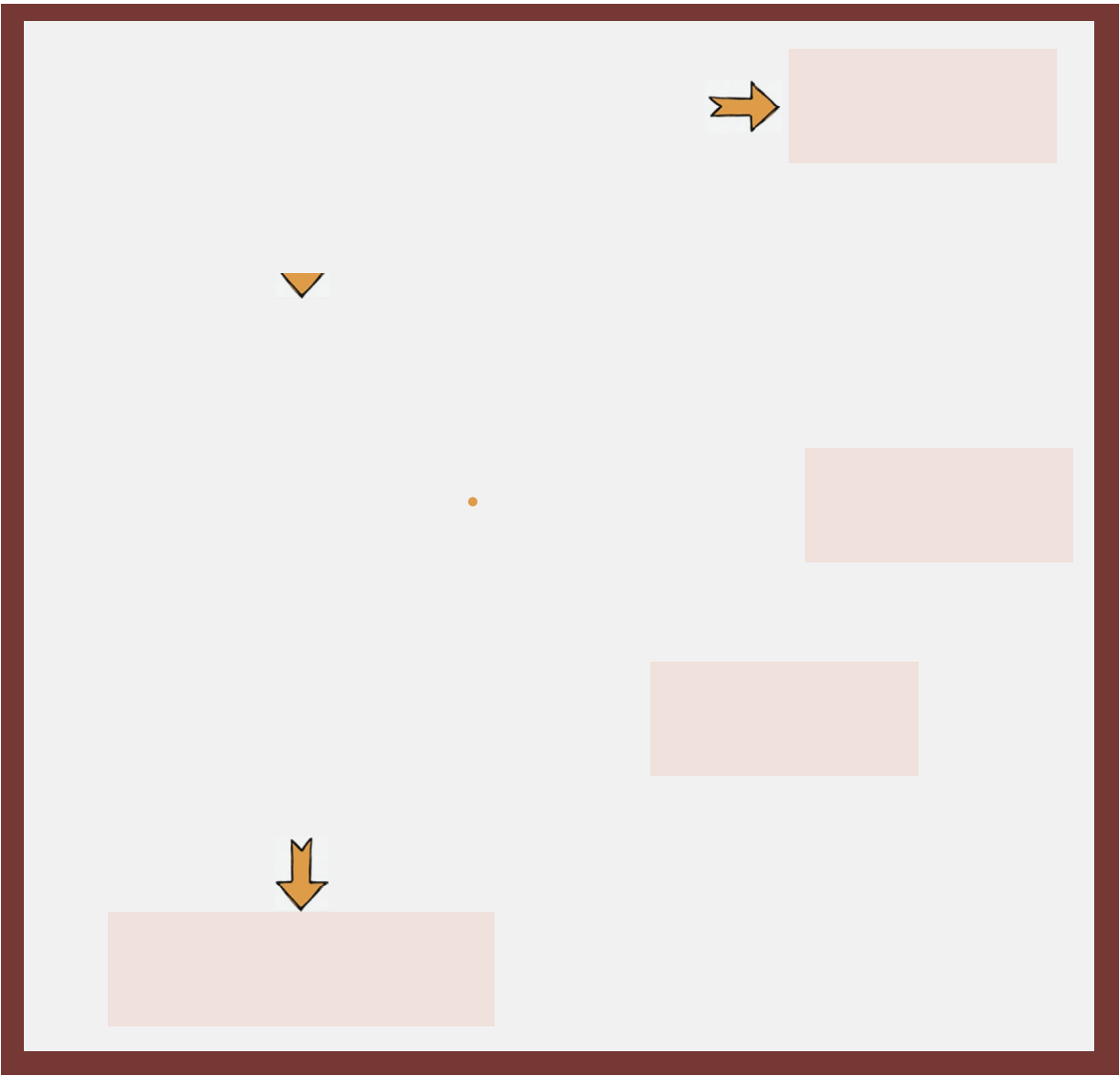


Figure 3: Summary of the Productivity Commission's method for determining confidence in the assessment of progress

Chapter 3: Assessing the current method

In this section we review the Productivity Commission's current method for assessing progress as described in Chapter 2 against key criteria, to identify if any revisions are needed. First, the method is assessed with respect to its cultural relevance and safety. Second, we review whether the method is fit for purpose and technically robust. Third, we assess whether the current method is likely to be understood and meaningful to a broad audience.

A culturally informed assessment

A review of the cultural relevance and safety of the method was undertaken by the Indigenous researchers on the ANU project team, Professor Valerie Cooms and Associate Professor Elfie Shiosaki. Two Indigenous members of staff at the Productivity Commission helped to clarify the scope of the review and answered questions about the target data and method. Additional support was provided by non-Indigenous members of the ANU project team. The task was to assess whether the Productivity Commission's method adequately assesses progress against the targets in a manner that takes account of, promotes, and does not diminish the cultures of Indigenous people.

Cultural relevance and safety of target data

In the process of reviewing the Productivity Commission's method, it became clear that there were significant issues of cultural relevance and safety with some of the target data itself, rather than the method. We note that issues of cultural safety and relevance of the data (rather than the method) were not within the scope of the project. However, we believe that they are fundamental and so wish to bring them to the attention of the PWG and the Productivity Commission. This is because we consider that the technique for assessing change is not culturally relevant and safe if it relies upon data which is not. The culturally-informed assessment raised a variety of substantive issues with a number of the targets and their measures. These issues included target conceptualisation, numerical interpretation, and data collection process.

Most importantly, *mainstream measures designed for the non-Indigenous population are adopted for most of the targets*. The indicators chosen to represent targets give little scope for self-determined Indigenous understandings and measurement of health, wellbeing, education and other concepts. For example, Target 5 commits all governments to 'increase the proportion of Aboriginal and Torres Strait Islander people (age 20–24) attaining Year 12 or equivalent qualification to 96 per cent' by 2031. Concerns were raised about the conceptualisation of this target. Specifically, we are concerned that achieving a target such as this may not be compatible with the cultural priorities and aspirations of some Indigenous individuals and communities. Governments, for the most part, are able to decide what education is delivered through the formal education system, particularly in terms of curriculum and pedagogy. Accordingly, this target only recognises formal schooling, leaving little space for Indigenous self-determination in the realm of education. We are concerned that policies to achieve this target through the formal education system might prevent Indigenous communities from deciding that culturally-relevant education may include education outside the formal education system, such as spending time on Country and undertaking customary activities outside the school system.

A second example we identified relates to the numerical interpretation of Target 12, to 'reduce the rate of overrepresentation of Aboriginal and Torres Strait Islander children (0–17 years old) in out-of-home care by 45 per cent' by 2031. The indicator for this target is the *rate* of Indigenous children aged 0–17 years in out-of-home care, presented as a rate per 1000 children. It may be more appropriate for this indicator to be expressed in absolute terms as the number of Indigenous children aged 0–17 years in out-of-home care, rather than as a rate. This is because the rapid growth in the Indigenous population may put downward pressure on the rate,

even while the number of Indigenous children in out-of-home care continues to grow. The number of Indigenous children in out-of-home care is arguably of greater concern than the rate.

A third example relates to data collection processes for Target 13, that ‘the rate of all forms of family violence and abuse against Aboriginal and Torres Strait Islander women and children is reduced at least by 50 per cent, as progress towards zero’. The data that inform the measurement of progress towards this target are sourced from the ABS National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) 2018–19. This is a face-to-face household survey undertaken by interviewers who primarily interview a single respondent per household in remote areas or up to two adults per household in non-remote areas. The ABS report that ‘interviewers participated in cultural awareness training which outlined how to conduct surveys in Indigenous community areas and described cultural considerations’ (ABS, 2019). We are concerned that a household survey in which a stranger asks questions like ‘In the last 12 months, has anyone, including people you know well, physically hurt or harmed you on purpose?’ and ‘Thinking about the [(most recent)] time that you were physically hurt or harmed on purpose, who did this to you?’ may not be culturally safe, especially if asked in a context where other household members – potentially perpetrators of violence – are present. This is compounded by concerns that interview participants may not have freely consented to participate in the survey, after reportedly being sent letters stating that ‘...if the Australian Statistician directs you in writing to provide information, you are legally obliged to do so. The *Census and Statistics Act 1905* provides for penalties of up to \$210 per day for failure to answer the questions, after such a direction has been made’ (Pearson, 2018). Although this manner of data collection is authorised by legislation, it is likely to be in breach of the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) *Code of Ethics for Aboriginal and Torres Strait Islander Research* (AIATSIS, 2020).

We note that since this report was initially drafted that the Commonwealth Department of Social Services has announced funding for a new First Nations-led data collection on domestic and family violence that can inform the monitoring of progress towards Target 13 (Rishworth, 2023). According to Minister Rishworth, this new First Nations-led data collection will ‘show a national picture for First Nations women and children, whilst being nuanced for community differences and embedding culturally sensitive data collection and reporting practices’ (Rishworth, 2023). Such an approach to data development is commendable and necessary in this instance.

In addition, as detailed in the next section, there are significant issues with respect to the timing, and in one case the non-collection of data. A failure to commit to the collection of appropriate and timely data to allow progress to be monitored appropriately and to hold governments to account suggests a lack of respect for the fundamental purpose of Closing the Gap. Given this and the above issues there is a clear need for an audit of the data collections and indicators. Auditing the indicators and data collection processes for each target would be a considerable task that was beyond the scope of this project. However, our brief review suggests that there are serious issues relating to the cultural relevance and safety of some of the target indicators and the processes for measuring them.

There are potential advantages and disadvantages that might arise from conducting such a review. The benefits are clear: there is little point directing government policy efforts toward measures that do not always align with aspirations of diverse Aboriginal and Torres Strait Islander peoples across the continent. Worse, it may potentially cause harm, especially if unsafe data collection methods are used. The potential disadvantage of auditing the indicators is that it may create changes to the framework of the agreement halfway through the term, changes that would require agreement by all Parties to the agreement. We think that the benefits of such a review would outweigh the risks, and that the first Independent Aboriginal and Torres Strait Islander-led reviews – to be undertaken within 12 months of the Productivity Commission’s review under Article 121 – provides an opportunity for such an audit to be undertaken. Given that we are now over 4 years into a 10-year agreement, such a review should be undertaken as a matter of urgency.

Recommendation: That a process for auditing the cultural relevance and safety of target data and data collection processes be undertaken as part of the first Independent Aboriginal and Torres Strait Islander-led review of the National Agreement on Closing the Gap.

Cultural relevance and safety of the method for assessing progress

To assess the cultural safety and relevance of the Productivity Commission's current method, we referred to a set of Practice Principles developed by Indigenous Nations and Collaborative Futures, from the Jumbunna Institute at the University of Technology Sydney (Rigney et al., 2021).

These principles were formulated by an expert Indigenous research team led by Daryl Rigney through an extensive literature review rooted in Aboriginal viewpoints, interviews with Aboriginal artists in New South Wales, and feedback from an independent international Indigenous Expert Panel. The principles were reportedly also influenced by the 2020 AIATSIS *Code of Ethics for Aboriginal and Torres Strait Islander Research*, the Victorian *Aboriginal Affairs Framework 2018–2025*, and the 2020 Productivity Commission's *Indigenous Evaluation Strategy*. The five practice principles relate to:

- **Indigenous leadership:** Indigenous leadership is a practice principle that emphasises the importance of self-determination and cultural guidance in government projects. It assigns governments to a supportive role, allowing Indigenous communities to lead the way. This approach includes community-led design, where decisions and designs are made together with the community, ensuring their needs and perspectives are central. Shared decision-making and co-design are key, fostering respectful, long-term partnerships.
- **Indigenous diversity:** Indigenous diversity as a practice principle focuses on recognising and valuing the diversity of First Nations communities across the country. Central to this principle is respecting the rich internal diversity within Aboriginal communities, including various language and cultural groups, cultural backgrounds, experiences of the Stolen Generations, and differences in gender, age, and disability. It acknowledges the importance of both Traditional Owners and historical residents.
- **Indigenous healing:** Indigenous healing as a practice principle centres around understanding and addressing the deep-seated effects of colonisation on Indigenous communities. It highlights the importance of sensitivity to the historical and ongoing trauma experienced by Indigenous people in Australia. This involves truth-telling about the lingering impacts of colonisation and promoting a holistic concept of well-being. Cultural safety is a key aspect, ensuring that Indigenous people feel safe and respected in their cultural identity.
- **Indigenous excellence:** Indigenous excellence is a practice principle that focuses on building upon the strengths within Indigenous communities. It requires a recognition of the expertise, capabilities and achievements of these communities. Key to this approach is supporting the development of Indigenous leadership and learning from Aboriginal-led solutions and successes. For government bodies, this means actively listening to and learning from Aboriginal communities, ensuring their voices lead the way in shaping policies and initiatives.
- **Indigenous knowledge, experience and expertise:** This practice principle requires the safeguarding Indigenous cultural and intellectual knowledge. It involves governments creating structures to uphold Indigenous data sovereignty and governance, and ensuring that data about Indigenous communities is managed according to their customs and wishes. It also involves valuing Indigenous place-based and sector-based knowledges, recognising the expertise and insights that Indigenous people hold about their lands and communities. It acknowledges the importance of Indigenous knowledge in understanding 'what works' for their communities.

Although these principles were initially developed for the context of New South Wales, their foundation is in the international research literature and human rights standards, notably the 2007 *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP), which has been adopted by the Australian Government. Given their global relevance and alignment with international standards, the research team is confident that these principles are well-suited for application on a national scale in Australia. To this end, the lead author, with the support of the research team, conducted a comparison of the Productivity Commission's existing methodology against these principles.

In relation to the principle of 'Indigenous leadership', it is observed that the Productivity Commission has worked with the PWG of the Joint Council on Closing the Gap to develop the method. The Productivity Commission's unpublished engagement strategy outlines how they handle disagreements within the PWG. When a decision is required and there is no consensus, the Productivity Commission decides by considering the evidence and reasoning behind different viewpoints. Their decision aims to support the self-determination of Aboriginal and Torres Strait Islander people and respect their experiences. Often, this means giving more weight to the opinions of the Coalition of Peaks, who represent Indigenous peoples in the PWG.

Regarding the principle of 'Indigenous diversity', the current method is not designed to specifically address diversity but it could potentially be used for the different Indigenous population 'disaggregations' as outlined in the National Agreement. At present, this method isn't used to evaluate progress for these diverse groups. For example, it might be useful to assess whether progress towards meeting certain targets is adequate in remote versus non-remote areas. While data for targets is reported by certain groupings, this does not include regional Indigenous areas or cultural groups, along with other important subgroups. While much of this issue lies in the data rather than the method, it is recognised that particular attention needs to be given to cultural safety for particular groups including First Nations people with disability, First Nations older people and the unique needs of First Nations women and girls. A future culturally-informed review might usefully consider the suitability of current disaggregations of the data, and whether or not the method for assessing progress should be applied across population disaggregations.

Considering the principle of 'Indigenous healing', the direct application of this to the Productivity Commission's methodology is limited. However, it is noteworthy that under the National Agreement, any failure by jurisdictions to stay 'on track' with targets activates specific government actions. These actions have the potential to address systemic issues, such as institutional racism, in government policies.

For 'Indigenous excellence', the ongoing engagement of the Productivity Commission in the decision-making process with the PWG is acknowledged. This requires continuous consultation, though the scope for applying this principle directly in the context of the current method is somewhat limited. There has been considerable debate regarding whether or not the socioeconomic targets in the new National Agreement adequately recognise Indigenous strengths or if they risk reinforcing 'the deficit narrative that we're too poor, too sick, too dysfunctional to achieve the same things as non-Indigenous people' (Moodie, 2020).

Regarding 'Indigenous knowledge, experience, and expertise', the current approach lacks Indigenous governance over both the data and the process of monitoring changes. To fully adhere to this principle, it may be necessary to transfer some of the Productivity Commission's responsibilities under the National Agreement, particularly those related to monitoring and assessing progress on Closing the Gap, to an appropriately established and funded Indigenous-controlled entity. On the other hand, the current arrangement whereby the Productivity Commission performs monitoring and data collation functions under the National Agreement was agreed to by the Coalition of Peaks. The Coalition of Peaks, and the PWG more broadly, may wish to consider whether the governance of the current reporting arrangements is satisfactory, or whether the devolution of the Productivity Commission's reporting functions to an Indigenous controlled entity is imperative.

This proposed transfer of responsibilities to an appropriately established and funded Indigenous-controlled entity aligns with the recommendation in the Productivity Commission's (2024) *Review of National Agreement on Closing the Gap*.³ The Productivity Commission recommended the establishment of a Bureau of Indigenous Data whose responsibilities would include to 'take carriage of the Closing the Gap information repository (dashboard) and Annual Data Compilation reports' (Productivity Commission, 2024, p. 77). We strongly support this recommendation.

Recommendation: That the Partnership Working Group consider the suitability of the current disaggregations for representing the diversity of Indigenous circumstances. That the Partnership Working Group consider requesting that the Productivity Commission assess the adequacy of progress towards meeting targets among different disaggregated Indigenous population groups.

Recommendation: That Parties to the National Agreement on Closing the Gap commit to establishing a Bureau of Indigenous Data with responsibilities including the work of assessing progress towards meeting socioeconomic targets under the National Agreement, including reporting and data governance.

Assessment of fitness for purpose and technical robustness

A review of the fitness for purpose and technical robustness of the Productivity Commission's method for assessing change was undertaken at three meetings of a statistical expert committee and its support team in September and October 2023. Personnel involved included Professor Nicholas Biddle, Associate Professor Deirdre Howard-Wagner, Dr Mandy Yap, Dr Rob Bray, Dr Francis Markham, Dr Yonatan Dinku, Wen Su and Pattheera Somboonsin. The assessment of that committee is reported in this section.

Fitness for purpose of data

We began our assessment of the Productivity Commission's method by examining the fitness-for-purpose of the target data to support the Productivity Commission's method. Table 2 briefly summarises the data sources that are relied upon to monitor progress for each target. We note that none of these data sources are under the custodianship of the Productivity Commission. Rather, the Productivity Commission relies on other agencies to gather or collate and then disaggregate data in collections usually designed for other purposes, which then feed into their monitoring of progress towards Closing the Gap. We identified four significant issues with the target data which affect the ability of the method to monitor whether or not targets specified in the National Agreement are on track to be met. These are:

- Problems which arise from the denominator and numerator for individual measures being drawn from different sources.
- The timeliness of data.
- A failure to collect, or systematically collect, data for some targets.
- The limited capacity of much of the data to be analysed, or reliably analysed, on a disaggregated basis.

³ This Productivity Commission draft report was not published until after our submission of the draft version of this report. Our recommendation for this transfer of responsibilities was made independently from and without knowledge of the content of the Productivity Commission's review.

Table 2: Data sources, frequency, typical publication delay, and maximum reporting gap for measuring progress towards the 19 Closing the Gap targets, July 2023

Target		Data source	Frequency*	Typical delay*	Maximum reporting gap*
1	Life expectancy	ABS Life Tables for Aboriginal and Torres Strait Islander Australians	5 yearly	1 years	5 years
2	Birthweight	Australian Institute of Health and Welfare (AIHW), National Perinatal Data Collection (NPDC)	1 yearly	3 years	4 years
3	Preschool enrolment	Numerator: ABS Preschool Education, Australia Denominator: ABS, Estimates and Projections for Aboriginal and Torres Strait Islander population	1 yearly	1 year	2 years
4	Child development	Department of Education Australian Early Development Census	3 yearly	1 year	4 years
5	Year 12 attainment	ABS Census of Population and Housing	5 yearly	1 year	6 years
6	Tertiary qualification	ABS Census of Population and Housing	5 yearly	1 year	6 years
7	Youth engagement	ABS Census of Population and Housing	5 yearly	1 year	6 years
8	Employment	ABS Census of Population and Housing	5 yearly	1 year	6 years
9A	Overcrowding	ABS Census of Population and Housing	5 yearly	1 year	6 years
9B	Essential services	–			Unknown
10	Incarceration	Numerator: ABS, Prisoners in Australia Denominator: ABS, Estimates and Projections for Aboriginal and Torres Strait Islander population	1 yearly	< 1 year	2 years
11	Child detention	Numerator: AIHW Youth Justice National Minimum Dataset Denominator: ABS, Estimates and Projections for Aboriginal and Torres Strait Islander population	1 yearly	1 year	2 years
12	Out-of-home care	Numerator: AIHW Child Protection National Minimum Data Set Denominator: ABS, Estimates and Projections for Aboriginal and Torres Strait Islander population	1 yearly	1 year	2 years
13	Family violence	ABS National Aboriginal and Torres Strait Islander Health Survey	Ad hoc (potentially 3 yearly)	< 1 year	Unknown
14	Suicide	Numerator: ABS, Causes of Death Denominator: ABS, Estimates and Projections for Aboriginal and Torres Strait Islander population	1 yearly	1 year	2 years
15A	Land rights or interests	Unpublished calculations by the National Native Title Tribunal	1 yearly	1 year	2 years
15B	Sea rights or interests	Unpublished calculations by the National Native Title Tribunal	1 yearly	1 year	2 years
16A	Languages spoken	AIATSIS National Indigenous Languages Surveys	Ad hoc	1 year	Unknown
16B	Languages spoken strongly	AIATSIS National Indigenous Languages Surveys	Ad hoc	1 year	Unknown
17	Digital inclusion	Indigenous: National Aboriginal and Torres Strait Islander Social Survey Non-Indigenous: N/A	Ad hoc (potentially 3 yearly)	< 1 year	Unknown

Source: Productivity Commission Closing the Gap Dashboard, data retrieved July 2023. *These estimates of timing are indicative only and are based primarily on evidence of past data publication patterns inferred from public documents.

Consequences of the numerator–denominator data source mismatch

Five of the targets rely on different data sources to provide the numerator and the denominator (Targets 3, 10, 11, 12, and 14). Specifically, these targets are all measured using a numerator from administrative data, and ABS population projections as the denominator. An example of this is Target 3. For this target, the numerator is an estimate of the number of Indigenous children enrolled in Year Before Full-time Schooling (YBFS) early childhood education, sourced from administrative data collated into the *Preschool Education, Australia* publication each year. The denominator is an estimate of the population of all Indigenous children of an age to enrol in YBFS early childhood education, sourced from ABS population projections. These projections are updated to reflect changes to the Indigenous population after each five-yearly Census, with a delay of around three years between Census data collection and the publication of Indigenous population projections.

Central to this is the use of these ABS Indigenous population projections as point-in-time estimates of the Indigenous population. Analysis of the Indigenous Census counts (rather than population estimates) have found that 56.5% of the increase in Indigenous census counts between 2016 and 2021 was non-demographic (i.e. cannot be accounted for by births, deaths and migration alone) (ABS, 2023). Yet the ABS Indigenous population projections do not take non-demographic growth into account. Accordingly, ABS Indigenous population projections have historically performed poorly as forecasts (Markham & Biddle, 2017; Wilson & Taylor, 2016).

This causes two problems. First, the percentages denominated by population projections can exceed 100%. For example, the Dashboard currently reports that in 2021, 139.9% of all Indigenous children of an age to enrol in YBFS early childhood education living in the Australian Capital Territory (ACT) were enrolled in YBFS education. Clearly such an outcome is impossible. This anomalous result has occurred partly because the Indigenous population projections for the denominator in 2021 are too low, and partly for other reasons. Specifically, the data supplied on the Dashboard report that 248 Indigenous children from a ‘potential population’ of 179 were enrolled in the ACT in 2021, with that denominator derived from 2016 Census-based population projections. Using the 2021 Census-based estimated resident population (ERP), we can estimate that there was a potential population of 223 Indigenous YBFS-age children in the ACT in 2021, still well below the 248 enrolments.⁴ This gives an enrolment rate of 111%, still exceeding 100%. We expect that while the true percentage of the Indigenous YBFS population in the ACT enrolled in preschool may be approaching 100%, and that this indicator will be revised downwards after the 2021 Census-based Indigenous population projections are incorporated into the Dashboard. However, as we have demonstrated, the numerator–denominator mismatch problem will not be eliminated in this instance by updating population projections. The reporting of mathematically impossible outcomes such as percentages greater than 100% is undesirable.

Second and more generally, large revisions to the observed percentages or rates for the five targets denominated by Indigenous population projections are anticipated once the 2021 Census-based Indigenous population projections are released. Denominating observed data percentages and rates using an unreliable forecast will predictably result in biased estimates outcome data. Biased data are poorly suited to the task of monitoring progress towards achieving targets. This is primarily because the resulting estimates may mislead policymakers, community-members and the public. It is also because these estimates will be subject to significant revision at a future time point, potentially leading to some targets changing their assessment from ‘on track’ to ‘improving but not on track’ or similar. This is likely to cause confusion.

⁴ We apply a ratio of 1.059 Indigenous YBFS-aged children for every Indigenous 4-year-old in the ACT to the ERP of 211 persons, yielding the estimate of 223 4-year-olds. This ratio is based on a comparison of the relevant 2021 potential population reported by the Productivity Commission and the 2021 projection published by the ABS.

For some of these targets – specifically 3, 10, 11, 12, and 14 – the development of a new data source using data integration may mitigate this problem. If linkage data were used, there is the potential to measure both the numerator and the denominator within the same data collection. For example, in the case of Target 3 (preschool enrolment), this might involve linking individual YBFS enrolment records with the Person Linkage Spine in the Person Level Integrated Data Asset (PLIDA). A consistent estimate of the percentage of eligible Indigenous children enrolled in YBFS early childhood education could be produced simply, using the Indigenous status variable in the Person Linkage Spine to identify eligible but unenrolled Indigenous children. If the numerator and denominator are consistently measured from a single integrated data source, percentages will never exceed 100%. Revision will also be avoided. As people's Indigenous status changes over time in the various data sources that make up the Person Linkage Spine (e.g. Medicare, Social Security, etc.), changes to the Indigenous population can be automatically and smoothly incorporated into the percentage estimates.

Recommendation: That parties to the National Agreement leverage existing data sources to monitor Targets 3, 10, 11, and 12 using via the Person Level Integrated Data Asset to avoid the biased and at times mathematically impossible observations that result from the numerator–denominator mismatch.

Timing issues

Timing issues relating to different data sources present a challenge for any method to monitor progress. They are highly policy relevant. Article 91 of the National Agreement commits governments to 'undertaking actions if a target is not on track to be achieved', with these actions to be listed in Jurisdictional Implementation Plans. The timing of these actions is dependent on the timing of an assessment that a target is not on track to be achieved. Data may be published too late in the life of the National Agreement for actions to be meaningfully undertaken in response to targets falling off track. Similarly, Article 71c commits governments to 'collect, handle and report data... in [a]... timely way, to empower local Aboriginal and Torres Strait Islander communities to access, use and interpret data for local decision-making'. The timeliness of data collection and publication is crucial to the goals of the National Agreement being met.

Different targets are reported on at different frequencies. Eight of the targets (2, 3, 10, 11, 12, 14, 15A and 15B) can be monitored for changes each year, meaning that progress towards achieving these targets can be assessed at least 10 times over the 10-year National Agreement. Annual data reporting is, in our opinion, sufficiently frequent to enable a timely policy response when targets are not on track to be achieved. However, six targets (1, 5, 6, 7, 8 and 9A) are derived from data collected in the five-yearly Census. This means that for most of the lifetime of the current 10-year National Agreement, many indicators will have just one or two measurements taken of progress since the baseline. The low frequency of some measures is compounded by the delay that happens between the collection of data and its publication. As Table 2 documents, some data sets are up to three years old by the time they are released.

The combination of low frequency data collection and reporting delay can result in what we term a 'reporting gap'. The reporting gap is a period in which there are no new data available to report on progress towards achieving targets. In some cases, such as Target 1 (life expectancy), this reporting gap can be up to seven years. For instance, at the time of writing in November 2023, the most recent estimate of Indigenous life expectancy relates to mortality that occurred between 2015 and 2017, a reporting gap of around seven years. The Dashboard reports the Productivity Commission's assessment that there has been 'improvement but target not on track to be met'. It notes that 'these assessments of progress should be used with caution as they are based on a limited number of data points' but fails to prominently point out the age of the data used to make this assessment. The Productivity Commission is unable to assess progress towards targets that may or may not be occurring in response to policy changes when there is no new data available which can be used to make that assessment. The result of this is that policymakers lack adequate timely assessments of progress towards

closing the gap on some targets such as Target 1. Put simply, for some targets the most recent data are often too dated to tell policymakers if they are on track to meet their commitments under the National Agreement, or to permit the community to hold governments to account. In addition, data for Target 4 is only collected every three years.

Once again, data development is needed to mitigate this problem. In the case of Target 1 (life expectancy), the ABS could estimate Indigenous life tables at a greater frequency (perhaps annually rather than every five years). This would have resourcing implications, and might require a change in methodology away from the current Census and Post-Enumeration Survey based approach. However, even a reduction in the time taken between data collection and publication for Indigenous life tables might substantially reduce the reporting gap, and could be achieved by rescheduling existing work plans.

In the case of targets currently derived from the Census, new non-Census data sources could be developed which could be published independently of the five-yearly Census collection and reporting cycle. This would require further data linkage. For example, in the case of Target 8 (employment), the Personal Linkage Spine could be linked to Single Touch Payroll data and Personal Income Tax data held by the ABS to produce an annual estimate of the Indigenous employment-to-population ratio.

Recommendation: That the ABS consider producing estimates of Indigenous life expectancy more frequently than every five years.

Recommendation: That parties to the National Agreement leverage existing data sources to monitor Targets 5, 6, 7, 8 and 9A annually using the Person Level Integrated Data Asset to increase the currency of assessments of progress.

Recommendation: That the Australian Government resource data collection for Target 4 at least biennially.

Data are inadequate for some targets.

There has been a failure to systematically collect data for some targets. In some cases, such as Target 9B (essential services), there is no relevant data collection that is current. In this instance, the former Aboriginal and Torres Strait Islander Commission (ATSIC) previously commissioned the ABS to produce a suitable data collection, the Community Housing and Infrastructure Needs Survey (CHINS) in 1992, 1999, 2001 and 2006. However, this enumeration has not been commissioned since the abolition of ATSIC. A suitably revised and revived CHINS will be needed to monitor progress towards Target 9B.

For Targets 13 (family violence) and 17 (digital inclusion) data which rely on nationally representative surveys of the Indigenous population, data are not collected on a frequent or regular basis. In the case of Target 13, there is an urgent need for a more thorough-going rethink of how data on Indigenous family violence is collected in order to address the issues of cultural safety described in Chapter 2. For Target 17 (digital inclusion) which is defined with reference to non-Indigenous rates of digital inclusion, regular data collection needs to be established in a regular mainstream survey (such as the ABS former General Social Survey) as well as in the ABS nationally representative surveys of the Indigenous population.

In the case of Targets 16A (languages spoken) and 16B (languages strongly spoken), a regular and frequent schedule for the collection of the National Indigenous Languages Survey (NILS) – previously conducted by AIATSIS – needs to be established. Currently, the Dashboard reports that the next wave of the NILS has been funded to be conducted by 2026. An irregular collection cycle with eight years between waves (from 2018–19 and 2026) is not fit-for-purpose for monitoring progress under the National Agreement. More frequent collections

will be needed if the Coalition of Peaks and governments are to respond to changes (or non-changes) to this target in a timely manner.

Recommendation: That the Australian Government urgently address the collection of data for Targets 9B, 13, 16 and 17, including the provision of appropriate resourcing.

Capacity for disaggregation

The capacity for data on progress towards targets to be disaggregated is necessary for the implementation of the agreement. Parties to the National Agreement recognised that ‘disaggregated data and information is most useful to Aboriginal and Torres’ (Article 70). Further, governments committed to collecting, handling and reporting ‘data at sufficient levels of disaggregation... to empower local Aboriginal and Torres Strait Islander communities to access, use and interpret data for local decision-making’ (Article 71c). This is necessary to reflect the diverse circumstances of Indigenous peoples in Australia, to guide government policies and to inform Indigenous organisations.

While we recognise that some key disaggregations (e.g. by gender, disability status, and remoteness) are already published on the Dashboard, there is likely to be considerable demand for further disaggregation, including by region. Some data sources support regional disaggregation better than others. The integration of existing data sources with PLIDA to monitor Targets 3, 5, 6, 7, 8, 9A 10, 11, and 12 would increase the capacity for the data to be disaggregated to policy-relevant population sub-groups.

The method’s fitness for purpose and technical robustness

This section reports on the ANU team’s review of the fitness for purpose and technical robustness of the Productivity Commission’s method for assessing change. Rather than listing each criterion individually, we have opted to report our findings against those criteria under thematic subheadings below.

No connection between policies and trajectories

The assessment of progress made by the Productivity Commission currently assumes that there will be consistent, linear progress made towards a target between the baseline year and the target year, although tests for non-linearity are scheduled for future implementation by the Productivity Commission. In practice, policy progress is rarely linear. As COAG noted with respect to the National Indigenous Reform Agreement (COAG, 2009a, p. 11).

[T]he actual trajectory will be a function of the policies and resources allocated to tackle the level of disadvantage. The relationship between inputs and outcomes is unlikely to be linear. In some cases, ‘quick win’ policies can be implemented immediately, but further gains are difficult. The trajectory will indicate decreasing marginal returns... In others, planning, implementation and reporting lags will imply little progress in early years with large pay-offs closer to the target date...

The framework in the National Agreement offers the Productivity Commission little useful information about the policies and resources directed towards meeting particular targets. A change to the accountability framework for the National Agreement might require jurisdictions in their implementation plans to quantify the changes to target outcomes that they expect to be realised by their actions, and a timeline for those changes to occur. Were this done systematically, it would allow jurisdictions and the Productivity Commission to produce policy-driven trajectories towards meeting targets. Policy-driven trajectories of this sort are unlikely to be linear. Policy-driven trajectories of this sort would provide a more effective monitoring tool, as they are aligned to the actions jurisdictions plan to take. This is because success or failure to meet policy-driven trajectories reflects on the success or failure of the actions from which those trajectories are derived. This kind of program logic approach

to implementation planning would also have other significant accountability and monitoring benefits in terms of encouraging jurisdictions to develop realistic plans to meet their commitments under the National Agreement, and to provide benchmarks for outcome evaluation of the actions listed in implementation plans.

In the absence of this degree of planning to meet commitments under the National Agreement, an assumption of linear progress towards meeting targets is reasonable if unrealistic. Although the shape of a trajectory might be estimated from data if sufficient data were available as the Productivity Commission intend to do, this will not be reliably possible for many of the Closing the Gap targets. Consequently, straight-line trajectories between baseline and target provide a path influenced by the fewest possible assumptions about the shape of future progress.

The appropriateness of using the Likelihood Ratio test to distinguish between change and no change

We noted that the LR test is used to distinguish an assessment of ‘no change’ from an assessment of ‘worsening’ or ‘improvement’. To do this, a bivariate linear regression model (i.e. a model of a linear time trend) is compared to a null model (i.e. a model in which there is no trend). While this is a standard applied statistical procedure which is appropriate for comparing models in this way, even for models based on relatively small samples (Pervin et al., 2020; Self et al., 1992; Shieh, 2000), we have reservations about its appropriateness. First, the linear model used includes an assumption about the distribution of the model residuals, an assumption which is impractical to test given small samples. Second, there is a performance issue when models are based on tiny samples such as two data points. The LR test uses a chi-square distribution to approximate the null distribution of likelihoods. This approximation works best with large sample sizes. It is likely that with tiny samples, the LR test will be unable to distinguish between change and no change in cases where change is in fact occurring. The underperformance of the LR test in this context requires the Productivity Commission to use a p -value of 0.5 as its threshold for making a ‘no change’ assessment, rather than the standard threshold of 0.05, resulting the assessment of 13 of the 16 targets with data being provided with either a ‘caution’ or ‘low confidence’ rating.

We make three observations regarding how this difficult problem might be addressed. Our preferred approach to ameliorating this problem is to increase the sample size by increasing the frequency and timeliness of data reporting for each of the targets. Increasing the quantity and timeliness of data reporting for each target will reduce the importance of the issue identified here.

Complementing this, a second approach to ameliorating this problem is to stop testing for a “no change” outcome’. That is, the list of possible outcomes from this assessment process could be reduced to ‘improvement and on track’, ‘improvement but not on track’ and ‘worsening’, without an option of ‘no change’. Across a population of over one million Indigenous people, it is exceedingly unlikely that progress towards a target such as those monitored under the National Agreement will not change over a period of a year. In almost all cases, there will be either an improvement or a worsening, even if only a small one in aggregate. Accordingly, there is a case to discard the ‘no change’ assessment entirely. However, there are some exceptions to this. For some targets such as Target 16B (number of strong languages spoken), the outcome is the count of a small number of languages (currently 14 for Target 16B). For this target and for others like 15A and 15B, no change is a plausible outcome from year to year, especially once the target is disaggregated by state and territory.

If a ‘no change’ assessment is to be retained within the existing framework of the Productivity Commission’s method, an alternative approach to testing for the existence of a trend such as the Spearman’s Rank-Order Correlation Test would be more appropriate. This can be conducted as an exact test, meaning that the significance of the test statistic is not determined from an approximate sampling distribution, as is the case with the LR test which becomes more accurate as sample sizes increase. Spearman’s Rank-Order Correlation

Test is particularly useful for testing for the presence or absence of a trend in data with small sample sizes (Bonett & Wright, 2000; Gauthier, 2001), where the LR test's approximation of the null distribution of likelihoods may be unreliable. A LR test and Spearman Rank Correlation analysis were conducted using data for Closing the Gap targets with at least three data points. The results from the two assessment methods are large comparable in terms of the 'No change' category. While the possible values of Spearman correlation coefficient ranges from -1 to $+1$, qualitatively, a value $>|0.2|$ is considered non-trivial (Prion & Haerling, 2014; Schober et al., 2018). In the case of the current national data, it produces the same qualitative results as the LR test (see Table 27 in Appendix 4).

Recommendation: That, if the current method is retained, the Productivity Commission change the statistical test used to determine if a target is changing over time.

Data uncertainty

There is considerable variability evident in indicator data for some targets that complicates assessing progress towards targets. Variability arises from a range of sources. The outcomes measured by some targets such as Target 14 (suicide) and Target 2 (healthy birthweight) are, from a purely statistical perspective, relatively rarely occurrences in absolute terms, especially in jurisdictions with small populations like the ACT. The number of rare events that occur each year will tend to jump around from year to year in ways that make identifying the underlying trend difficult. Outcomes that are measured by survey such as Target 13 (family violence) and Target 17 (digital inclusion) will also tend to include a degree of survey-to-survey change that is due to sample variation, especially in population groups or jurisdictions with small sample sizes. Phenomena which are in some way 'external' to the Closing the Gap framework, such as Covid-19 or natural disasters, are also likely to introduce variation into the data. Finally, errors in administrative data sources are another potential source of error or variation.

The current method uses trend lines estimated using bivariate linear regression analysis to deal with variation in the data. This is an appropriate approach to extrapolating forward likely-future data based on observed past data, while accounting for fluctuations in the observed data. However, there are limitations to this approach when it comes to describing the degree of confidence in the assessment of progress.

First, with so few data points, the linear regression framework is poorly suited to assigning a level of confidence to the assessment. Currently, this is only done once five or more data points have been observed, meaning that for several targets, assessments will be reported as 'Use with caution' across the life of the National Agreement, regardless of the values observed. Accordingly, a target may be consistently trending upwards to a level well above the national target and its assessment will still be labelled 'use with caution'.

Second, Wald-style 95% confidence intervals around predictions in the target year which are used to determine the level of confidence in whether assessments are 'improvement and on track' or 'improvement but not on track' perform poorly with very small samples. A prediction interval rather than a confidence interval would in any case be a more appropriate statistic for this purpose. Prediction intervals are likely to wider than confidence intervals as they not only depend on the accuracy of the estimation of the mean (or trend), but also on the variance of the target distribution.

Third, these tests assume that observed data are measured without error and do not make use of ancillary information relating to the variability of the measure. This ancillary information might be in the form of variability bands or sample-based confidence intervals. It is difficult to modify the existing method to incorporate this uncertainty. An alternative method for assessing whether or not targets are on track should be considered if uncertainty in the measurement of observed data is to be incorporated.

Fourth, we note that many data series begin several observations prior to the observation on the baseline year. However, information regarding the variability of the measure that is present in this longer data series is ignored when making the assessment of confidence. This information on historical variability is valuable to the assessment of progress towards meeting the target and should not be discarded.

We believe that an alternative approach to assessing progress towards meeting targets that can better represent the uncertainty of the assessment and that can take advantage of additional information about variation in the measure should be explored. We describe one such approach in Chapter 4.

Recommendation: That the Productivity Commission consider adopting the alternative approach to assessing progress towards meeting targets that can better represent the uncertainty of the assessment and that can take advantage of additional information about variation in the measure.

Communication to a broad audience

This section reports on the ANU team's review of the method's ability to be meaningfully understood by a broad audience. We would like to make two observations. First, while the method is relatively complicated (as evident in the flowcharts in Figure 2 and Figure 3) and requires a sophisticated understanding of statistics to fully comprehend, we do not perceive this to be a barrier to communication or understanding. The classification of the assessment into categories such as 'worsening' and 'improvement and on track' and of confidence into three categories ('use with caution', 'low confidence' and 'high confidence') simplifies a complex judgement about trends, trajectories and variations into two readily interpreted dimensions. We do not think that an understanding of the mechanics of the method are needed to meaningfully engage with the outcomes of that assessment.

Second, we are of the opinion that the communication of the assessments on the Dashboard and in the annual data compilation report should be improved. This is largely a matter of visual information design. We describe some specific shortcomings in communication below. They are significant in ensuring that users of the material can obtain a clear and meaningful understanding of the current state of progress.

Prominence of confidence assessments and timeliness

The confidence ratings are a crucial output of the method for assessing progress towards Closing the Gap targets. However, these are not prominently displayed on the Dashboard or in the latest *Closing the Gap Annual Data Compilation Report July 2023* (Productivity Commission, 2023).

In the case of the Dashboard, for targets with less than five observations since baseline, the notice '*Note: These assessments of progress should be used with caution as they are based on a limited number of data points*' appears towards the bottom of a very visually crowded page. It is our expectation based on our own experience of using the Dashboard that few people will read or engage with this textual notice which is not displayed prominently.

For those targets with at least five indicators, the confidence level is reported on the Dashboard in the same table as the assessment of progress. This increases the visual prominence of reporting of confidence on the Dashboard, but the use of text rather than an icon reduces the visibility of the confidence reporting relative to the assessment of progress.

In the case of the *Closing the Gap Annual Data Compilation Report July 2023*, no mention of the reliability of the assessments of progress is made until page 37. There is no mention or visual indication of confidence levels on the visual summary of 'Data availability and latest assessments of progress, at June 2023' on pages 8–9 of the

report, even though almost the Dashboard instructs readers to use almost all of those assessments with caution. Even a dedicated reader engaging with the target-specific report in Attachment C (pages 44–76) will not receive a visual prompt suggesting that assessments should be used with caution, with this notice appearing only in the text for each target.

Similarly, the *Closing the Gap Annual Data Compilation Report July 2023* does not visually highlight the currency of the data against which an assessment is being made in its visual summary, although that information is reported in the text.

Focus of the Dashboard landing page

At present, the landing page of the Dashboard presents the most recent measurement of each target, one of six icons to represent the trend in progress toward each target, and a text description of each target. By presenting multiple types of information (percentages, rates, numbers) and icons, the landing page obscures the critical information related to the Agreement - whether the targets will be met in the target year. We suggest that the landing page be re-designed to present this information. Under the current method, we recommend that the Dashboard focus instead on whether the target is on track or not. In the case of the alternative method, which is covered in the next chapter, the focus would be the probability that the target is on track to be met and corresponding wording to describe the probability. For example, if the predicted probability of a target being met in the target year was 74%, this could be presented on the Dashboard landing page as 'Likely'.

We argue that whether the targets are expected to be met is the most critical piece of information in relation to the targets and should be the first piece of information users of the dashboard are presented with. Detail on each target, such as the current progress, trends over time, and probabilities of different outcomes (which themselves are based on the progress to date), can be presented on the click-through page for a target. Monitoring and reporting obligations under the Agreement can still be met by including the relevant details on each target on the detailed

An example of what the Dashboard landing page could look like is presented below, noting the values are for example purposes only. If there was a preference to include an icon in addition to wording, the iconography only needs to display one of three outcomes, one for probabilities considered unlikely or very unlikely, one for probabilities considered about as likely as not, and one for probabilities considered likely or very likely.

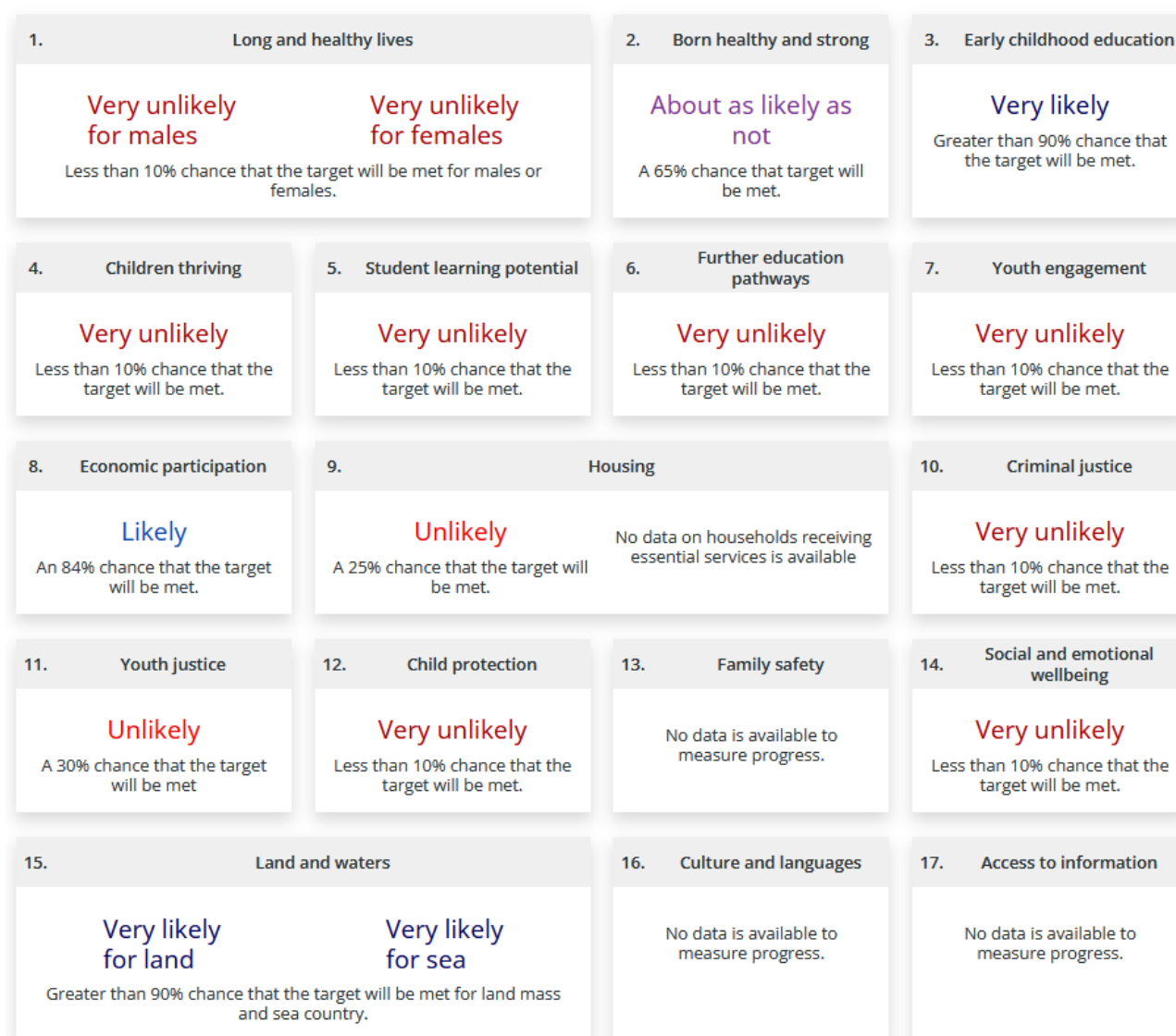


Figure 4: Proposed redesign of the Dashboard landing page that focuses on whether targets are predicted to be met

Related matters

There are several other more minor presentational matters that might be considered in future reports. In the *Annual Data Compilation Report*, current value of the measure lacks prominence relative to the assessment of progress. This should be considered. For example, on Target 1 (life expectancy), it would be beneficial for the reader to have an understanding of the remaining 'gap'. Another significant problem with the Data Compilation Report is that there are few references to the actual target year. The 2031 target year for Target 1 (life expectancy) is just mentioned in passing on page 34. On page 19, there is reference to Target 15A (land rights and interests) noting that 'the target will be exceeded by 2026 (five years ahead of schedule)'. This leaves it to the reader to note the actual target year.

Recommendation: That the Productivity Commission consider a visual redesign of the Dashboard and Annual Data Compilation Report be undertaken. If the alternative method is used, then focus on the probability of a target being met in the target year. If the current method is retained: gives a greater

visual prominence to the confidence levels of the assessment, and to the currency of the assessment; represents assessments visually with greater consistency; and includes both the assessment and confidence in a single visual icon.

Chapter 4: An alternative method

This chapter describes an alternative method for assessing progress towards targets that ameliorates some of the shortcomings described in Chapter 3. Without seeking to address the important issues with the underlying data, this method improves upon the calculations of confidence undertaken in the current method. It incrementally improves upon the method already used by the Productivity Commission. The alternative method is simply to implement in *R* code, which runs quickly on a standard laptop, and could be readily incorporated into the Productivity Commission's existing workflow for assessing progress towards meeting targets.

Rationale for developing an alternative method

Based on the analysis in Chapter 3, we believe that an alternative method could be developed that improves upon some of the shortcomings in the existing method. In particular, the linear regression-based method in Chapter 3:

- relies on strong assumptions about the distribution of the observed data and the characteristics of estimated parameters, which rarely hold with real-world data, especially with small sample size, leading to definitive conclusions about progress toward the Closing the Gap targets
- provides little information on the range of possible outcomes in the target year and their likelihood of happening
- is difficult to modify so that uncertainty in observations (which may be estimated from a sample or be provided with variability bands) can be incorporated into the model
- may provide estimates outside possible bounds (e.g. estimate that in the target year, the proportion of eligible Indigenous children enrolled in early childhood education is greater than 100%)
- cannot easily be extended to incorporate idiosyncratic features of certain targets (e.g. Target 15A and 15B on legal interests in land and seas should never be predicted to decrease over time).

The method outlined below alleviates many of these limitations.

A description of alternative method

The alternative method described in this chapter utilises the same underlying trajectories as the current method employed by the Productivity Commission. It makes several improvements over the current method:

1. Providing assessments of the probability that the target will be met in the target year, and including whether the target is 'very likely to be met', 'likely to be met', 'about as likely to be met as not', 'unlikely to be met' or 'very unlikely to be met'.
2. Providing similar assessments of the probability of other outcomes in the target year, such as 'improved but not met', 'no noticeable change', and 'worsened'.
3. Incorporating information about variability of historical data prior to the baseline year to, on the assumption that future trajectories have similar variability to historical data, better assess uncertainty in future trajectories. This is especially important for targets with very few observations since the baseline year.
4. No longer relying on statistical tests which perform poorly with uncertain data or with very small samples, as detailed in Chapter 3.

To do this, we take a non-parametric approach to assessing progress and calculating confidence. The alternative method is simulation-based. Rather than relying on a regression model of trendlines to predict future data trajectories, we simulate a range of scenarios based on the data observed since the baseline and the

variability in historical data observed before the baseline year. This approach allows us to quantify confidence in the assessments while making weaker assumptions than the regression and LR test approach.

Fundamental to this approach is the assumption that future growth rates of the target indicators will be drawn from the same distribution as the growth rates observed in the past. Accordingly, we perform simulations of future values of the measure, increasing the value each year at a rate drawn randomly from a distribution of growth rates parameterised based on past growth rates.

Growth rates are calculated from data for observed targets. With each pair of adjacent data points, we have a growth rate signifying the proportional changes between the previous data point and the current data point. For a given series of observations of data for a closing the gap target of length n , we have a slightly shorter series of growth rates showing the changes from observation year to observation year (of length $n - 1$). We set the mean growth rate in the simulations to equal the mean observed growth rates since baseline. To better incorporate information about the variability of a data series from observation to observation, we set the standard deviation of growth rates in the simulation to equal the standard deviation of growth rates in all observed data, including growth in the period prior to the baseline year.

This alternative method assumes that the future trends in targets mirror the observed growth in targets since the baseline year. This means the predicted future values of the targets are calculated based on the directions, magnitude and variation in growth rates observed to date. This is a fairly reasonable assumption for all the indicators included.

The alternative method takes the following steps:

1. Calculate observed growth rates since baseline and find the mean growth rate.

The first operation is to calculate the observed growth rates based on observed data since baseline. Growth rates here are defined as the proportional changes in a rate or percentages over a smaller time unit (1 year, 3 years, 5 years, etc.). Therefore, the growth rate can be interpreted as the measure in question having an increase/decrease of $x\%$ over a given period. Our calculation of the growth rate is adopted from Preston et al. (2001) and Keyfitz and Caswell (2005) with an assumption of constant growth. The growth rate (denoted as r) calculation is shown as follows:

$$r = \frac{\log\left(\frac{N(t)}{N(0)}\right)}{t},$$

where the notation $N(t)$ is the value at time t and $N(0)$ at the starting time. Since most of the measures come with their own frequency in terms of the period of data collection (see Table 2), we assume this value of t to be one to avoid complexity. This requires at least two observations.

From this vector of growth rates, we find the mean growth rate between baseline and the most recent observation.

2. Calculate growth rates for all observed data (including before baseline) and find their standard deviation.

This step calculates growth rates following the method in step 2 above. However, instead of only using data observed since baseline, growth rates are calculated using all available data in the time series. Where observed data are measured subject to uncertainty (i.e. are provided along with confidence intervals or variability bands), the variability of growth rates is taken into account (a procedure for doing so is described below).

From this vector of growth rates, we find the standard deviation of growth rates for all observed data.

3. *Simulate a distribution of the growth rates.*

Next, we draw a normally distributed pool of possible growth rates with a mean determined in step 2 and a standard deviation determined in step 3. We assume a normal distribution for the growth rates based on the mean and the standard deviations of the observed growth rates. The normal distribution is essentially a bell curve with values closer to the mean values of the observed growth rates being more possible for the future trajectory of the target. We simulate 100,000 possible scenarios which is more than sufficient for the simulation to achieve stable results while still executing quickly on modern computers.

The model provides considerable flexibility to depart from this assumption about future growth rates where it is logical to do so. For example, in the case of Target 15A and 15B (interests in land and sea) we have modelled growth rates as being drawn from a log-normal distribution. This is because values for Target 15A and 15B are extremely unlikely to ever decrease. When data are log-normally distributed, then the natural logarithm of the variable is normally distributed. This has the convenient property of ensuring that values are always positive, making it suitable for these specific targets. It is also positively skewed, meaning it can model growth rates where there is a small chance of very large improvements, which is also suitable for data on changes to legal rights and interests in lands and seas.

4. *Perform a random walk simulation 100,000 times using the pool of growth rates.*

Next, we run a simulation of 100,000 'random walks'. The random walk simulation is an intuitive way to project the possible future values based on the value we have at hand. This is best illustrated by a single random walk. The random walk starts at the most recent observation. For each 'step' until the target year, a growth rate is drawn at random from the pool of growth rates determined in step 4 and applied (for measures observed annually, a step is a single year, whereas for Census-derived measures, a step is a five-year period). By the time the random walk reaches the target year, the simulated value is clipped to within mathematically possible bounds. For example, for targets expressed as percentages, values greater than 100 or less than 0 are constrained to fall within the range 0–100. Although the simulated future trajectories are clipped at the mathematical bounds, the clipped value still influences the trajectory at the target year, with a great proportion of the results being the mathematical bound. Unless a large proportion of simulated values showing a worsening trend, the assessment of progress will not exempt a worsening trend, only a probable parallel trend at the mathematical bound (e.g. 100% for Target 3). Note that the values exceeding the mathematical bounds are a result of the measurement error embedded within the data. For targets that do not use percentages as units of measure, the original units of measure are retained in the predicted values during target year. For example, for Target 1 and 2, the units of measure for target year will be years of life. The upper bound is defined as 110 years, an upper limit of longevity that only a small number of people achieve. Meanwhile, for Targets 10–12, the units of measure for target year will be rates per 100,000. The upper bounds would be 100,000 since the rates would then imply everyone exposed would experience the event in question. For Target 15, the upper bound is the area of the land and sea territories of Australia. The values beyond the mathematical bounds are clipped across all stages of the simulation as the highest bound (in the percentage case this would be 100%). By doing so, the value of the mean at target year would be different from when values beyond mathematical bounds are being accounted as their original values. This final simulated value is recorded. This procedure is repeated 100,000 times, giving 100,000 different simulated random walk trajectories.

5. *Calculate quantities of interest.*

The results of the 100,000 simulations can be summarised to calculate various quantities of interest, such as the probabilities of each outcome in the target year or the most likely outcome in the target year. We recommend reporting the probabilities of all outcomes as this provides users with the most information and is transparent on the uncertainty included in the projected outcomes. Given the simulations relate to the probabilities of outcomes in the target year, the language used to describe the outcomes differs slightly to the

language used under the current method, which relates to the current state of progress. The proposed outcomes are:

- 'target met' instead of 'good improvement and on track'
- 'improved but not met' instead of 'improvement but not on track'
- 'worsened' instead of 'worsening, not on track'
- 'no noticeable change' instead of 'no change from baseline'.

Treatment of confidence intervals and variability bands

For certain targets, their data come with confidence intervals (e.g. Target 13 and 17) or variability bands (e.g. Target 2). Confidence intervals apply when the measure is derived from survey data and thus are measured subject to sampling error. Variability bands arise from complete population data. For example, in Target 2 the proportion of children born with a health birth weight is measured using all relevant births, not a sample of births, and so sampling error does not apply. However, it is often considered good practice in epidemiology to consider uncertainty around these measurements (Redelings, 2012). This is because, without accounting for variability, there is a risk of drawing incorrect conclusions from observed data. For instance, a one-off increase in healthy birth weights rates might be interpreted as a trend when it could be due to random variation. Variability bands help to caution against such premature conclusions by showing the range within which the measure is likely to have fallen if the year could be 're-run' multiple times, in the manner of Groundhog Day.

The alternative method may incorporate these into the assessment of the target. In this variation on the method described above, observed values are assumed to be drawn from a distribution centred around the observed value but with uncertainty defined by the confidence intervals or variability band. The difference with the treatment of the method for confidence intervals or variability bands is to estimate the growth rates trajectories as being sampled from a distribution, where each observation of the measure is represented not by a single number but by a normal distribution derived from each observation and its uncertainty estimate. Accordingly, random draws from the distributions with the mean growth rates and the standard deviation of those growth rates are used in place of the observed values themselves, contrary to the observed growth rates without the confidence interval and variability bands present.

In practice, this has the effect of increasing the variation in growth rates somewhat. For example, for Target 2 at the national level, the mean growth rate is 1.002% per year. Ignoring the uncertainty bands, the growth rate is estimated to fall into the range 0.993%–1.011% in 95% of cases. However, incorporating uncertainty bands, the growth rate falls into the range 0.991%–1.014% in 95% of cases, a small but not negligible increase in uncertainty. However, the impact of incorporating this uncertainty is higher in smaller jurisdictions.

Categorisation and reporting of probabilities

To support the adoption of the alternative method, a set of criteria are provided to classify the simulated outcomes into one of four categories, similar to the current method of reporting the Closing the Gap targets. This would allow the alternative method to be adopted in a way which is consistent with the current Dashboard's usage of four different possible outcomes.

The classification of outcomes under the alternative method can be broken down into the following steps:

1. Calculate the range for the 'no noticeable change' category.
2. Calculate the range for the remaining categories.
3. Calculate the probability of each outcome.
4. Assign a plain language description to these probabilities.

The definition of the 'no noticeable change' category under the alternative method is fundamentally different to the 'no change' category used for the current method. As highlighted previously, the current 'no change' category relates to the result of the LR test. The 'no noticeable change' category under the alternative method represents a degree of change from the baseline value that is considered to be characteristically similar to a change of zero. The choice of threshold for defining this range of values is arbitrary, however the category overall is easier to understand and more transparent than the current 'no change' category.

The steps to calculate the 'no noticeable change' and other categories are explained here, and a worked example is provided to demonstrate.

1. Calculate the range for the 'no noticeable change' category.

The difference between the baseline year and target year is used to calculate the range of values for a determination of 'no noticeable change', where the boundaries of this range represent a 5% relative proportion of the absolute difference between the baseline and target years.

$$\text{Boundary} = Y_{\text{baseline}} \pm (|Y_{\text{target}} - Y_{\text{baseline}}| \times 0.025)$$

The 5% width is relatively narrow, which we think is fitting for 'no noticeable change'. A width of 5% was chosen to resonate with the familiar threshold for p -values of being less than 0.05, but it has no particular statistical meaning and is somewhat arbitrary. A wider or narrower threshold could be chosen if that were more acceptable to users.

To demonstrate, the baseline year for socioeconomic outcome 8 was 51% of Aboriginal and Torres Strait Islander people aged 25–64 were employed, with the target year being 62%. The 5% 'no noticeable change' range is then calculated as follows. The target and baseline years are represented as

$$Y_{\text{target}} = 0.62$$

$$Y_{\text{baseline}} = 0.51$$

Which means the value to be added and subtracted from the baseline year to generate the relative 5% 'no noticeable change' range is

$$(|0.62 - 0.51|) \times 0.025 = 0.00275$$

This leads to boundaries for the range of 'no noticeable change' of 0.50725 (50.725%) and 0.51275 (51.275%).

2. Calculate the ranges for the remaining categories

With the 'no noticeable change' range defined, all other boundaries naturally follow. The category 'target met' contains all values equal to or better than the target year value. The 'improved but not met' category includes all values between the target year value and the nearest boundary of the 'no noticeable change' category. The 'worsened' category includes all values worse than the lower boundary of the 'no noticeable change' category. Table 3 demonstrates these boundaries for Target 8.

Table 3: Example of ranges for outcomes categories for Target 8

Outcome category	Outcome category range in the target year
Target met	$\geq 62\%$
Improved but target not met	$< 62\%$ and $> 51.275\%$
No noticeable change	$\leq 51.275\%$ and $\geq 50.725\%$
Worsened	$< 50.725\%$

3. Calculate the probability of each outcome category.

Once the ranges have been calculated, all simulations are categorised as falling into one of the four outcome categories. The count, or density, of outcomes that fall into each given category make up a proportion of all simulated outcomes. These can be interpreted as the probability of these outcomes occurring. Table 4 displays the result of this procedure for Target 8. It estimates that, if future data follows the observed trends, there is an 83.6% chance of the target being met in the target year.

Table 4: Example of the predicted probability of different outcomes eventuating in the target year for Target 8

Outcome category	Count out of 100,000	Probability
Target met	83,567	0.83567
Improved but target not met	16,425	0.16425
No noticeable change	3	0.00003
Worsened	5	0.00005

4. Assign a plain language statement to these probabilities.

There is no singular best way to provide a translation between numeric probabilities and plain language adjectives. The users of the Closing the Gap Dashboard will vary in their cultural and language background, education, and goals, so any choice of language will be preferable for some while disagreeable for others. We suggest using terminology for describing probabilities in English using the classification outlined in Table 5. The approach outlined in that table draws on a guidance note written by the International Panel on Climate Change on how to communicate uncertainties in climate projections using what they call 'likelihood terms' (European Food Safety Authority et al., 2019; Mastrandrea et al., 2011).

Table 5: A classification of 'likelihood terms' for describing probabilities in words

Likelihood term	Probability
Very likely	$0.90 \geq p \leq 1$
Likely	$0.66 > p < 0.90$
About as likely as not	$0.33 \geq p \leq 0.66$
Unlikely	$0.10 > p < 0.33$
Very unlikely	$0 \geq p \leq 0.10$

Source: Mastrandrea et al. (2011, p. 680).

While we have suggested the five likelihood terms described in Table 5, the Coalition of Peaks and PWG may prefer to create a different number of probability categories than that proposed. For example, it may be

preferred to only have four categories, such that a probability is only interpreted as being likely or unlikely, with the degree of likeliness depending on the probability value (e.g. lower than 20%, very unlikely, 20% to 50%, unlikely). Alternatively, such decisions would need to be based on perspectives of the PWG and their understanding of the user needs of the Closing the Gap Dashboard.

Summaries of assessments should present information about likely outcomes hierarchically

The alternative method produces considerable data about the probabilities of different outcomes being reached in the target year, which could be confusing were it all presented at once. We think that summaries of assessments should present information about likely outcomes hierarchically, with the most important information presented first and most prominently, with less important information available as readers and website visitors drill down into the detail. This is particularly helpful if the alternative method results in no outcome categories with a high probability, such as for Target 11 presented in Table 6 below. The authors are not experts on user design, however, and so user testing of the acceptability of this suggestion prior to implementation is advisable.

The single most important piece of information for each assessment is the likelihood term describing the probability of whether or not the target will be met in the target year. This should be presented on the front page of the Dashboard and data compilation. The second most important piece of information is the direction of change from baseline that is the most likely, which could be an improvement (this includes both target met and improved but target not met), no change, or worse in the target year. The third most important piece of information is the likelihood term and probabilities for all four outcome categories. To continue with the example of Target 11, all information presented in Table 6 should be reported.

In the case of Target 11 (reported in Table 6), results might be summarised hierarchically as follows:

- **Top level:** *It is unlikely that the target will be met in the target year (probability = 30%).*
- **Second level:** *While it is unlikely that the target will be met in the target year, the outcome is likely to have improved by the target year (probability = 78%).*
Third level: *The target is unlikely to be met in the target year (probability = 30%). It is about as likely as not that the outcome in the target year will have improved but without the target being met (probability is 48%). It is very unlikely that there will be no change in the outcome in the target year (probability 2%). It is unlikely that the target will have worsened by the target year (probability = 11%).*

Table 6: Outcomes for Target 11, where no outcome has a probability greater than 50%.

Outcome category	Probability	Likelihood term
Target met	30%	Unlikely
Improved but target not met	48%	About as likely as not
No noticeable change	2%	Very unlikely
Worsened	11%	Unlikely

Note the information communicated in the second level represents a combination of two outcomes – that the target was met and that it improved but was not met. This is due to the aim of the second level of information communicating one of three outcomes (improved, not changed, worsened), meaning the probabilities of ‘target met’ and ‘improved but not met’ are summed and reported as the probability of the target having improved since baseline. These second-level probabilities should also be reported according to the classification system in Table 5, even when the most likely direction of change from baseline is considered ‘about as likely as not’.

Consider the hypothetical scenario where ‘improved’ had a probability of 49%, where target met was 24%, improved but not met was 25%, ‘worsened’ had a probability of 49%, and ‘no noticeable change’ had a probability of 2%. The top-level information clearly communicates it is unlikely the target will be met. For the second-level information, the probabilities can be examined to the decimal place required to identify which is greater, with the direction with the greatest probability reported. In this scenario, the third-level information is especially useful, as presenting the probabilities of all outcomes highlights that the target could go in any direction, which would suggest there needs to be greater effort to ensure the target is met.

Comparison between the current method and the alternative method

Assessing progress toward a development target is inherently challenging due to uncertainty about the future. Development outcomes can be influenced by a complex interplay of social, economic, political and environmental factors such as government policy, macroeconomic conditions, social behaviour, natural disaster and pandemics. It is impossible to be certain about how some of these factors would change over time and impact the intended development outcome. Therefore, a robust progress assessment model should allow a degree of uncertainty in its modelling process.

The current method used by the Productivity Commission to assess progress toward the Closing the Gap targets involves fitting an OLS regression to estimate the direction and pace of the change in the outcome variable. While producing clear, deterministic forecasts that are easy to communicate and interpret, the OLS regression does not account for factors that drive changes in the outcome variables. Nor does it incorporate a degree of uncertainty or variability in future values. The OLS regression also requires strong assumptions about the distribution of the historical data and the characteristics of estimated parameters, which rarely hold with real-world data, especially with small sample size. Despite these shortcomings, the current method simply uses historical data to estimate an average growth rate and predict a single socioeconomic outcome value in the target year along with a confidence interval around this point estimate. While uncertainty via the confidence interval is used in determining whether a target is on track or not, this approach overall may lead to overconfidence in the prediction.

The alternative method, on the other hand, involves the application of a probability model to estimate the probability of achieving the target value. Like the current method, the alternative method does not account for the factors that drive changes in the socioeconomic outcome variables and it uses the historical data to estimate progress toward the Closing the Gap targets. However, unlike the current method, the alternative method accounts for uncertainty in the future values by allowing a random variation in the growth rate. Further, instead of estimating a single value of the socioeconomic outcomes in the target year, the current method provides a complete distribution of possible future values.

The major distinctions between the two methods are:

- The Productivity Commission’s current method, using linear regression, estimates a growth rate from observed data to determine a single value and trajectory at a given point in time. It relies on a regression model that requires the data to have certain distributional properties. For example, a linear regression requires the model residuals to have a normal distribution.
- The proposed alternative method, on the other hand, introduces a random variation in the growth rate to account for variabilities in the data generation process and produces a distribution of plausible values and different trajectories at a given point in time. This approach does not rely on assumptions about the distributional properties of data (e.g. data needs to be normal). The distribution from which the plausible growth rates are drawn could be statistical distributions other than normal distribution, a flexibility that we use to model a monotonic growth function for Target 15A and 15B.

- The alternative method also accounts for mathematical bounds for the projected values during target period when there is a measurement error present within the observed data that leads to unpalatable estimates.
- The alternative method provides richer information about the probability of a target being met, incorporating historical data about variation in outcomes as much as possible.

The alternative method has some properties which we believe are an advance on those in the current method.

- It incorporates additional information about variance in observed data into the assessment of progress. This is particularly important given the existing available data used by the Productivity Commission are insufficient to determine a single growth-rate and projected value with a reasonable degree of confidence.
- It does not rely on a hypothesis-testing framework which performs poorly with very small samples and may result in confidence being overstated.

The alternative method assesses progress towards the goal assuming a linear trajectory from baseline to target. While these linear trajectories are not directly used in the assessment, they serve as helpful visual tools for understanding progress. When the available data are scarce, this assumption with the alternative method, combined with values drawn from a normal distribution during the simulation, would generate similar results as the linear regression method. However, the interpretation of the uncertainty or variability around target period values are different between the two methods. While the confidence intervals from the linear regression is interpreted as the uncertainty of the estimates conditioned on years, the alternative method fully characterises uncertainty in the projected probabilities by reporting all possible outcomes, where the uncertainty arises from variation in historical growth rates and variability bands (where applicable).

A drawback of the alternative method is that it doesn't support the use of curved trajectories for assessment. However, considering the short span of the longest observation series (10 observations), we advise against creating curvilinear trajectories inductively based on these observations. This is because deriving curvilinear trajectories inductively from such a limited dataset could result in overfitted curves that extrapolate poorly into future years.

Another drawback is that some users may find probabilities difficult to interpret and communicate. To address this issue, we provide recommendations for plain language descriptions of numeric probabilities to assist in their interpretation.

Performance of the alternative method on existing data

The alternative method's process is visualised in Figure 5 using Target 2 (healthy birthweight) as an example. Figure 5 shows historic annual observed data between 2014 and 2017, annual observed data under the current National Agreement from 2018 to 2021, and a selection of random walk paths taken. Figure 5 also includes bands demonstrating the boundaries for each of the four outcomes, along with their respective probabilities according to the alternative method.

The predicted values using this method are listed in Table 7. For example, for Target 2 (healthy birthweight), 65% of simulations result in the national target of 91.0% being met in 2031. Accordingly, it is assessed as 'about as likely as not' to be met. The probability of the measure improving but not reaching the target by 2031 is estimated as 31% ('unlikely'). And the probability of the target showing either no noticeable change or worsening by 2031 is estimated as <1% in both cases ('very unlikely').

Table 7 compares assessments undertaken using current method to those undertaken using the alternative method. In terms of the categorical assessments of progress, there are several differences between the current method and the alternative method. The information presented for the alternative method is consistent with the top and second level information identified earlier, where the probability of meeting the target is reported,

followed by the most likely direction of change. In general, the outcomes are concordant between the current and alternative method, however some targets are different. Target 2's outcome is reported as 'on track' with 'low confidence' under the current method, but 'about as likely as not' to be met under the alternative method. In both cases though, the uncertainty around Target 2's outcome is communicated. Target 11 is reported as 'no change' under the current method. Under the alternative method, Target 11 is reported as being unlikely (30%) to have been met in the target year, but likely to have improved since baseline (77%). This is due to the different approaches in defining 'no change' and 'no noticeable change', where the current method makes this determination using LR test p -values greater than 0.5 (a purely statistical approach) whereas the alternative method characterises 'no noticeable change' as a degree of change from the baseline value that is characteristically similar to zero (i.e. very small).

When accounting for the values constrained by the mathematical bounds and letting them be their original values which exceeds the mathematical bounds, the alternative method performs similarly in terms of the mean values at target years to the respective results from the linear regression method originally proposed by the Productivity Commission. An unclipped data series simulated with a normal distribution will generate a value during target year very close to the original estimates from the Productivity Commission using linear regression (113.0% from alternative method vs. 111.7% from the Productivity Commission for Target 3⁵).

The major distinction between the two methods lies in the differences between the *Confidence* assessment in the current method and the *Probability of being on track* assessment in the alternative method. In practice, there is relatively little difference in outcomes between the current method and the alternative method.

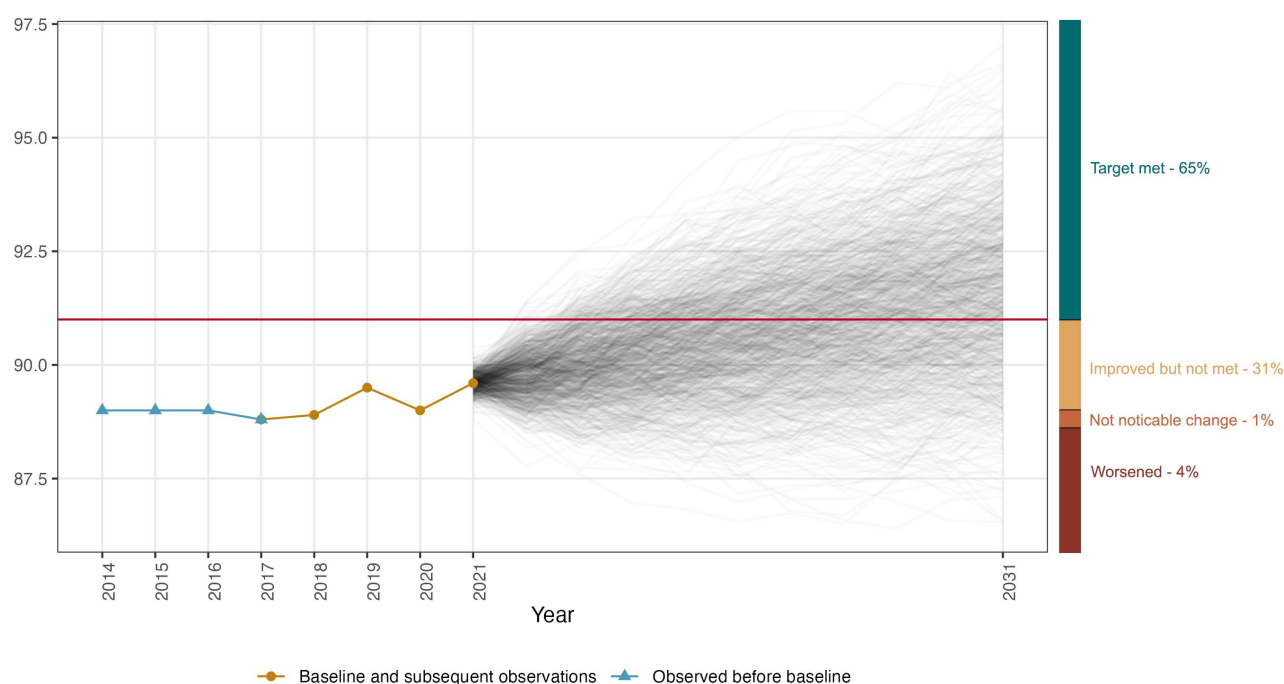


Figure 5: Visualisation of the alternative method for assessing progress, Target 2 (healthy birthweight). Faint grey lines show some of the paths taken by the random walk simulations.

⁵ These values were calculated using the 2023 update to the Dashboard data.

Table 7: Comparison of the results of the current method and the alternative method

Target				Current method			Alternative method		
N	Short name	Baseline value	Target value	Value in target year	Assessment	Confidence level	Probability of meeting the target	Most likely direction of change since baseline	Probability of all four outcomes
1	Life expectancy (female)	8.6 years	0.0 years	6.7 years	Improving but not on track	Caution	Very unlikely (<10%)	Improved (86%)	Target met <10% Improved not met 86.3% No noticeable change <10% Worsened <10%
1	Life expectancy (male)	11.4 years	0.0 years	6.5 years	Improving but not on track	Caution	Very unlikely (<10%)	Improved (>90%)	Target met <10% Improved not met >90% No noticeable change <10% Worsened <10%
2	Healthy Birthweight	89.0%	91.0%	91.2%	On track	Low	About as likely as not (65%)	Improved (>90%)	Target met 64.7% Improved not met 30.5% No noticeable change <10% Worsened <10%
3	Preschool enrolment	76.7%	95.0%	110.3%	On track	High	Very likely (>90%)	Improved (>90%)	Target met >90% Improved not met <10% No noticeable change <10% Worsened <10%
4	Child development	35.2%	55.0%	31.4%	Worsening	Caution	Very unlikely (<10%)	Worsened (68%)	Target met <10% Improved not met 26.5% No noticeable change <10% Worsened 68.1%
5	Year 12 attainment	63.2%	96.0%	77.9%	Improving but not on track	Caution	Very unlikely (<10%)	Improved (>90%)	Target met <10% Improved not met >90% No noticeable change <10% Worsened <10%
6	Tertiary qualification	42.3%	70.0%	56.5%	Improving but not on track	Caution	Very unlikely (<10%)	Improved (>90%)	Target met <10% Improved not met >90% No noticeable change <10% Worsened <10%
7	Youth engagement	57.2%	67.0%	59.7%	Improving but not on track	Caution	Very unlikely (<10%)	Improved (79%)	Target met <10% Improved not met 77.8% No noticeable change <10% Worsened 16.5%

8	Employment	51.0%	62.0%	65.1%	On track	Caution	Likely (84%)	Improved (>90%)	Target met 83.6% Improved not met 16.4% No noticeable change <10% Worsened <10%
9A	Overcrowding	78.9%	88.0%	86.5%	Improving but not on track	Caution	Unlikely (25%)	Improved (>90%)	Target met 25.4% Improved not met 74.6% No noticeable change <10% Worsened <10%
9B	Essential Services	Unknown	100%	n/a	n/a	n/a	n/a	n/a	n/a
10	Incarceration	2,142.9 per 100,000	1,821.5 per 100,000	2,483.8 per 100,000	Worsening	Low	Very unlikely (<10%)	Worsened (>90%)	Target met <10% Improved not met <10% No noticeable change <10% Worsened >90%
11	Child detention	32.0 per 10,000	22.3 per 10,000	28.0 per 10,000	No change	Low	Unlikely (30%)	Improved (77%)	Target met 29.8% Improved not met 47.6% No noticeable change <10% Worsened 20.9%
12	Out-of-home care	54.2 per 1,000	29.8 per 1,000	63.0 per 1,000	Worsening	High	Very unlikely (<10%)	Worsened (>90%)	Target met <10% Improved not met <10% No noticeable change <10% Worsened >90%
13	Family violence	8.4%	4.2%	n/a	n/a	n/a	n/a	n/a	n/a
14	Suicide	25.1 per 100,000	6.3 per 100,000*	37.6 per 100,000	Worsening	High	Very unlikely (<10%)	Worsened (>90%)	Target met <10% Improved not met <10% No noticeable change <10% Worsened >90%
15A	Land rights or interests	3.91 million km ²	4.50 million km ²	4.21 million km ²	On track	Caution	Very likely (>90%)	Improved (>90%)	Target met >90% Improved not met <10% No noticeable change <10% Worsened <10%
15B	Sea rights or interests	90,252 km ²	103,790 km ²	106,872 km ²	On track	Caution	Very likely (>90%)	Improved (>90%)	Target met >90% Improved not met <10% No noticeable change <10% Worsened <10%
16	Languages spoken	123	> 123	n/a	n/a	n/a	n/a	n/a	n/a
16	Languages spoken strongly	14	> 14	n/a	n/a	n/a	n/a	n/a	n/a
17	Digital inclusion	Unknown	0% gap	n/a	n/a	n/a	n/a	n/a	n/a

Chapter 5: State and territory contributions

This chapter presents three options to assess the contribution of the states and territories towards meeting the national-level targets agreed in the National Agreement. We aim to present options which will enable to the Productivity Commission to assess whether a state or territory is ‘on track’ to make an adequate contribution toward achieving Closing the Gap targets in the target year. For the sake of consistency, we aim to make this methodology compatible with those described in Chapters 3 and 4 (the current and alternative method). Accordingly, the task that we address in this chapter is to develop a method for calculating minimum adequate contributions of each jurisdiction towards meeting the national targets in the target year.

As discussed in Chapter 3, ideally there would be a close relationship between state and territory trajectories and targets and the jurisdictional policies that aim to reach the agreed targets by the target year. This is more critical for states and territories when it comes to targets where the outcomes primarily rely on state and territory policies. For example, in the case of incarceration rates, states and territories have clear policy levers relating to sentencing and bail laws that could be used to meet commitments under the National Agreement. However, in the absence of systematic state and territory plans with actions that quantify their contributions to meeting targets in particular years, it is not possible to develop policy-driven minimum adequate contributions and trajectories. Accordingly, we take the approach of developing an objective method for calculating minimum adequate state/territory contributions in the target year, and assuming a straight-line trajectory from baseline to target.

Setting state and territory targets and trajectories is essential if the commitments made under the National Agreement are to be met. They serve two purposes. First, they keep states and territories accountable for their efforts in implementing the policies and directing the resources necessary to meet targets. Second, they can be used to identify where national programs and policies are failing.

Developing state and territory minimum adequate contributions

Principles for state and territory minimum adequate contributions

We take a principles-based approach to setting state and territory minimum adequate contributions and trajectories that respects the consensus reached in the National Agreement. Specifically, Article 83 states that:

Government Parties agree that targets are designed to be met at a national level, while recognising that starting points, past trends and local circumstances differ so jurisdictional outcomes may vary.

In addition, we believe that the following constraints are reasonable and desirable when formulating state and territory minimum adequate contributions and trajectories:

1. No state or territory minimum adequate contribution should represent a worsening of outcomes from baseline.
2. No state or territory minimum adequate contribution should exceed mathematically possible bounds (e.g. no target should be set at greater than 100%).
3. The weighted average of state and territory minimum adequate contributions should be equal to the national target (i.e. if every state and territory minimum adequate contribution is precisely met, then the national target will also be precisely met).

Options for state and territory minimum adequate contributions

We have identified four possible options for estimating adequate state and territory minimum adequate contributions, subject to the three constraints enumerated above.

- a) The first is based on **equal outcomes**, where the target for each state and territory is the same as the national target. Normatively, this approach seeks to reverse past trends and see states and territories which are furthest from the national target improve the most, and might be characterised as an 'equal levels' option because it seeks to place all jurisdictions at the same target value in the target year.
- b) The second is based on **equal absolute improvements**, where each state and territory must achieve the same absolute change as the national target. Under this option, if the national target is to improve an outcome by a certain quantity (e.g. Target 8 which increases employment by 11 percentage points), then each state and territory minimum adequate contribution is also set to improve by that same quantity (11 percentage points). Normatively, this approach seeks equal effort from states and territories irrespective of their starting point. Those states and territories that are already doing well on a target are expected to improve just as much as those that are lagging. This might be described as an 'equal trends' option because the trajectories follow the same slope in all jurisdictions regardless of level.
- c) The third is based on **equal relative improvements**, where each state and territory must improve on their baseline value by the same percentage (a relative amount, rather than an absolute amount), where the percentage improvement is based on the baseline and target values of the national target. Under this option, if the national target is to reduce a gap between the baseline value and a desired outcome (or target value), then all state and territory jurisdictions are expected to reduce the gap between the baseline outcome and an ideal value by the same proportion. The 'ideal value' refers to a hypothetical state when no negative outcomes occur (e.g. an incarceration rate of zero or an employment rate of 100). Using this option, first a national 'reduction' proportion is calculated using the national baseline and national target values. Then that proportion is applied to each state and territory baseline value to calculate the adequate contribution for that jurisdiction.

$$adequate_contribution_s = baseline_value_s + improvement_s$$

$$reduction = \frac{((ideal_value - baseline_value_{national}) - (ideal_value - target_value_{national}))}{ideal_value - baseline_value_{national}}$$

$$improvement_{state} = reduction \times (ideal_value - baseline_value_{state})$$

This can be clarified using a worked example. In the case where the national target is to increase employment by 11 percentage points from 51% to 62%, the reduction in the gap between the baseline value and the ideal value can be calculated this way:

$$reduction = \frac{(100 - 51) - (100 - 62)}{100 - 51} = \frac{49 - 38}{49} = 0.2245$$

This proportion can then be applied to the undesirable outcome for each state and territory to calculate the improvement required by the target year. In the Northern Territory, where the value in the baseline year is 35.4% this means that the improvement and adequate contribution can be calculated as:

$$improvement_{state} = (100 - 35.4) \times 0.2245 = 14.5$$

$$adequate_contribution_{state} = 35.4 + 14.5 = 49.9$$

In this example, an adequate contribution for the Northern Territory would be reaching an employment rate of 49.9% in the target year. This compares with 46.4% in the target year calculated using the equal absolute improvement option, or 62.0% calculated using the equal outcomes option.

Normatively, this might be described as a 'compromise' option because the contribution lies between those of the equal outcomes option and the equal absolute improvement option. This option considers the different starting points of different jurisdictions and does not expect rapid convergence as in the equal outcomes option. However, it also recognises that states with worse outcomes at baseline should improve more than those closer to the national target at baseline.

- d) The fourth is based on **equal relative improvements but constraining outliers**. This reduces the contribution assessed under the equal relative improvements option for states and territories where that jurisdiction's contribution is an 'outlier' relative to other jurisdictions. This means that no state or territory is asked to contribute 'too much' relative to other jurisdictions, but means that more typical jurisdictions are required to make more effort to compensate for this. This option was added as a result of feedback on the draft report.

The outlier adjustment implemented by first calculating the contributions using the equal relative improvements method described above, but adding an additional constraint: that no state/territory's adequate improvement is more than a certain number of standard deviations from the mean adequate improvement for all states and territories.

The extent to which 'outliers' are constrained is somewhat arbitrary should be specified by the PWG if this option is preferred. However, it is not always possible to constrain outliers strongly while also applying the other three constraints outlined above. Experimentation with a number of values suggested that a constraint of 2 standard deviations could be applied in all cases without contradicting the other three constraints. Accordingly, we recommend that if outliers are to be constrained, a constraint that no state or territory should be asked to make a contribution that is more than 2 standard deviations above the mean contribution by other jurisdictions is applied.

In practice, this means that states whose starting position is well behind the average state are still asked to do more than the average state, but that this additional contribution is made less extreme. For targets where one jurisdiction's starting point is far behind the others, this brings the contributions from the starting point of the 'equal improvement (relative)' option slightly closer to the 'equal improvement (absolute)' option.

When applied to the current targets, these constraints only apply for Target 3 (early childhood education), Target 5 (Year 12 attainment) and Target 9A (overcrowding). In these instances, the outliers in the baseline year are New South Wales, Northern Territory and Northern Territory (again) respectively. How this example works is illustrated through the example of Target 9A. Between the baseline and target year, the contributions calculated under the equal relative improvements options for states and territories averages 9.0 percentage points, with a standard deviation of 7.4 percentage points. However, the Northern Territory, which had by far the poorest performance on this measure in the baseline year, is expected to contribute an increase of 26.5 percentage points. Because the ratio of the Northern Territory increase to standard deviation is greater than 2 ($26.5 / 7.4 = 2.35$), it is considered an outlier. The increase for the Northern Territory is reduced under this option to 16.1 percentage points and all other states have their contribution increased by 0.9 percentage points. This brings the Northern Territory's contribution to just within the 2 standard deviation range of the new mean of 8.5 percentage points. In concrete terms, it reduces the measure for Target 9A in the target year for the Northern Territory from 64.9% of people living in suitably sized dwellings to 54.5%.

Satisfying the constraints

The state and territory minimum adequate contributions estimated using these options will not always meet the three criteria described above. Some examples illustrate this issue. For example, consider Target 3 (preschool enrolment), which calls for a national increase in the enrolment rate by 18.3 percentage points from 76.7% to 95.0%. Using the equal outcomes option would see the minimum adequate contributions for all jurisdictions set to 95.0%. But in South Australia, the baseline value was 96.3%. A minimum adequate contribution that is lower than the value in the baseline year conflicts with criteria 1. Accordingly, to meet criteria 1, this minimum adequate contribution must be held at 96.3%. However, this means that the weighted average of all jurisdictional minimum adequate contributions in the target year no longer equals the national target (criteria 3). To meet criteria 1 and 3 simultaneously, the minimum adequate contributions for all other jurisdictions must be lowered below 95.0% while the target for South Australia is held at 96.3% until criteria 3 is satisfied.

Alternatively, keeping with the example of Target 3 (preschool enrolment) but using the equal absolute improvements method, we should see all jurisdictions increase their enrolment rate by 18.3 percentage points. Applying this increase to Victoria, which had an enrolment rate of 88.1% in the baseline year, would see a minimum adequate contribution set at the impossible level of 106.3%. Consequently, to meet criteria 2, this minimum adequate contribution must be reduced to 100%. Once again, an adjustment must be made to ensure that criteria 3 is met, while holding the minimum adequate contributions for Victoria at 100%.

Consequently, implementing any of these options requires identifying the set of state and territory contributions that meets all three constraints while deviating minimally from the original goals of the targets. This can be achieved with a relatively simple iterative process which is illustrated by pseudo-code below. An implementation of this procedure using the *R* statistical environment can be supplied upon request.

```
While any constraint is not met:
  If State_contribution[s] exceeds possible bounds:
    State_contribution[s] = max_or_min_bound
    Pinned_contributions[s] = True
  Else:
    Pinned_contributions[s] = False

  If State_contribution[s] is worse than baseline value:
    State_contribution[s] = baseline[s]
    Pinned_contributions[s] = True

  If weighted_average(State_contribution) doesn't equal national_target:
    State_contribution =
      adjust_non_pinned_to_meet_criteria_3(State_contribution,
      Pinned_contributions, national_target)
```

Weighted averages

The weighted average referred to in criteria 3 has policy relevance and requires further discussion. Constraint 3 requires that weighted averages of state and territory contributions equal the national target. The weights for each state and territory should be equal to the denominator for the target measure in each state and territory. Usually this is the Indigenous population. The populations used for each of the targets is listed in

Table 8. These could be more precisely defined to align with each target's denominator. For example, for Target 2 (healthy birthweight), the population could be specified as 'Indigenous Persons Aged 0 years old'. However,

because this is unlikely to materially change the targets that are calculated, this complexity was deemed unnecessary.

Table 8: Population concepts for each target applied during weighted averaging of state and territory targets

Target	Population
1	Life expectancy (female)
1	Life expectancy (male)
2	Healthy birthweight
3	Preschool enrolment
4	Child development
5	Year 12 attainment
6	Tertiary qualification
7	Youth engagement
8	Employment
9A	Overcrowding
9B	Essential services
10	Incarceration
11	Child detention
12	Out-of-home care
13	Family violence
14	Suicide
15A	Land rights or interests
15B	Sea rights or interests
16A	Languages spoken
16B	Languages spoken strongly
17	Digital inclusion

There are several choices to be made when specifying the weights to use that have implications for monitoring progress towards targets. Specifically, a choice needs to be made about whether weights are based on present-day denominators, or denominators in the target year. This choice matters because different jurisdictions have different rates of Indigenous population increase. Consequently, the relative weights will differ between jurisdictions depending on whether they are set based on baseline year populations or target year populations. This matters for two reasons. First, it may influence the relative contributions of different states and territories, although this effect is generally marginal. Second, it may influence the level of targets across all states and territories.

If populations in the target year are to be used, then there is a question of the method used to forecast future Indigenous populations. Two options are explored to forecast populations in the target year. First, the official ABS Indigenous population projections which have historically under-forecast Indigenous population increase may be used. Second, population forecasts which are intended to maximise forecast accuracy may be used, as the other features of the ABS cohort-component based projections are unnecessary in this context.

The three approaches have different strengths and weaknesses:

1. **Fixing the population weights in the baseline year** provides certainty for policymakers planning actions to meet minimum adequate contribution targets, as targets are fixed in advance. The disadvantage of this approach is that, to the extent that the relative size of Indigenous populations in jurisdictions diverge by the target year, Constraint 3 may no longer hold in practice. Put simply, it is possible in this approach that all states and territories precisely make their individual minimum adequate contributions but the national target is not met.
2. Using a **forecast of Indigenous populations in the target year** does not require the relaxation of Constraint 3 if the forecast is accurate.
 - a) **Using the ABS Indigenous population projections** as forecasts has the advantage of using an official and well recognised data series. However, these projections are not intended to be used as forecasts, and systematically underestimate non-demographic sources of Indigenous population increase. This tends to underestimate the contribution that states with the fastest growing populations make to the national task of meeting targets.
 - b) **Devising custom Indigenous population forecasts** provides an alternative that may be less subject to forecast error. This could be achieved by a variety of means, potentially by extrapolating past Indigenous population growth rates into the future, or alternatively by developing a multistate, multi-region cohort-component population projection model that incorporates non-demographic population increase. Either of these methods is likely to provide more accurate forecasts than the official ABS Indigenous population projections, decreasing the magnitude of any errors in the target year or revisions to targets and trajectories after the release of 2026 Census-based population estimates.

Applying state and territory options to the national socioeconomic targets

In this section, we report the results of applying these options for devising state and territory minimum adequate contributions to the socioeconomic target data. In Appendix 1, the trajectories for each option in each state and territory for most of the targets are displayed. This is intended to give the reader an intuition about the general performance of the three options when applied to real world data, as well as to allow readers with interests in particular jurisdictions to assess what each option means for their jurisdiction. Both the data in Table 9 and the figures in Appendix 1 take the approach of using the 2021 jurisdiction population estimates as the basis for population-weighted averages.

The options for calculating contributions

A summary of the calculated minimum adequate contributions, and how they translate into assessments of progress against targets to date, is presented in Table 9, and the full range of outcomes in Appendix 3. An examination of Table 9 yields the following observations:

- The 'equal relative improvement' option provides the less extreme contributions than the 'equal outcomes' or 'equal absolute improvement' options.
- The 'equal relative improvement with constrained outliers' reduces ambition for jurisdictions where their starting point is dramatically behind that of the other states and territories. This further moderates extreme contributions.
- The 'equal outcomes' option encounters many examples where individual state and territories have already met their contribution in the baseline year and so no improvement is necessary. This seems out of keeping with the spirit of the National Agreement.

- The ‘equal absolute improvement’ option encounters many examples where individual state and territories contributions are constrained to the maximum possible amount (e.g. 100% of young adults completing Year 12). This seems like an unrealistic expectation for those jurisdictions.

Impact of different population weights

In order to test the impact of different population-weights, we also recalculated the state and territory contributions using the ‘equal relative improvement’ method, but varying the population weighting approach used. Custom jurisdictional Indigenous population forecasts for 2031 were devised by calculating the compound annual growth rate (CAGR) for jurisdictional Indigenous populations between 2001 and 2021, and then applying those growth rates to the 2021 population estimates, yielding 2031 jurisdictional population forecasts significantly in excess of those projected by the ABS (2019) on the basis of the 2016 Census. Results are presented in

Table 10 in Appendix 2, with the 2031 population weights used in each of the three options are presented in

Table 11 in Appendix 2. Numerical weights for land and sea targets are also provided in in

Table 10 in Appendix 2.⁶

Since the publication of the draft report, the 2021 Census-based ABS projections have become available. Accordingly, these values are also included in

Table 10 and

Table 11 in Appendix 2.

Two features are evident. First, in practice, the magnitude of differences in jurisdictional contributions between methods of population weighting are mostly minor, especially in comparison to the choice of methods for devising jurisdictional targets. Second, the official 2021 population estimates always provides the middle estimate for these three methods of population weighting. Third, the use of CAGR-based forecasts has the effect of increasing the relative weighting of states that are growing faster than the ABS (2019, 2024) projections (especially New South Wales and Victoria) and decreasing the relative weight of those growing slower than the ABS (2019, 2024) projections (especially Northern Territory, Western Australia and Queensland). In the cases where targets where states like New South Wales and Victoria are closer to the target in the baseline year than the national average, the use of CAGR-based forecasts tends to decrease the state and territory target contributions. And conversely, in the cases where targets for states like New South Wales and Victoria are further from the target in the baseline year compared to the national average, the use of CAGR-based forecasts tends to increase the state and territory target contributions. In general (but not without exception), the use of CAGR-based forecasts slightly reduces the collective level of ambition required across all jurisdictions.

Ultimately the choice of population-weighting scheme is unlikely to have major impacts on state and territory target contributions and trajectories. Consequently, we favour the use of the official 2021 population estimates as the most easily understood and least assumption-driven approach to population weighting in the target year, but hold this preference only weakly. We do not think that there is much to be gained by updating these weights

⁶ Total sea areas for each jurisdiction were not provided by the Productivity Commission, and so were calculated based on the Coastal Waters areas described in Section 3 of the *Coastal Waters (State Powers) Act 1980*, and the *Coastal Waters (Northern Territories Powers) Act 1980*. Areas were calculated using the Albers equal area projection.

after the publication of the 2026 Census-based ERP, given the very minor changes to state and territory contributions that such an update is likely to entail.

Exceptions to these methods for calculating contributions

There are several socioeconomic targets to which these methods cannot be applied. Most obviously, this includes Target 1 (life expectancy). Target 1 specifies that the value of the life expectancy gap will be zero in the target year. However, Target 16A (languages spoken) and Target 16B (languages spoken strongly), are more difficult. This is because for the target to be met, only a single additional language needs to be spoken (or spoken strongly) across the country, assuming that current levels of language use continue. Adequate jurisdictional data on language use do not exist to facilitate an algorithmic setting of contributions for these targets. As such, it seems prudent that state/territory contributions be set at the 2018/19 level (so as to oblige all jurisdictions to protect against the deterioration in the strength of any language). On top of this baseline, the PWG should enlist experts in determining where the most likely avenues for growth in the ‘number of languages spoken’ and ‘number of languages strongly spoken’ may lie. For Target 17, we have not yet calculated state and territory contributions because, in the absence of a numerically specified target at the national level, we cannot calculate state and territory contributions. However, this should be relatively straightforward once a national target is set.

Summary

The benefit of using the equal relative improvement with constrained outliers option to determine state and territory contributions is clear. Firstly, it is most consistent with the stipulation in Article 83 of the National Agreement that ‘starting points, past trends and local circumstances differ so jurisdictional outcomes may vary’. This is because it doesn’t require equality of outcomes between jurisdictions (like the equal outcomes option does). But unlike the equal absolute improvement option, it also expects that states where outcomes were worse at baseline should make a greater contribution to closing the gap nationally than states where outcomes were better at baseline. Secondly, applying the options to the state and territory baseline data provided by the Productivity Commission showed that the equal relative improvement option results in fewer (but not zero) instances where Constraints 1 or 2 are violated. Adding the additional objective of constraining outliers further accentuates these features. Put simply, we believe that this option generates state and territory contributions that are better suited to the expectations laid out in the criteria and the intent of Article 83 of the National Agreement.

Recommendation: That the ‘equal relative improvement with constrained outliers’ option is used to devise state and territory contributions and trajectories, weighting populations according to official 2021 population estimates.

Table 9: State and territory contributions and assessments under the alternative method in the target year using four different options for calculating adequate contributions.

Target	Jurisdiction	Equal outcomes				Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
		Baseline value	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 1 - Females	NSW	8.6	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)
Target 1 - Females	NT	11.6	0.0	Very unlikely (<10%)	Worsened since baseline (89%)	0.0	Very unlikely (<10%)	Worsened since baseline (89%)	0.0	Very unlikely (<10%)	Worsened since baseline (89%)	0.0	Very unlikely (<10%)	Worsened since baseline (89%)
Target 1 - Females	Qld	10.0	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)
Target 1 - Females	WA	12.9	0.0	Very unlikely (<10%)	Improved since baseline (77%)	0.0	Very unlikely (<10%)	Improved since baseline (77%)	0.0	Very unlikely (<10%)	Improved since baseline (77%)	0.0	Very unlikely (<10%)	Improved since baseline (77%)
Target 1 - Males	NSW	10.5	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)
Target 1 - Males	NT	14.0	0.0	Very unlikely (<10%)	Improved since baseline (55%)	0.0	Very unlikely (<10%)	Improved since baseline (55%)	0.0	Very unlikely (<10%)	Improved since baseline (55%)	0.0	Very unlikely (<10%)	Improved since baseline (55%)
Target 1 - Males	Qld	11.8	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)
Target 1 - Males	WA	14.7	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (>90%)
Target 2	ACT	88.6	91.0	About as likely as not (47%)	Improved since baseline (54%)	90.7	About as likely as not (48%)	Improved since baseline (54%)	90.7	About as likely as not (47%)	Improved since baseline (54%)	90.7	About as likely as not (47%)	Improved since baseline (54%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 2	NSW	90.4	91.0	Unlikely (29%)	Worsened since baseline (62%)	92.5	Unlikely (12%)	Worsened since baseline (61%)	92.2	Unlikely (14%)	Worsened since baseline (61%)	92.2	Unlikely (14%)	Worsened since baseline (61%)
Target 2	NT	85.6	91.0	Unlikely (15%)	Worsened since baseline (56%)	87.7	Unlikely (30%)	Worsened since baseline (57%)	88.3	Unlikely (27%)	Worsened since baseline (57%)	88.3	Unlikely (27%)	Worsened since baseline (57%)
Target 2	Qld	89.1	91.0	Very likely (>90%)	Improved since baseline (>90%)	91.2	Likely (89%)	Improved since baseline (>90%)	91.1	Likely (89%)	Improved since baseline (>90%)	91.1	Likely (89%)	Improved since baseline (>90%)
Target 2	SA	88.4	91.0	Unlikely (24%)	Worsened since baseline (63%)	90.5	Unlikely (26%)	Worsened since baseline (63%)	90.6	Unlikely (26%)	Worsened since baseline (63%)	90.6	Unlikely (26%)	Worsened since baseline (63%)
Target 2	Tas	88.5	91.0	Likely (72%)	Improved since baseline (81%)	90.6	Likely (74%)	Improved since baseline (81%)	90.7	Likely (74%)	Improved since baseline (81%)	90.7	Likely (74%)	Improved since baseline (81%)
Target 2	Vic	88.8	91.0	Likely (86%)	Improved since baseline (>90%)	90.9	Likely (87%)	Improved since baseline (>90%)	90.9	Likely (87%)	Improved since baseline (>90%)	90.9	Likely (87%)	Improved since baseline (>90%)
Target 2	WA	86.9	91.0	Unlikely (33%)	Improved since baseline (75%)	89.0	About as likely as not (54%)	Improved since baseline (75%)	89.4	About as likely as not (50%)	Improved since baseline (75%)	89.4	About as likely as not (50%)	Improved since baseline (75%)
Target 3	ACT	85.4	94.9	Likely (82%)	Improved since baseline (>90%)	100.0	About as likely as not (56%)	Improved since baseline (>90%)	96.7	Likely (75%)	Improved since baseline (>90%)	98.3	Likely (67%)	Improved since baseline (>90%)
Target 3	NSW	60.1	94.9	Very likely (>90%)	Improved since baseline (>90%)	85.5	Very likely (>90%)	Improved since baseline (>90%)	91.3	Very likely (>90%)	Improved since baseline (>90%)	88.5	Very likely (>90%)	Improved since baseline (>90%)
Target 3	NT	79.5	94.9	Very unlikely (<10%)	Worsened since baseline (>90%)	100.0	Very unlikely (<10%)	Worsened since baseline (>90%)	95.4	Very unlikely (<10%)	Worsened since baseline (>90%)	97.0	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 3	Qld	82.2	94.9	Very likely (>90%)	Improved since baseline (>90%)	100.0	Likely (68%)	Improved since baseline (>90%)	96.0	Very likely (>90%)	Improved since baseline (>90%)	97.6	Likely (89%)	Improved since baseline (>90%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 3	SA	96.3	96.3	Very unlikely (<10%)	Worsened since baseline (>90%)	100.0	About as likely as not (54%)	Improved since baseline (>90%)	99.0	Likely (74%)	Improved since baseline (>90%)	100.0	About as likely as not (54%)	Improved since baseline (>90%)
Target 3	Tas	90.9	94.9	Very likely (>90%)	Improved since baseline (>90%)	100.0	About as likely as not (65%)	Improved since baseline (>90%)	97.9	Likely (87%)	Improved since baseline (>90%)	99.5	Likely (72%)	Improved since baseline (>90%)
Target 3	Vic	88.1	94.9	Very likely (>90%)	Improved since baseline (>90%)	100.0	Likely (70%)	Improved since baseline (>90%)	97.3	Very likely (>90%)	Improved since baseline (>90%)	98.9	Likely (81%)	Improved since baseline (>90%)
Target 3	WA	94.8	94.9	Very likely (>90%)	Improved since baseline (>90%)	100.0	Likely (74%)	Improved since baseline (>90%)	98.7	Very likely (>90%)	Improved since baseline (>90%)	100.0	Likely (74%)	Improved since baseline (>90%)
Target 4	ACT	26.4	55.0	Very unlikely (<10%)	Improved since baseline (69%)	46.4	Very unlikely (<10%)	Improved since baseline (71%)	49.0	Very unlikely (<10%)	Improved since baseline (70%)	49.0	Very unlikely (<10%)	Improved since baseline (70%)
Target 4	NSW	42.2	55.0	Very unlikely (<10%)	Worsened since baseline (>90%)	62.2	Very unlikely (<10%)	Worsened since baseline (>90%)	60.0	Very unlikely (<10%)	Worsened since baseline (>90%)	60.0	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 4	NT	18.2	55.0	Very unlikely (<10%)	Worsened since baseline (85%)	38.1	Very unlikely (<10%)	Worsened since baseline (86%)	43.3	Very unlikely (<10%)	Worsened since baseline (86%)	43.3	Very unlikely (<10%)	Worsened since baseline (86%)
Target 4	Qld	33.5	55.0	Very unlikely (<10%)	Improved since baseline (53%)	53.5	Unlikely (11%)	Improved since baseline (53%)	53.9	Unlikely (10%)	Improved since baseline (53%)	53.9	Unlikely (10%)	Improved since baseline (53%)
Target 4	SA	29.0	55.0	Very unlikely (<10%)	Improved since baseline (90%)	49.0	Unlikely (15%)	Improved since baseline (90%)	50.8	Unlikely (12%)	Improved since baseline (90%)	50.8	Unlikely (12%)	Improved since baseline (90%)
Target 4	Tas	37.5	55.0	Very unlikely (<10%)	Improved since baseline (63%)	57.5	Very unlikely (<10%)	Improved since baseline (62%)	56.8	Very unlikely (<10%)	Improved since baseline (62%)	56.8	Very unlikely (<10%)	Improved since baseline (62%)
Target 4	Vic	35.1	55.0	Very unlikely (<10%)	Improved since baseline (82%)	55.1	Very unlikely (<10%)	Improved since baseline (81%)	55.0	Very unlikely (<10%)	Improved since baseline (81%)	55.0	Very unlikely (<10%)	Improved since baseline (81%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 4	WA	31.4	55.0	Very unlikely (<10%)	Worsened since baseline (49%)	51.3	Very unlikely (<10%)	Worsened since baseline (50%)	52.5	Very unlikely (<10%)	Worsened since baseline (50%)	52.5	Very unlikely (<10%)	Worsened since baseline (50%)
Target 5	ACT	77.4	96.0	About as likely as not (35%)	Improved since baseline (>90%)	100.0	Unlikely (22%)	Improved since baseline (>90%)	97.5	Unlikely (30%)	Improved since baseline (>90%)	97.9	Unlikely (29%)	Improved since baseline (>90%)
Target 5	NSW	64.3	96.0	Very unlikely (<10%)	Improved since baseline (>90%)	98.7	Very unlikely (<10%)	Improved since baseline (>90%)	96.1	Very unlikely (<10%)	Improved since baseline (>90%)	96.5	Very unlikely (<10%)	Improved since baseline (>90%)
Target 5	NT	37.5	96.0	Very unlikely (<10%)	Improved since baseline (76%)	71.5	Very unlikely (<10%)	Improved since baseline (78%)	93.2	Very unlikely (<10%)	Improved since baseline (76%)	88.9	Very unlikely (<10%)	Improved since baseline (76%)
Target 5	Qld	69.5	96.0	Very unlikely (<10%)	Improved since baseline (>90%)	100.0	Very unlikely (<10%)	Improved since baseline (>90%)	96.7	Very unlikely (<10%)	Improved since baseline (>90%)	97.1	Very unlikely (<10%)	Improved since baseline (>90%)
Target 5	SA	61.4	96.0	Very unlikely (<10%)	Improved since baseline (86%)	95.8	Very unlikely (<10%)	Improved since baseline (86%)	95.8	Very unlikely (<10%)	Improved since baseline (86%)	96.2	Very unlikely (<10%)	Improved since baseline (86%)
Target 5	Tas	62.7	96.0	Very unlikely (<10%)	Improved since baseline (>90%)	97.1	Very unlikely (<10%)	Improved since baseline (>90%)	95.9	Very unlikely (<10%)	Improved since baseline (>90%)	96.3	Very unlikely (<10%)	Improved since baseline (>90%)
Target 5	Vic	69.6	96.0	Very unlikely (<10%)	Improved since baseline (>90%)	100.0	Very unlikely (<10%)	Improved since baseline (>90%)	96.7	Very unlikely (<10%)	Improved since baseline (>90%)	97.1	Very unlikely (<10%)	Improved since baseline (>90%)
Target 5	WA	57.4	96.0	Very unlikely (<10%)	Improved since baseline (>90%)	91.7	Very unlikely (<10%)	Improved since baseline (>90%)	95.4	Very unlikely (<10%)	Improved since baseline (>90%)	95.7	Very unlikely (<10%)	Improved since baseline (>90%)
Target 6	ACT	62.1	70.0	About as likely as not (51%)	Improved since baseline (>90%)	89.1	Very unlikely (<10%)	Improved since baseline (89%)	80.0	Very unlikely (<10%)	Improved since baseline (>90%)	80.0	Very unlikely (<10%)	Improved since baseline (>90%)
Target 6	NSW	48.3	70.0	About as likely as not (39%)	Improved since baseline (>90%)	75.4	Unlikely (18%)	Improved since baseline (>90%)	72.8	Unlikely (27%)	Improved since baseline (>90%)	72.8	Unlikely (27%)	Improved since baseline (>90%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 6	NT	18.1	70.0	Very unlikely (<10%)	Improved since baseline (64%)	45.5	Very unlikely (<10%)	Improved since baseline (70%)	57.2	Very unlikely (<10%)	Improved since baseline (67%)	57.2	Very unlikely (<10%)	Improved since baseline (67%)
Target 6	Qld	42.4	70.0	Unlikely (10%)	Improved since baseline (>90%)	69.6	Unlikely (11%)	Improved since baseline (>90%)	69.8	Unlikely (11%)	Improved since baseline (>90%)	69.8	Unlikely (11%)	Improved since baseline (>90%)
Target 6	SA	39.8	70.0	Very unlikely (<10%)	Improved since baseline (86%)	67.0	Very unlikely (<10%)	Improved since baseline (86%)	68.4	Very unlikely (<10%)	Improved since baseline (86%)	68.4	Very unlikely (<10%)	Improved since baseline (86%)
Target 6	Tas	47.0	70.0	Very unlikely (<10%)	Improved since baseline (>90%)	74.1	Very unlikely (<10%)	Improved since baseline (>90%)	72.2	Very unlikely (<10%)	Improved since baseline (>90%)	72.2	Very unlikely (<10%)	Improved since baseline (>90%)
Target 6	Vic	56.5	70.0	Unlikely (21%)	Improved since baseline (76%)	83.6	Very unlikely (<10%)	Improved since baseline (75%)	77.1	Very unlikely (<10%)	Improved since baseline (75%)	77.1	Very unlikely (<10%)	Improved since baseline (75%)
Target 6	WA	33.8	70.0	Very unlikely (<10%)	Improved since baseline (>90%)	61.0	Very unlikely (<10%)	Improved since baseline (>90%)	65.3	Very unlikely (<10%)	Improved since baseline (>90%)	65.3	Very unlikely (<10%)	Improved since baseline (>90%)
Target 7	ACT	73.7	73.7	Very unlikely (<10%)	Worsened since baseline (>90%)	83.5	Very unlikely (<10%)	Improved since baseline (78%)	79.7	Very unlikely (<10%)	Improved since baseline (79%)	79.7	Very unlikely (<10%)	Improved since baseline (79%)
Target 7	NSW	61.7	66.9	Unlikely (11%)	Improved since baseline (59%)	71.5	Very unlikely (<10%)	Improved since baseline (58%)	70.4	Very unlikely (<10%)	Improved since baseline (58%)	70.4	Very unlikely (<10%)	Improved since baseline (58%)
Target 7	NT	40.0	66.9	Very unlikely (<10%)	Worsened since baseline (>90%)	49.8	Very unlikely (<10%)	Worsened since baseline (>90%)	53.7	Very unlikely (<10%)	Worsened since baseline (>90%)	53.7	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 7	Qld	55.4	66.9	Unlikely (32%)	Improved since baseline (90%)	65.2	About as likely as not (42%)	Improved since baseline (90%)	65.6	About as likely as not (39%)	Improved since baseline (90%)	65.6	About as likely as not (39%)	Improved since baseline (90%)
Target 7	SA	57.6	66.9	Very unlikely (<10%)	Worsened since baseline (>90%)	67.4	Very unlikely (<10%)	Worsened since baseline (>90%)	67.3	Very unlikely (<10%)	Worsened since baseline (>90%)	67.3	Very unlikely (<10%)	Worsened since baseline (>90%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 7	Tas	62.4	66.9	Very unlikely (<10%)	Improved since baseline (>90%)	72.2	Very unlikely (<10%)	Improved since baseline (>90%)	71.0	Very unlikely (<10%)	Improved since baseline (>90%)	71.0	Very unlikely (<10%)	Improved since baseline (>90%)
Target 7	Vic	65.4	66.9	Unlikely (23%)	Improved since baseline (56%)	75.2	Very unlikely (<10%)	Improved since baseline (51%)	73.3	Very unlikely (<10%)	Improved since baseline (52%)	73.3	Very unlikely (<10%)	Improved since baseline (52%)
Target 7	WA	51.5	66.9	Very unlikely (<10%)	Improved since baseline (>90%)	61.3	Very unlikely (<10%)	Improved since baseline (>90%)	62.6	Very unlikely (<10%)	Improved since baseline (>90%)	62.6	Very unlikely (<10%)	Improved since baseline (>90%)
Target 8	ACT	70.1	70.1	Very unlikely (<10%)	Worsened since baseline (>90%)	80.7	About as likely as not (36%)	Improved since baseline (>90%)	76.5	Likely (75%)	Improved since baseline (>90%)	76.5	Likely (75%)	Improved since baseline (>90%)
Target 8	NSW	54.6	61.9	Very likely (>90%)	Improved since baseline (>90%)	65.3	Very likely (>90%)	Improved since baseline (>90%)	64.6	Very likely (>90%)	Improved since baseline (>90%)	64.6	Very likely (>90%)	Improved since baseline (>90%)
Target 8	NT	35.4	61.9	Very unlikely (<10%)	Worsened since baseline (68%)	46.2	Very unlikely (<10%)	Worsened since baseline (70%)	49.7	Very unlikely (<10%)	Worsened since baseline (69%)	49.7	Very unlikely (<10%)	Worsened since baseline (69%)
Target 8	Qld	52.1	61.9	Likely (85%)	Improved since baseline (>90%)	62.8	Likely (82%)	Improved since baseline (>90%)	62.6	Likely (82%)	Improved since baseline (>90%)	62.6	Likely (82%)	Improved since baseline (>90%)
Target 8	SA	46.4	61.9	Unlikely (22%)	Improved since baseline (>90%)	57.2	About as likely as not (61%)	Improved since baseline (>90%)	58.3	About as likely as not (51%)	Improved since baseline (>90%)	58.3	About as likely as not (51%)	Improved since baseline (>90%)
Target 8	Tas	59.0	61.9	Very likely (>90%)	Improved since baseline (>90%)	69.7	About as likely as not (52%)	Improved since baseline (>90%)	67.9	About as likely as not (66%)	Improved since baseline (>90%)	67.9	About as likely as not (66%)	Improved since baseline (>90%)
Target 8	Vic	57.3	61.9	Very likely (>90%)	Improved since baseline (>90%)	68.0	Very likely (>90%)	Improved since baseline (>90%)	66.6	Very likely (>90%)	Improved since baseline (>90%)	66.6	Very likely (>90%)	Improved since baseline (>90%)
Target 8	WA	44.7	61.9	About as likely as not (49%)	Improved since baseline (>90%)	55.5	Likely (77%)	Improved since baseline (>90%)	56.9	Likely (71%)	Improved since baseline (>90%)	56.9	Likely (71%)	Improved since baseline (>90%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 9	ACT	91.6	91.6	Very unlikely (<10%)	Worsened since baseline (>90%)	100.0	Very unlikely (<10%)	Worsened since baseline (69%)	95.0	Unlikely (10%)	Worsened since baseline (70%)	95.9	Very unlikely (<10%)	Worsened since baseline (70%)
Target 9	NSW	85.9	87.9	Very likely (>90%)	Improved since baseline (>90%)	94.6	Very unlikely (<10%)	Improved since baseline (>90%)	91.8	Unlikely (21%)	Improved since baseline (>90%)	92.7	Very unlikely (<10%)	Improved since baseline (>90%)
Target 9	NT	38.4	87.9	Very unlikely (<10%)	Improved since baseline (>90%)	47.3	Very likely (>90%)	Improved since baseline (>90%)	64.8	Very unlikely (<10%)	Improved since baseline (>90%)	54.4	About as likely as not (61%)	Improved since baseline (>90%)
Target 9	Qld	79.4	87.9	Very unlikely (<10%)	Improved since baseline (>90%)	88.2	Very unlikely (<10%)	Improved since baseline (>90%)	88.1	Very unlikely (<10%)	Improved since baseline (>90%)	88.9	Very unlikely (<10%)	Improved since baseline (>90%)
Target 9	SA	82.5	87.9	Unlikely (15%)	Improved since baseline (56%)	91.2	Very unlikely (<10%)	Improved since baseline (55%)	89.8	Very unlikely (<10%)	Improved since baseline (56%)	90.7	Very unlikely (<10%)	Improved since baseline (55%)
Target 9	Tas	89.9	89.9	Very unlikely (<10%)	Worsened since baseline (>90%)	98.6	Very unlikely (<10%)	Worsened since baseline (>90%)	94.0	Very unlikely (<10%)	Worsened since baseline (>90%)	95.0	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 9	Vic	87.6	87.9	Very likely (>90%)	Improved since baseline (>90%)	96.3	Very unlikely (<10%)	Improved since baseline (>90%)	92.7	Very unlikely (<10%)	Improved since baseline (>90%)	93.6	Very unlikely (<10%)	Improved since baseline (>90%)
Target 9	WA	75.2	87.9	About as likely as not (36%)	Improved since baseline (>90%)	84.0	Likely (76%)	Improved since baseline (>90%)	85.7	About as likely as not (59%)	Improved since baseline (>90%)	86.5	About as likely as not (50%)	Improved since baseline (>90%)
Target 10	ACT	1703.9	1703.9	Very unlikely (<10%)	Worsened since baseline (>90%)	1404.2	About as likely as not (49%)	Improved since baseline (65%)	1467.6	About as likely as not (53%)	Improved since baseline (65%)	1467.6	About as likely as not (53%)	Improved since baseline (65%)
Target 10	NSW	1868.9	1868.9	Very unlikely (<10%)	Worsened since baseline (>90%)	1571.8	Unlikely (32%)	Improved since baseline (77%)	1609.7	About as likely as not (39%)	Improved since baseline (78%)	1609.7	About as likely as not (39%)	Improved since baseline (78%)
Target 10	NT	2450.8	1894.5	Very unlikely (<10%)	Worsened since baseline (>90%)	2162.8	Very unlikely (<10%)	Worsened since baseline (>90%)	2110.9	Very unlikely (<10%)	Worsened since baseline (>90%)	2110.9	Very unlikely (<10%)	Worsened since baseline (>90%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 10	Qld	1814.5	1814.5	Very unlikely (<10%)	Worsened since baseline (>90%)	1516.5	Very unlikely (<10%)	Worsened since baseline (>90%)	1562.9	Very unlikely (<10%)	Worsened since baseline (>90%)	1562.9	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 10	SA	2395.5	1894.5	Unlikely (16%)	Improved since baseline (54%)	2106.6	Unlikely (32%)	Improved since baseline (55%)	2063.3	Unlikely (28%)	Improved since baseline (55%)	2063.3	Unlikely (28%)	Improved since baseline (55%)
Target 10	Tas	729.7	729.7	Very unlikely (<10%)	Worsened since baseline (>90%)	414.7	Very unlikely (<10%)	Worsened since baseline (84%)	628.5	Very unlikely (<10%)	Worsened since baseline (85%)	628.5	Very unlikely (<10%)	Worsened since baseline (85%)
Target 10	Vic	2114.3	1894.5	Likely (88%)	Improved since baseline (>90%)	1821.0	Likely (86%)	Improved since baseline (>90%)	1821.1	Likely (86%)	Improved since baseline (>90%)	1821.1	Likely (86%)	Improved since baseline (>90%)
Target 10	WA	3581.8	1894.5	Very unlikely (<10%)	Worsened since baseline (51%)	3311.6	Unlikely (27%)	Worsened since baseline (54%)	3085.1	Unlikely (15%)	Worsened since baseline (53%)	3085.1	Unlikely (15%)	Worsened since baseline (53%)
Target 11	ACT	15.3	15.3	Very unlikely (<10%)	Worsened since baseline (>90%)	5.7	Very unlikely (<10%)	Worsened since baseline (>90%)	10.8	Very unlikely (<10%)	Worsened since baseline (>90%)	10.8	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 11	NSW	22.3	22.3	Very unlikely (<10%)	Worsened since baseline (>90%)	12.8	About as likely as not (36%)	Improved since baseline (80%)	15.7	About as likely as not (54%)	Improved since baseline (80%)	15.7	About as likely as not (54%)	Improved since baseline (80%)
Target 11	NT	30.9	23.9	Very unlikely (<10%)	Worsened since baseline (>90%)	21.5	Very unlikely (<10%)	Worsened since baseline (>90%)	21.8	Very unlikely (<10%)	Worsened since baseline (>90%)	21.8	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 11	Qld	41.2	23.9	Very unlikely (<10%)	Worsened since baseline (81%)	32.0	Very unlikely (<10%)	Worsened since baseline (81%)	29.1	Very unlikely (<10%)	Worsened since baseline (81%)	29.1	Very unlikely (<10%)	Worsened since baseline (81%)
Target 11	SA	27.4	23.9	Very likely (>90%)	Improved since baseline (>90%)	18.0	Very likely (>90%)	Improved since baseline (>90%)	19.3	Very likely (>90%)	Improved since baseline (>90%)	19.3	Very likely (>90%)	Improved since baseline (>90%)
Target 11	Tas	8.5	8.5	Very unlikely (<10%)	Worsened since baseline (>90%)	0.0	Very unlikely (<10%)	Improved since baseline (62%)	6.0	About as likely as not (54%)	Improved since baseline (62%)	6.0	About as likely as not (54%)	Improved since baseline (62%)

Target	Jurisdiction	Equal outcomes				Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
		Baseline value	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 11	Vic	18.5	18.5	Very unlikely (<10%)	Worsened since baseline (>90%)	9.0	Very likely (>90%)	Improved since baseline (>90%)	13.1	Very likely (>90%)	Improved since baseline (>90%)	13.1	Very likely (>90%)	Improved since baseline (>90%)
Target 11	WA	55.1	23.9	Very likely (>90%)	Improved since baseline (>90%)	46.0	Very likely (>90%)	Improved since baseline (>90%)	38.8	Very likely (>90%)	Improved since baseline (>90%)	38.8	Very likely (>90%)	Improved since baseline (>90%)
Target 12	ACT	68.5	29.8	Very unlikely (<10%)	Improved since baseline (82%)	43.4	Unlikely (20%)	Improved since baseline (82%)	37.3	Very unlikely (<10%)	Improved since baseline (82%)	37.3	Very unlikely (<10%)	Improved since baseline (82%)
Target 12	NSW	60.2	29.8	Very unlikely (<10%)	Improved since baseline (>90%)	35.2	Very unlikely (<10%)	Improved since baseline (>90%)	32.8	Very unlikely (<10%)	Improved since baseline (>90%)	32.8	Very unlikely (<10%)	Improved since baseline (>90%)
Target 12	NT	36.6	29.8	Very likely (>90%)	Improved since baseline (>90%)	12.0	Very unlikely (<10%)	Improved since baseline (>90%)	19.9	Very unlikely (<10%)	Improved since baseline (>90%)	19.9	Very unlikely (<10%)	Improved since baseline (>90%)
Target 12	Qld	37.0	29.8	Very unlikely (<10%)	Worsened since baseline (>90%)	12.4	Very unlikely (<10%)	Worsened since baseline (>90%)	20.1	Very unlikely (<10%)	Worsened since baseline (>90%)	20.1	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 12	SA	75.3	29.8	Very unlikely (<10%)	Worsened since baseline (>90%)	50.1	Very unlikely (<10%)	Worsened since baseline (>90%)	41.0	Very unlikely (<10%)	Worsened since baseline (>90%)	41.0	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 12	Tas	32.7	29.8	Very unlikely (<10%)	Worsened since baseline (77%)	8.1	Very unlikely (<10%)	Worsened since baseline (71%)	17.8	Very unlikely (<10%)	Worsened since baseline (74%)	17.8	Very unlikely (<10%)	Worsened since baseline (74%)
Target 12	Vic	89.9	29.8	Very unlikely (<10%)	Worsened since baseline (>90%)	64.4	Very unlikely (<10%)	Worsened since baseline (>90%)	49.0	Very unlikely (<10%)	Worsened since baseline (>90%)	49.0	Very unlikely (<10%)	Worsened since baseline (>90%)
Target 12	WA	64.2	29.8	Very unlikely (<10%)	Worsened since baseline (49%)	39.1	Very unlikely (<10%)	Worsened since baseline (50%)	35.0	Very unlikely (<10%)	Worsened since baseline (49%)	35.0	Very unlikely (<10%)	Worsened since baseline (49%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 15A	ACT	0.0	40.4	Very unlikely (<10%)	No noticeable change since baseline (>90%)	7.7	Very unlikely (<10%)	No noticeable change since baseline (>90%)	15.6	Very unlikely (<10%)	No noticeable change since baseline (>90%)	15.6	Very unlikely (<10%)	No noticeable change since baseline (>90%)
Target 15A	NSW	0.8	40.4	Very unlikely (<10%)	No noticeable change since baseline (>90%)	8.5	Very unlikely (<10%)	No noticeable change since baseline (>90%)	16.3	Very unlikely (<10%)	No noticeable change since baseline (>90%)	16.3	Very unlikely (<10%)	No noticeable change since baseline (>90%)
Target 15A	NT	70.0	70.0	Very unlikely (<10%)	Worsened since baseline (>90%)	77.6	Very likely (>90%)	Improved since baseline (>90%)	74.7	Very likely (>90%)	Improved since baseline (>90%)	74.7	Very likely (>90%)	Improved since baseline (>90%)
Target 15A	Qld	30.6	40.4	Very likely (>90%)	Improved since baseline (>90%)	38.3	Very likely (>90%)	Improved since baseline (>90%)	41.5	Very likely (>90%)	Improved since baseline (>90%)	41.5	Very likely (>90%)	Improved since baseline (>90%)
Target 15A	SA	76.6	76.6	Very unlikely (<10%)	Worsened since baseline (>90%)	84.2	Very unlikely (<10%)	Improved since baseline (>90%)	80.2	Very unlikely (<10%)	Improved since baseline (>90%)	80.2	Very unlikely (<10%)	Improved since baseline (>90%)
Target 15A	Tas	0.9	40.4	Very unlikely (<10%)	No noticeable change since baseline (>90%)	8.6	Very unlikely (<10%)	No noticeable change since baseline (>90%)	16.4	Very unlikely (<10%)	No noticeable change since baseline (>90%)	16.4	Very unlikely (<10%)	No noticeable change since baseline (>90%)
Target 15A	Vic	6.6	40.4	Very unlikely (<10%)	Improved since baseline (87%)	14.2	Very unlikely (<10%)	Improved since baseline (>90%)	21.1	Very unlikely (<10%)	Improved since baseline (>90%)	21.1	Very unlikely (<10%)	Improved since baseline (>90%)
Target 15A	WA	65.6	65.6	Very unlikely (<10%)	Worsened since baseline (>90%)	73.3	Very likely (>90%)	Improved since baseline (>90%)	71.0	Very likely (>90%)	Improved since baseline (>90%)	71.0	Very likely (>90%)	Improved since baseline (>90%)
Target 15B	NSW	0.2	25.1	Very unlikely (<10%)	No noticeable change since baseline (>90%)	3.5	Very unlikely (<10%)	No noticeable change since baseline (>90%)	4.4	Very unlikely (<10%)	No noticeable change since baseline (>90%)	4.4	Very unlikely (<10%)	No noticeable change since baseline (>90%)

Target	Jurisdiction	Baseline value	Equal outcomes			Equal absolute improvement			Equal relative improvement			Equal relative improvement (with constrained outliers)		
			Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change	Target value	Probability of meeting the target	Most likely direction of change
Target 15B	NT	4.5	25.1	Very unlikely (<10%)	No noticeable change since baseline (>90%)	7.8	Very unlikely (<10%)	No noticeable change since baseline (>90%)	8.5	Very unlikely (<10%)	No noticeable change since baseline (>90%)	8.5	Very unlikely (<10%)	No noticeable change since baseline (>90%)
Target 15B	Qld	19.8	25.1	Very likely (>90%)	Improved since baseline (>90%)	23.1	Very likely (>90%)	Improved since baseline (>90%)	23.2	Very likely (>90%)	Improved since baseline (>90%)	23.2	Very likely (>90%)	Improved since baseline (>90%)
Target 15B	SA	0.6	25.1	About as likely as not (38%)	Improved since baseline (>90%)	3.9	Likely (90%)	Improved since baseline (>90%)	4.8	Likely (86%)	Improved since baseline (>90%)	4.8	Likely (86%)	Improved since baseline (>90%)
Target 15B	Tas	0.0	25.1	Very unlikely (<10%)	No noticeable change since baseline (>90%)	3.3	Very unlikely (<10%)	No noticeable change since baseline (>90%)	4.2	Very unlikely (<10%)	No noticeable change since baseline (>90%)	4.2	Very unlikely (<10%)	No noticeable change since baseline (>90%)
Target 15B	Vic	2.6	25.1	Very unlikely (<10%)	Improved since baseline (85%)	5.9	Very unlikely (<10%)	Improved since baseline (>90%)	6.7	Very unlikely (<10%)	Improved since baseline (>90%)	6.7	Very unlikely (<10%)	Improved since baseline (>90%)
Target 15B	WA	34.2	34.2	Very unlikely (<10%)	Worsened since baseline (>90%)	37.5	Very unlikely (<10%)	Improved since baseline (>90%)	37.0	Very unlikely (<10%)	Improved since baseline (>90%)	37.0	Very unlikely (<10%)	Improved since baseline (>90%)

Chapter 6: Conclusion and recommendations

Achieving the targets specified in the National Agreement will require that all governments undertake iterative processes of monitoring progress and adjusting policies and resourcing to achieve the desired outcomes. The Productivity Commission is obligated under the National Agreement to perform certain reporting roles to assess progress towards targets and publish those assessments. This report has:

- described the current method for assessing progress towards the targets
- analysed the current data used for assessing progress towards the targets, aiming both to ensure the cultural safety and relevance of the assessment and to ensure that the method is fit for purpose
- analysed the current methods used for assessing progress towards the targets
- developed an alternative method for assessing progress towards the targets
- devised options for setting state and territory targets and trajectories.

The most important finding relates to the data used to assessing progress towards the targets. The data have two sorts of shortcomings, relating to efficacy and cultural suitability. For many of the targets, monitoring of progress is hampered because of massive gaps in the data. In many cases, there are large 'reporting gaps' in the data due to a combination of low frequency data collections (up to five years in the case of Census-based measures) and slow reporting of data (up to three years). In some cases, policymakers must make do with data and assessments of progress that are up to seven years out-of-date, which renders the exercise of monitoring progress unhelpful from a policy perspective, does not promote accountability and is disrespectful to the Closing the Gap objective, and to Indigenous people. Data need to be reported annually, and with relatively short lag times from data collection to data publication. In other cases, there are simply no data, such as for life expectancy in some states and territories. In yet other cases, there is no clear timeline for future data collections. The efficacy of data monitoring is also compromised because of the use of different data sources to calculate population numerators and denominators, leading to substantial revisions of observed data in some cases. Many of these shortcomings can be resolved by significant data development, including making use of contemporary data linking technologies.

Our culturally informed assessment identified significant concerns relating to the cultural safety and relevance of data. These concerns are at multiple levels, including conceptual ('what is the target trying to measure?'), interpretation ('how should these data be best expressed?'), data collection focused ('are these data collected in a manner that is ethical and likely to produce accurate results?') and the capacity of Aboriginal and Torres Strait Islander people, their communities, organisations and businesses to be informed on *current* outcomes and progress and work with governments, and hold them to account. Accordingly, we urge the Productivity Commission and the PWG to commission a thorough Indigenous-led culturally-informed review of the data used to monitor the Closing the Gap socioeconomic targets to systematically identify potential problems with the targets and data, and to identify avenues to mitigate those problems.

This report has identified several improvements that can be made to the method of assessing progress, as well as to the presentation of those assessments. These particularly relate to estimates of confidence in the assessments of progress. While important, these are relatively minor compared to the larger picture outlined above.

Finally, we have devised three options for calculating adequate state and territory contributions to meeting national targets. From these three options, we believe that the 'equal relative increase' option exhibits the best

performance on jurisdictional data, and is most consistent with the principles articulated in Article 83 of the National Agreement.

Recommendations

1. **Recommendation:** That a process for auditing the cultural relevance and safety of target data and data collection processes be undertaken as part of the first Independent Aboriginal and Torres Strait Islander-led review of the National Agreement on Closing the Gap.
2. **Recommendation:** That the Partnership Working Group consider the suitability of the current disaggregations for representing the diversity of Indigenous circumstances. That the Partnership Working Group consider requesting that the Productivity Commission assess the adequacy of progress towards meeting targets among different disaggregated Indigenous population groups.
3. **Recommendation:** That Parties to the National Agreement on Closing the Gap commit to establishing a Bureau of Indigenous Data with responsibilities including the work of assessing progress towards meeting socioeconomic targets under the National Agreement, including reporting and data governance.
4. **Recommendation:** That parties to the National Agreement leverage existing data sources to monitor Targets 3, 10, 11, and 12 using via the Person Level Integrated Data Asset to avoid the biased and at times mathematically impossible observations that result from the numerator–denominator mismatch.
5. **Recommendation:** That the ABS consider producing estimates of Indigenous life expectancy more frequently than every five years.
6. **Recommendation:** That parties to the National Agreement leverage existing data sources to monitor Targets 5, 6, 7, 8 and 9A annually using the Person Level Integrated Data Asset to increase the currency of assessments of progress.
7. **Recommendation:** That the Australian Government resource data collection for Target 4 at least biennially.
8. **Recommendation:** That the Australian Government urgently address the collection of data for Targets 9B, 13, 16 and 17, including the provision of appropriate resourcing.
9. **Recommendation:** That, if the current method is retained, the Productivity Commission change the statistical test used to determine if a target is changing over time.
10. **Recommendation:** That the Productivity Commission consider adopting the alternative approach to assessing progress towards meeting targets that can better represent the uncertainty of the assessment and that can take advantage of additional information about variation in the measure.
11. **Recommendation:** That the Productivity Commission consider a visual redesign of the Dashboard and Annual Data Compilation Report be undertaken. If the alternative method is used, then focus on the probability of a target being met in the target year. If the current method is retained: gives a greater visual prominence to the confidence levels of the assessment, and to the currency of the assessment; represents assessments visually with greater consistency; and includes both the assessment and confidence in a single visual icon.

12. Recommendation: That the 'equal relative improvement with constrained outliers' option is used to devise state and territory contributions and trajectories, weighting populations according to official 2021 population estimates.

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Appendix 1: State and territory trajectories by target by calculation option

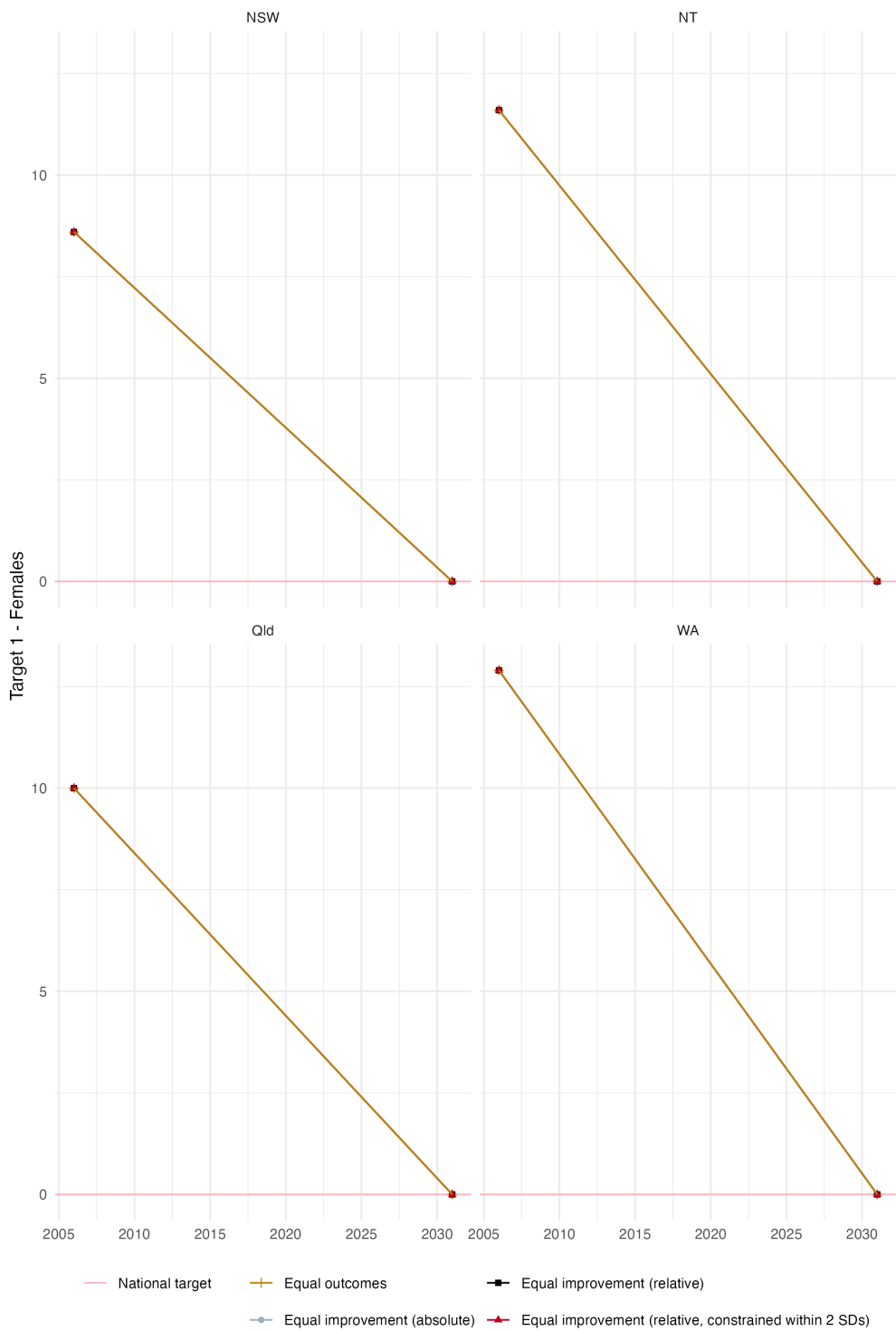


Figure 6: Options for state and territory contribution targets and trajectories, Target 1, females (life expectancy)

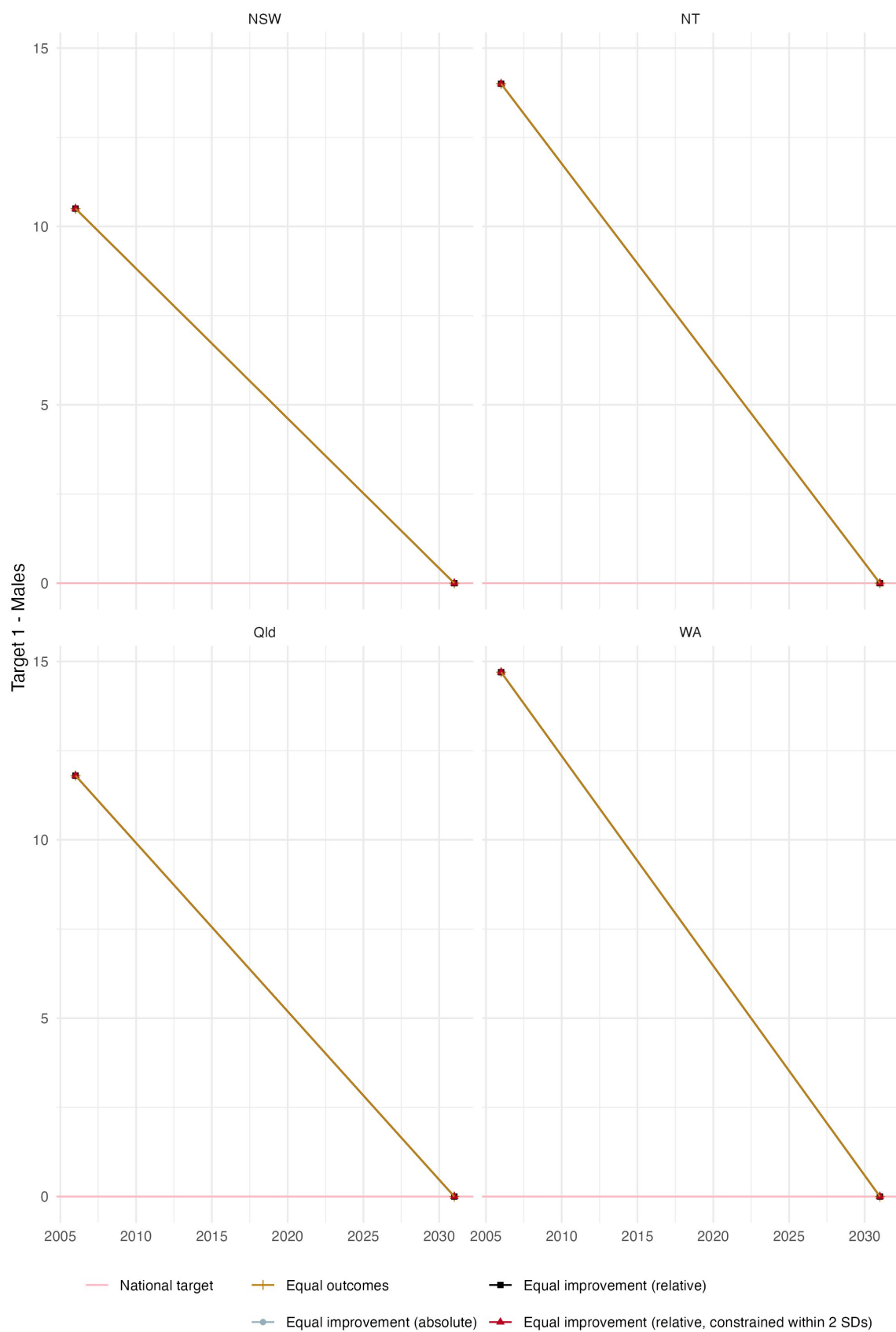


Figure 7: Options for state and territory contribution targets and trajectories, Target 1, males (life expectancy)

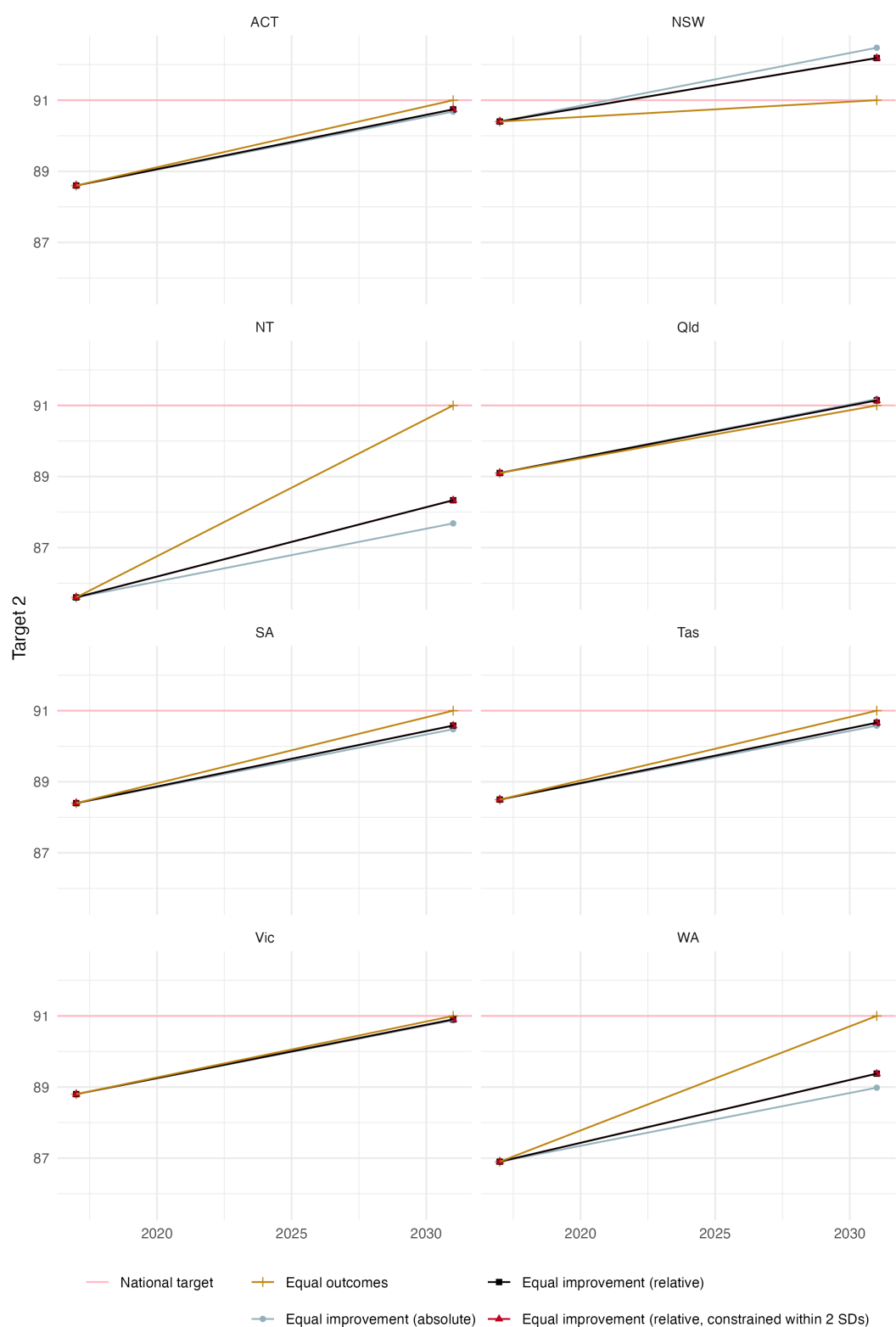


Figure 8: Options for state and territory contribution targets and trajectories, Target 2 (healthy birthweight)

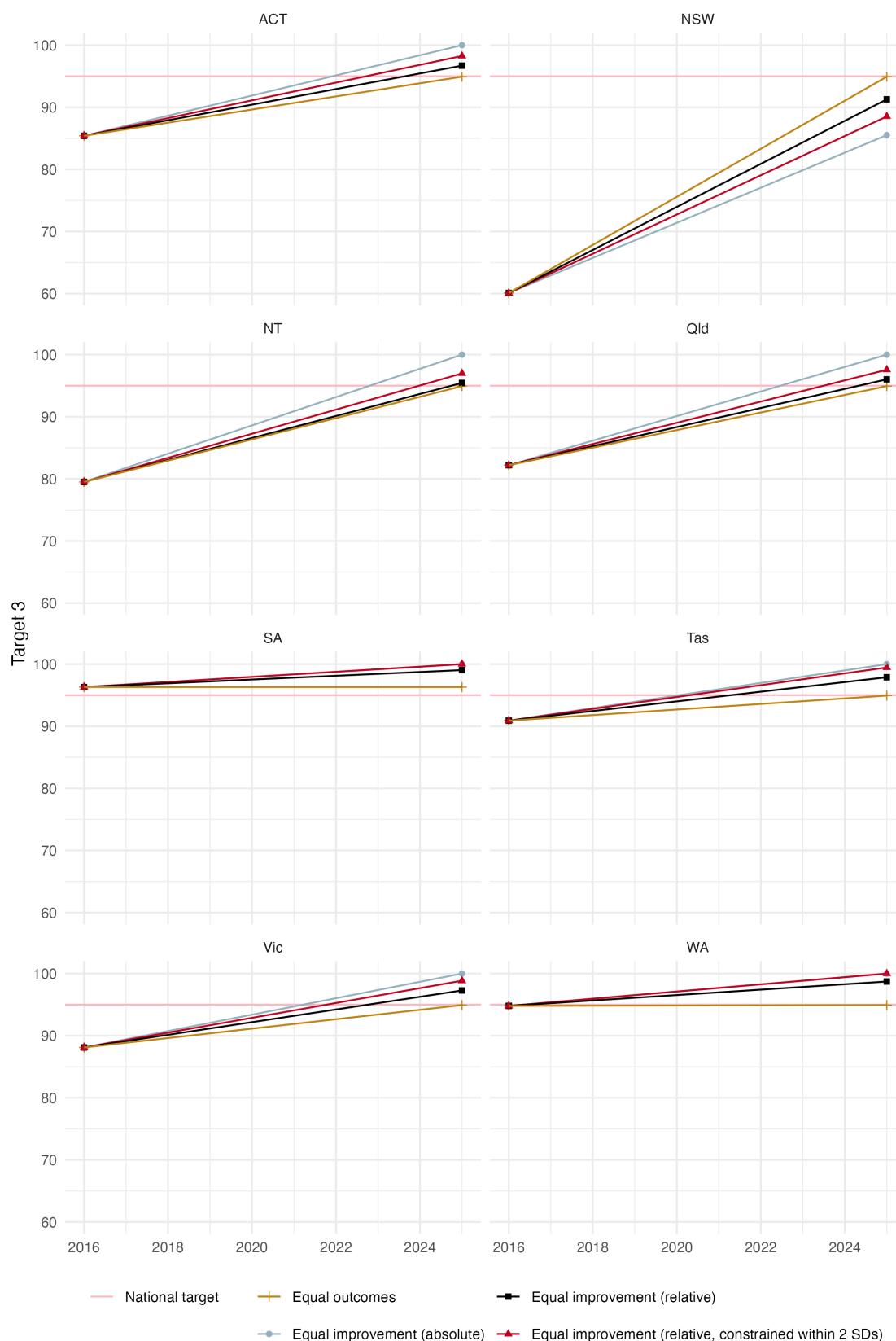


Figure 9: Options for state and territory contribution targets and trajectories, Target 3 (preschool enrolment)

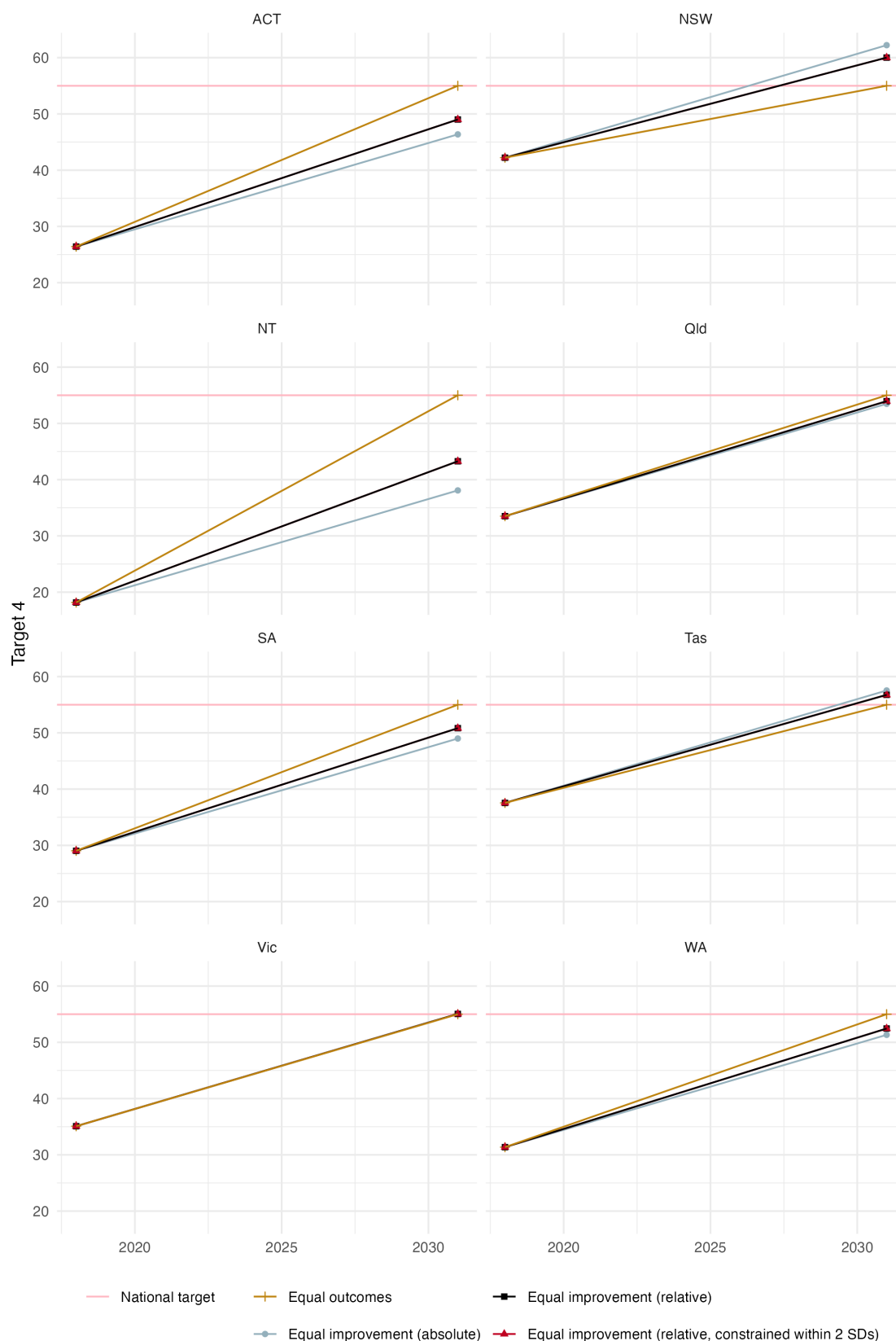


Figure 10: Options for state and territory contribution targets and trajectories, Target 4 (child development)

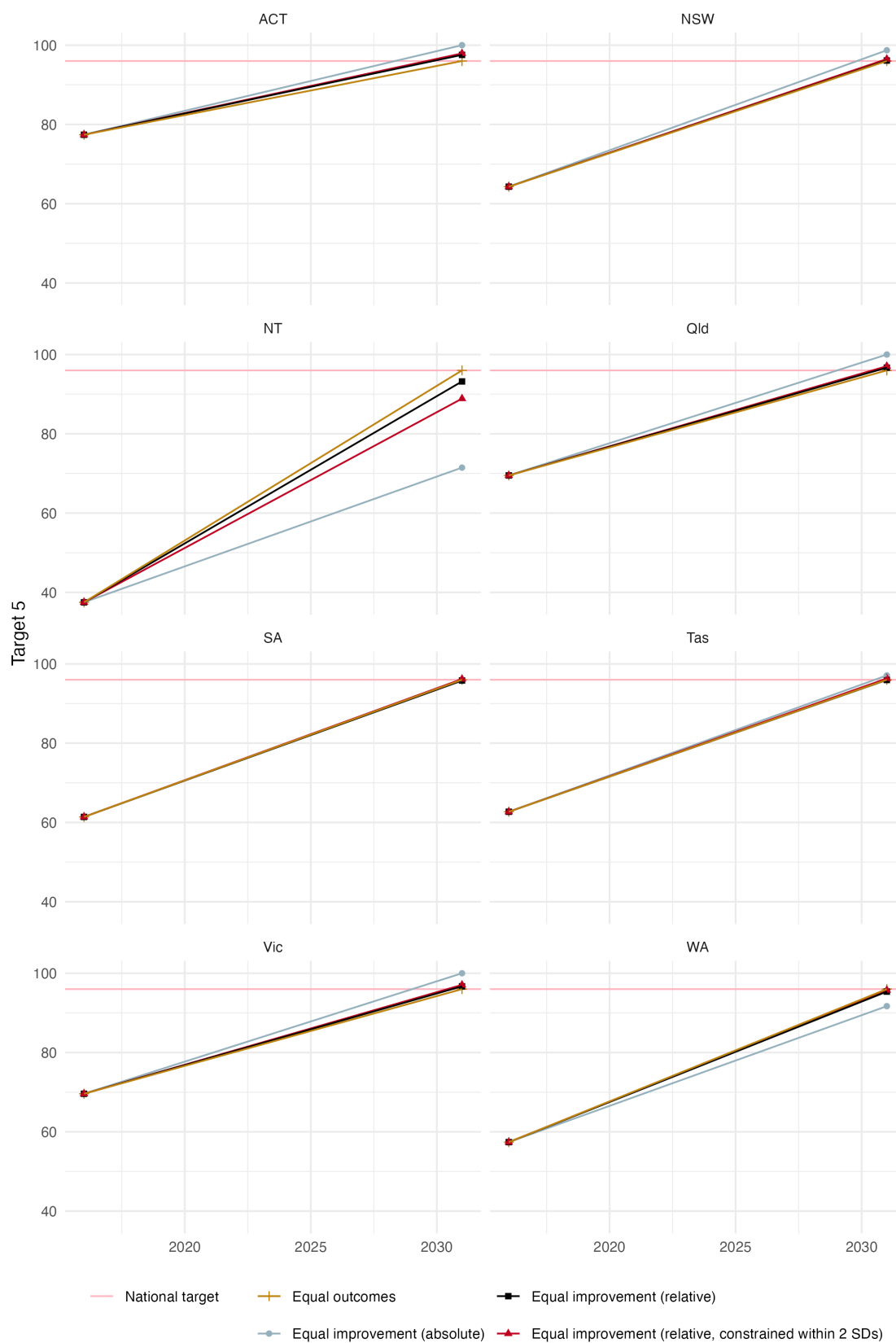


Figure 11: Options for state and territory contribution targets and trajectories, Target 5 (Year 12 attainment)

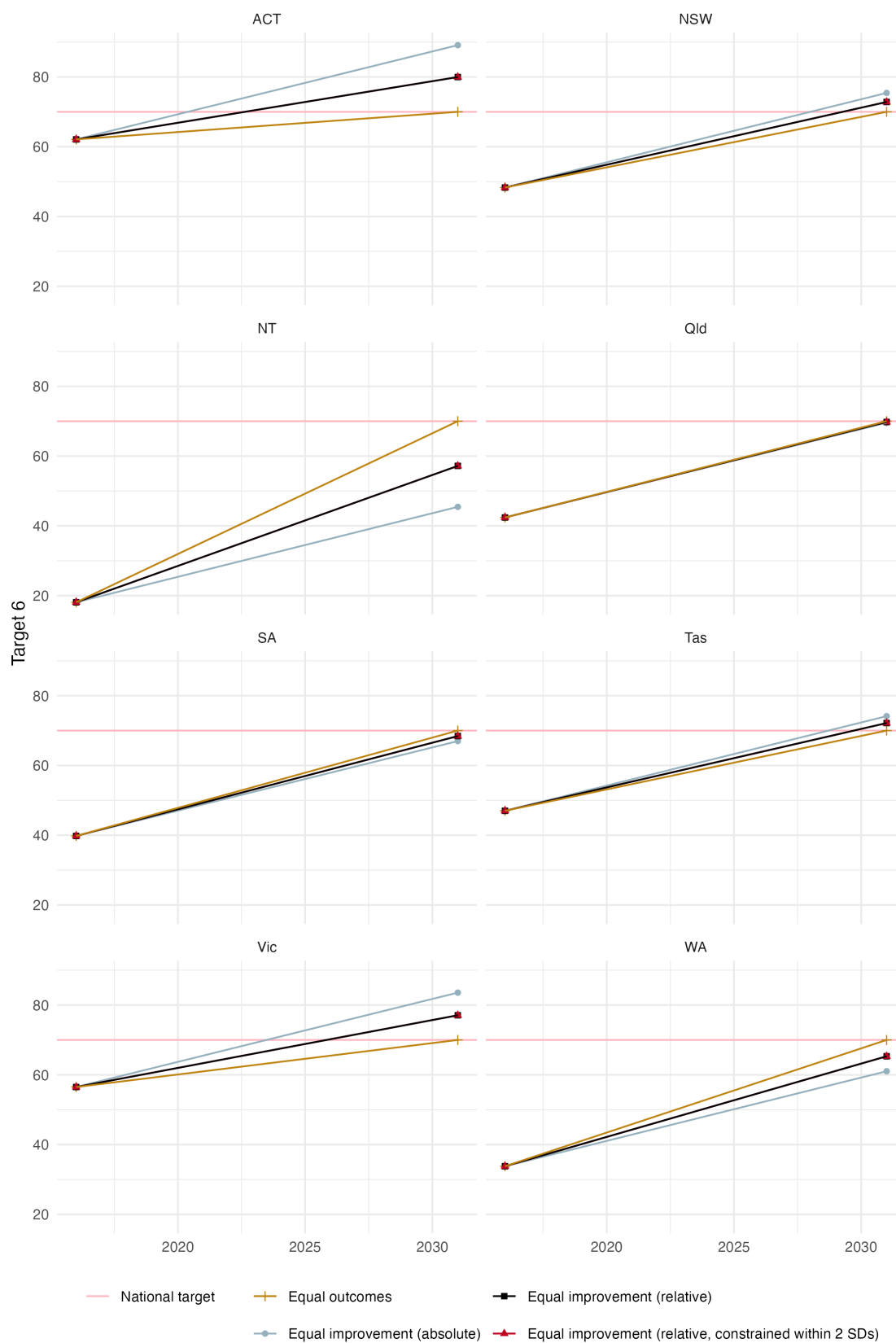


Figure 12: Options for state and territory contribution targets and trajectories, Target 6 (tertiary education)

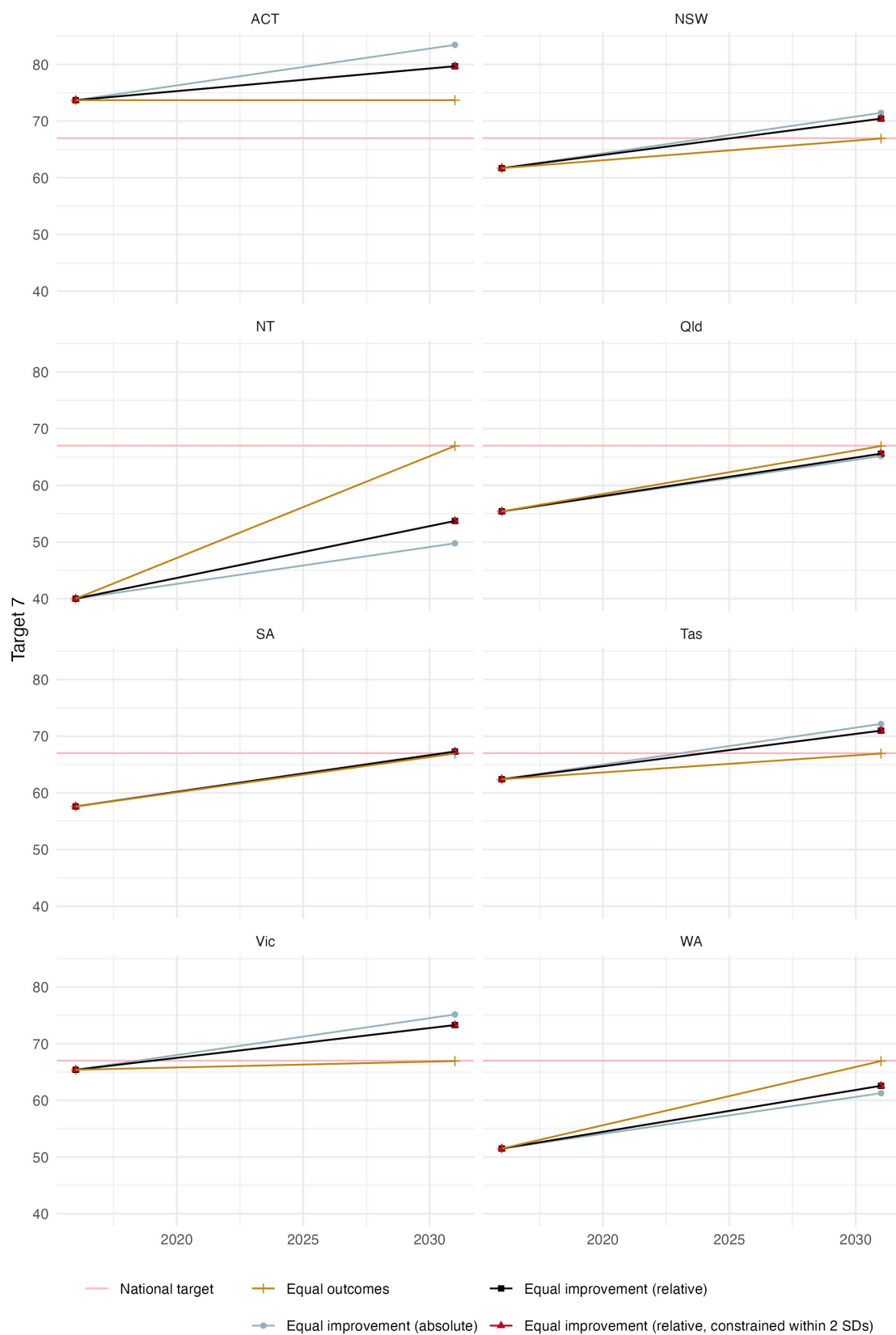


Figure 13: Options for state and territory contribution targets and trajectories, Target 7 (youth engagement)

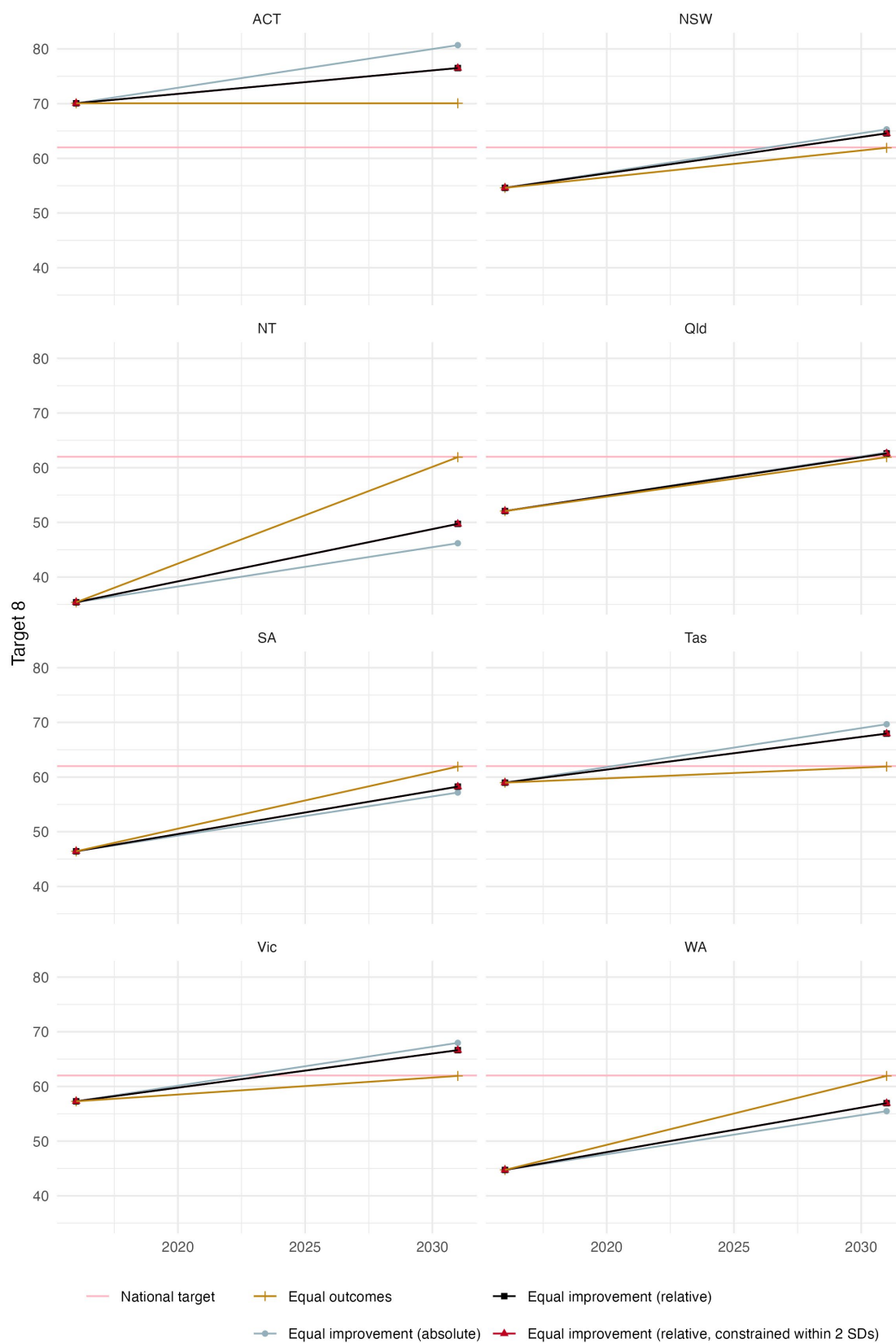


Figure 14: Options for state and territory contribution targets and trajectories, Target 8 (adult employment)

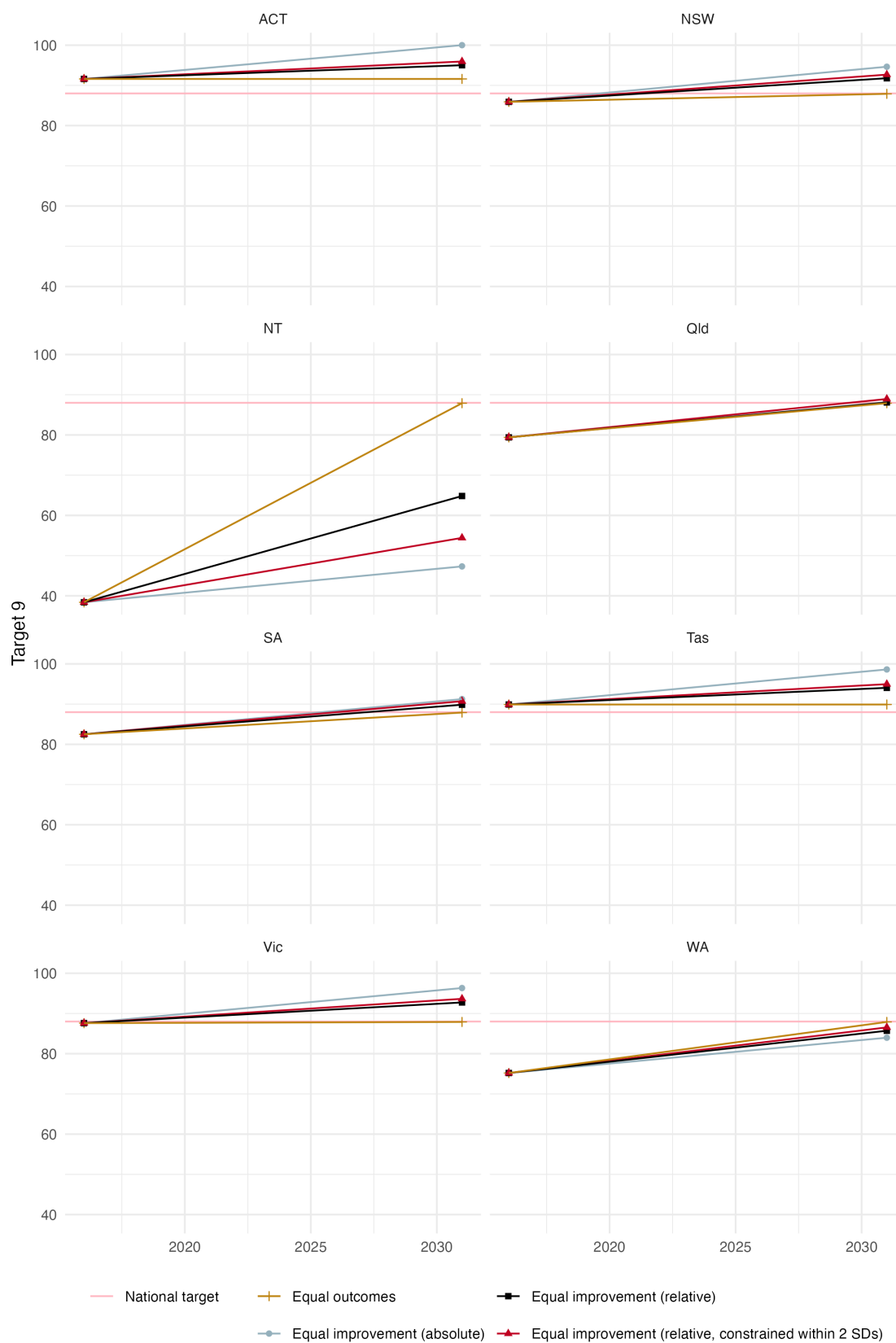


Figure 15: Options for state and territory contribution targets and trajectories, Target 9A (overcrowding)

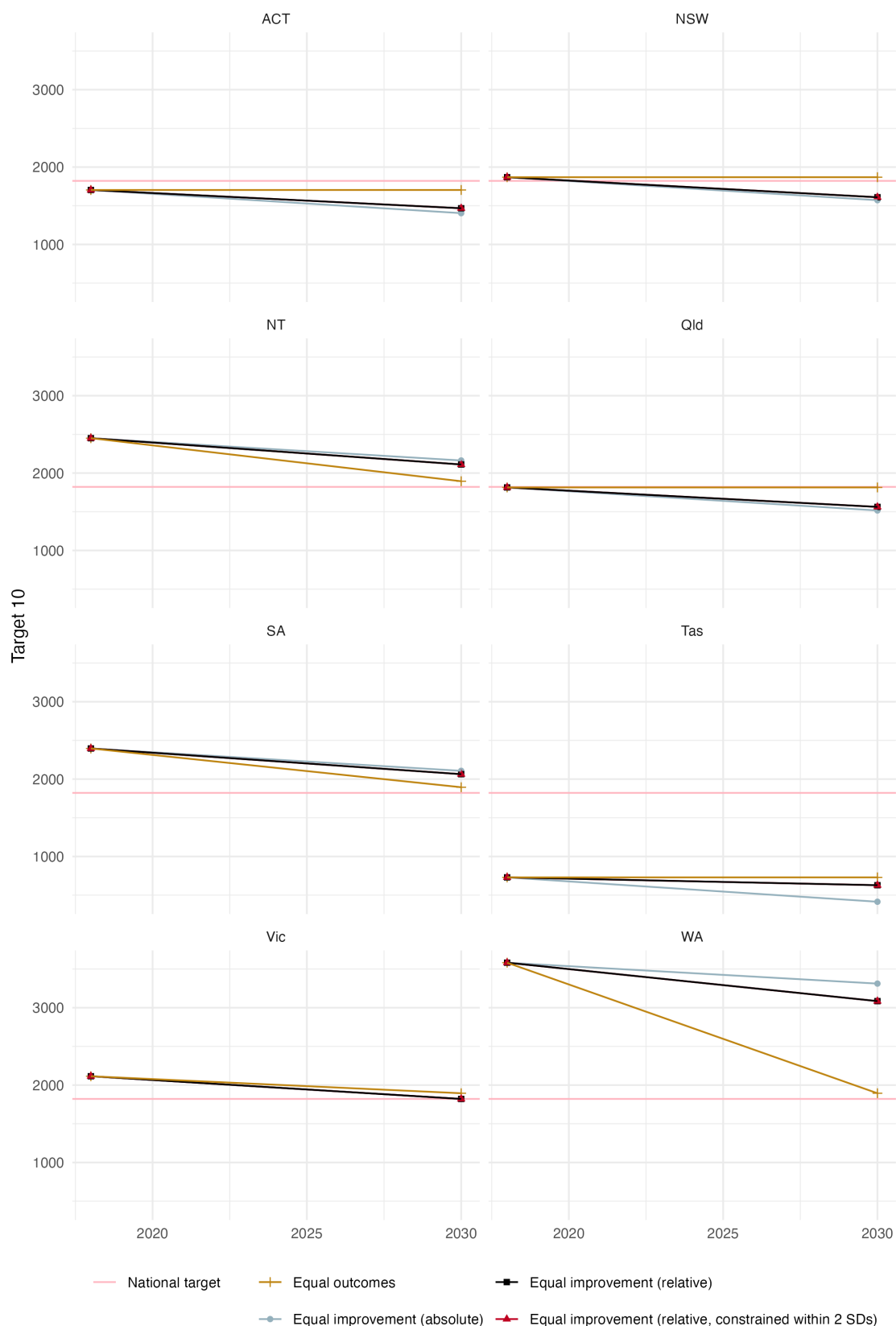


Figure 16: Options for state and territory contribution targets and trajectories, Target 10 (incarceration)

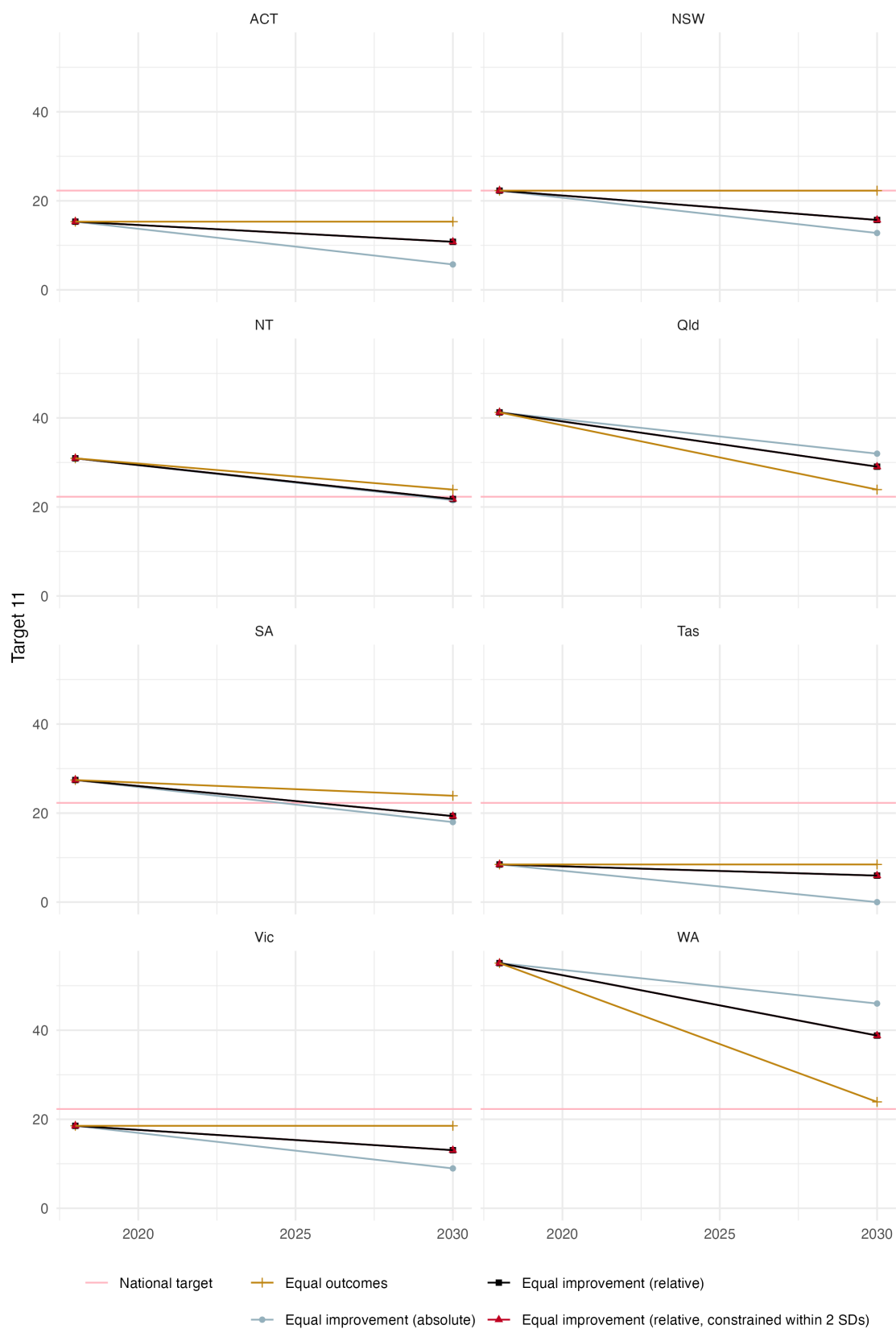


Figure 17: Options for state and territory contribution targets and trajectories, Target 11 (youth detention)

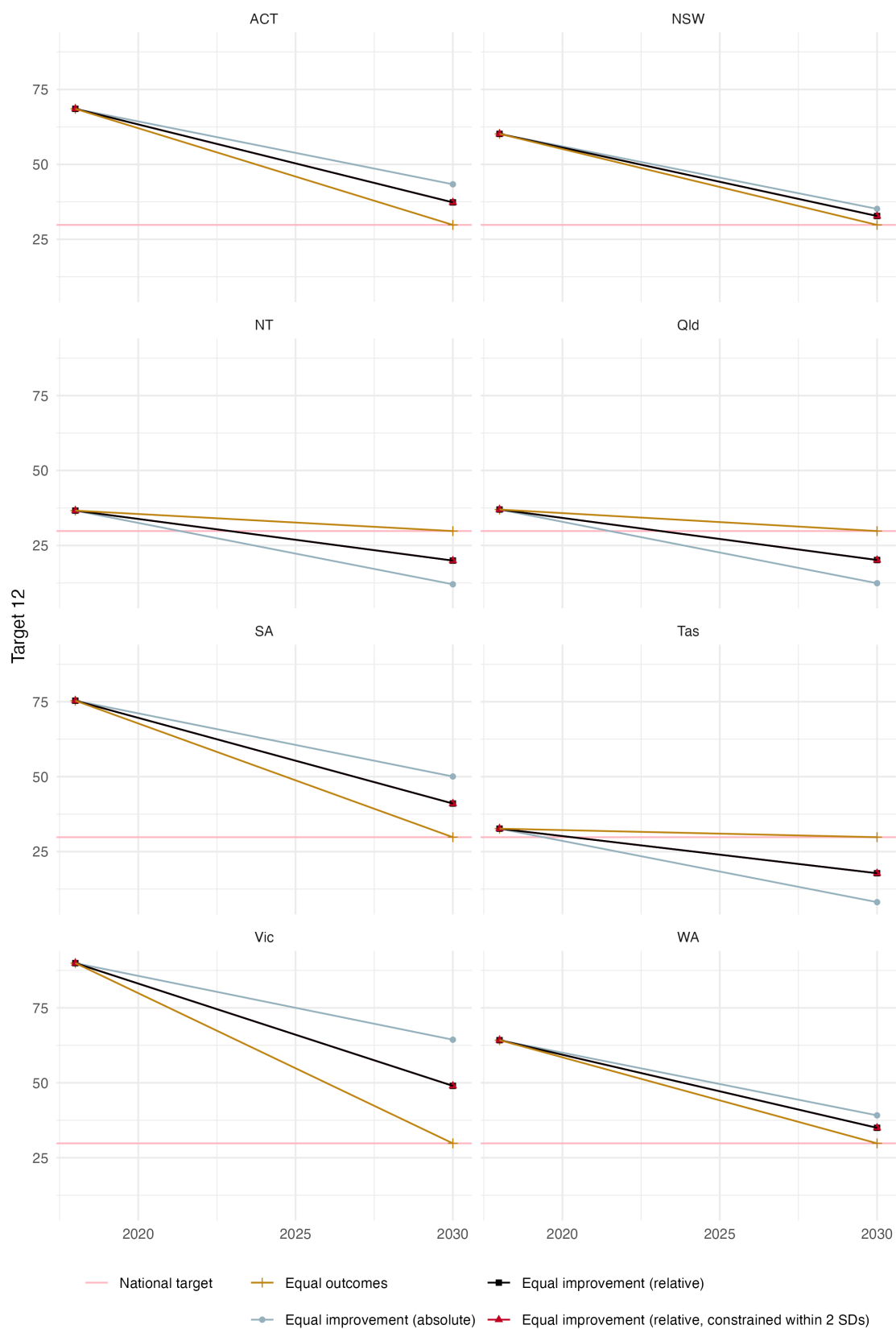


Figure 18: Options for state and territory contribution targets and trajectories, Target 12 (out-of-home care)

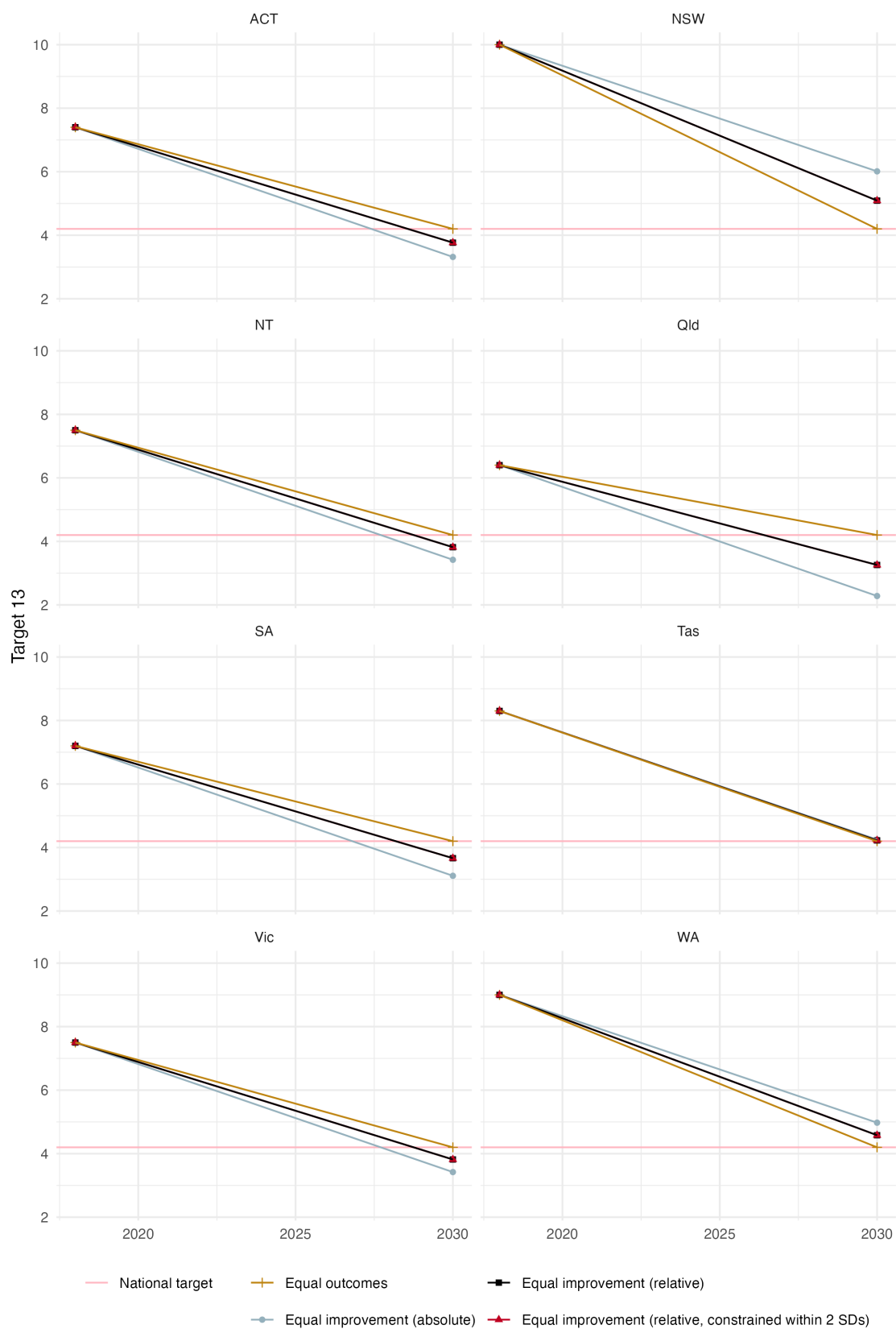


Figure 19: Options for state and territory contribution targets and trajectories, Target 13 (family violence)

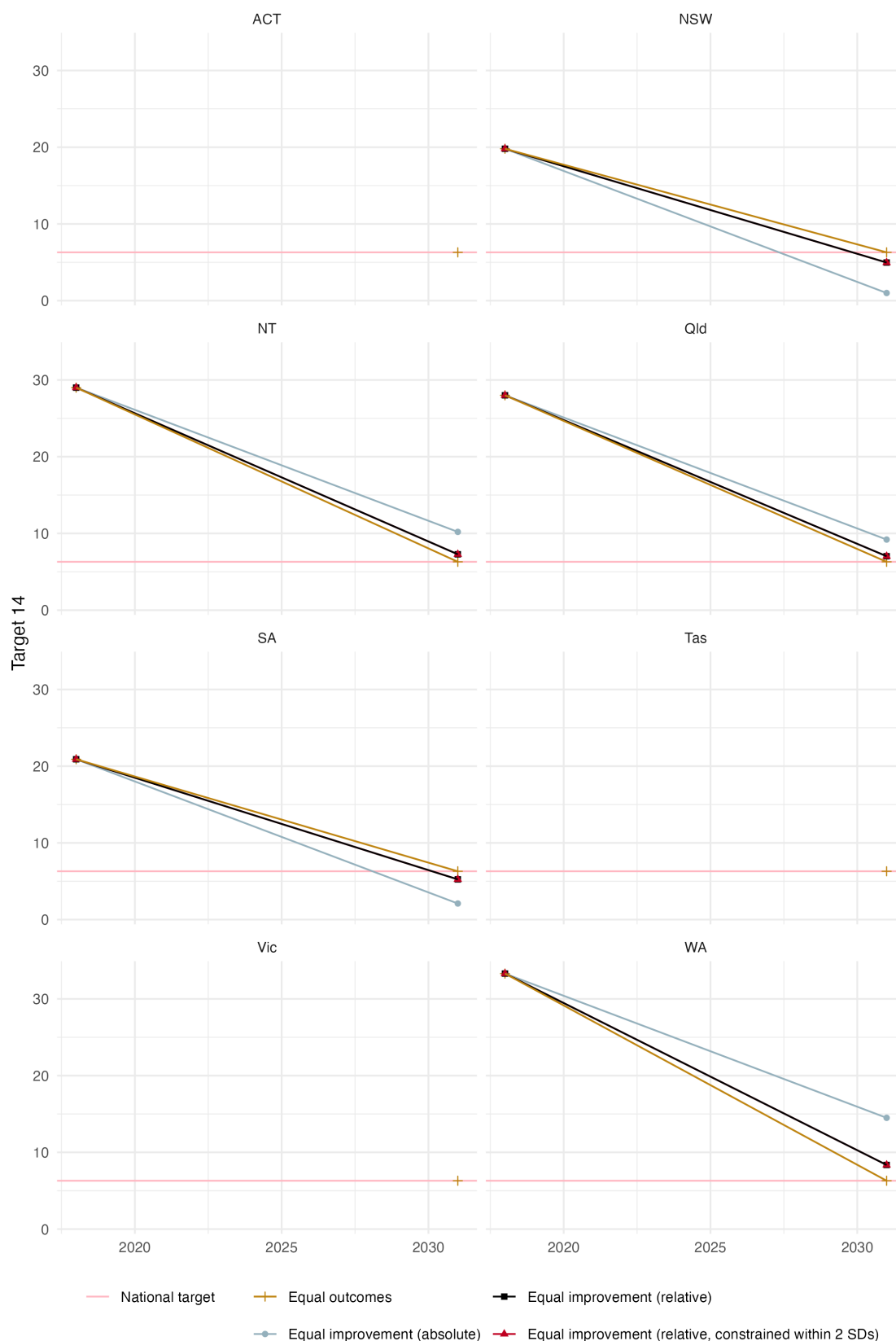


Figure 20: Options for state and territory contribution targets and trajectories, Target 14 (suicide), applied to the Productivity Commission's notional 75% reduction national target

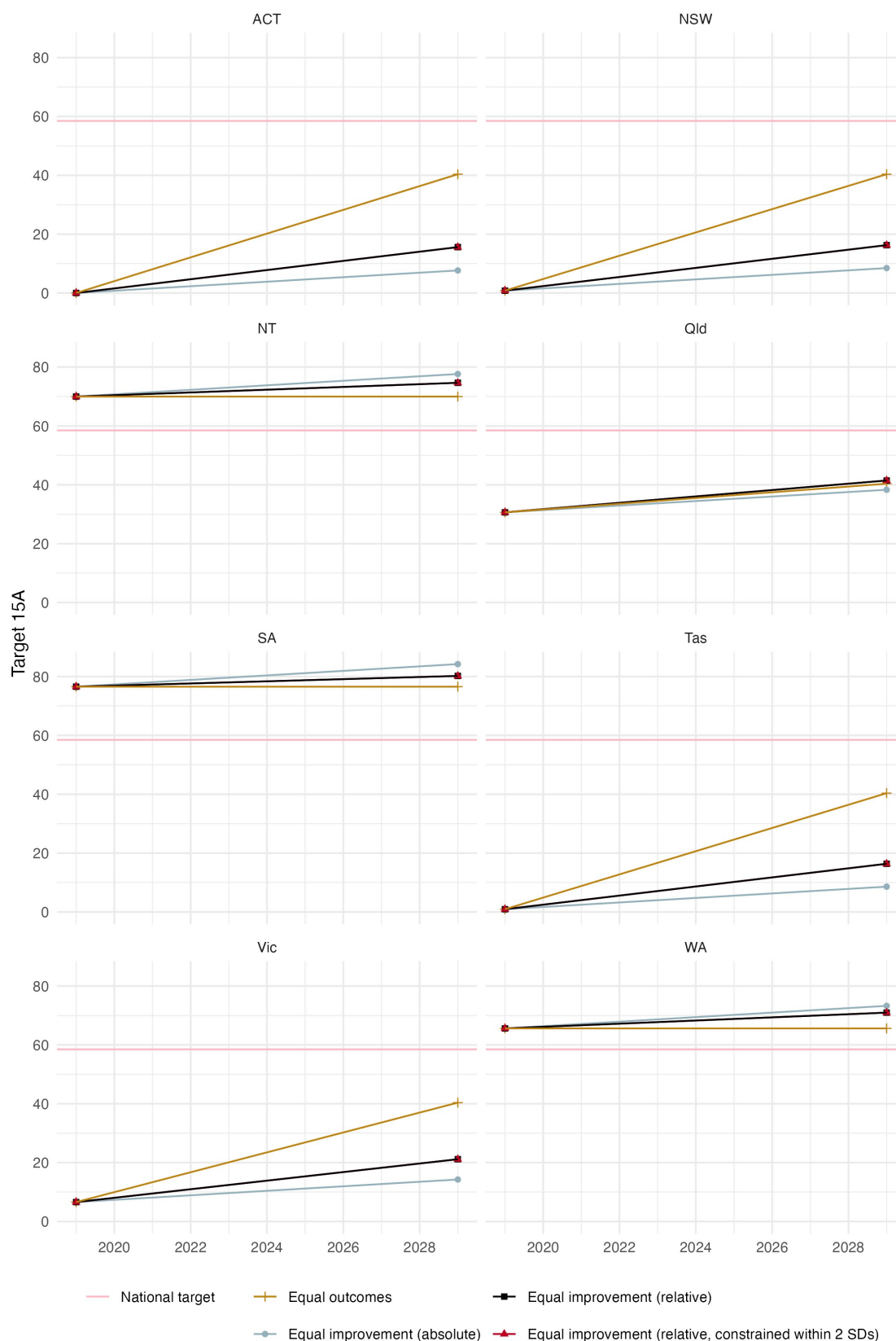


Figure 21: Options for state and territory contribution targets and trajectories, Target 15A (land rights and interests)

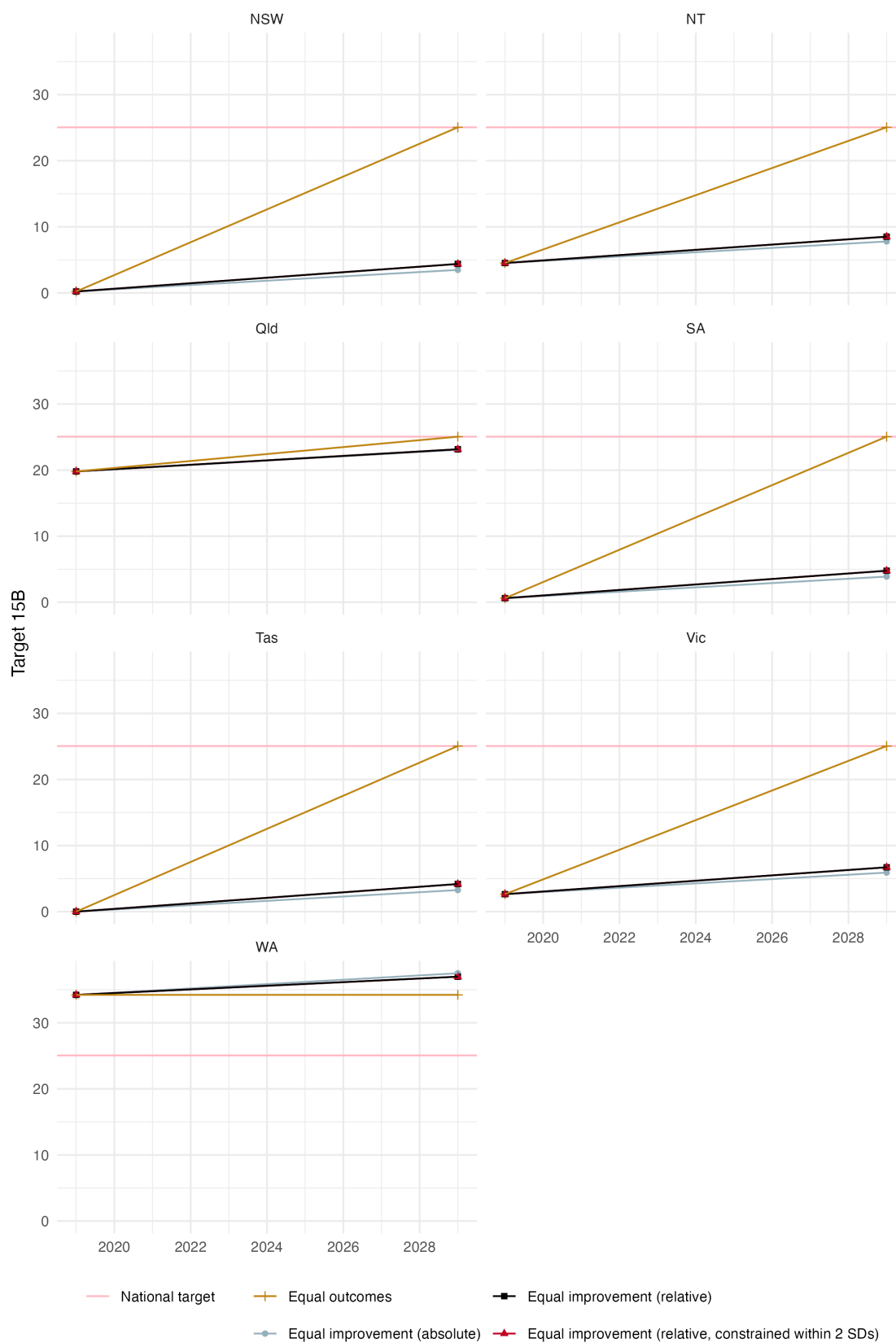


Figure 22: Options for state and territory contribution targets and trajectories, Target 15B (sea rights and interests)

Appendix 2: The effect of using different population weighting schemes

Table 10: State and territory contribution targets in target year using the equal relative improvement method and three different population weighting schemes

Target	Jurisdiction	Value in baseline year	Target value in target year			
			ABS (2019) projections	ABS (2024) projections	2021 Census-based population estimates	Extrapolation of 2001–2021 growth rates to 2031
Target 2	ACT	88.6	90.8	90.7	90.7	90.7
	NSW	90.4	92.2	92.2	92.2	92.1
	NT	85.6	88.4	88.3	88.3	88.2
	Qld	89.1	91.2	91.1	91.1	91.1
	SA	88.4	90.6	90.6	90.6	90.5
	Tas	88.5	90.7	90.6	90.7	90.6
	Vic	88.8	90.9	90.9	90.9	90.8
	WA	86.9	89.4	89.4	89.4	89.3
Target 3	ACT	85.4	96.6	96.7	96.7	96.8
	NSW	60.1	91.2	91.3	91.3	91.3
	NT	79.5	95.4	95.4	95.4	95.5
	Qld	82.2	96.0	96.0	96.0	96.1
	SA	96.3	99.0	99.0	99.0	99.1
	Tas	90.9	97.8	97.9	97.9	97.9
	Vic	88.1	97.2	97.3	97.3	97.3
	WA	94.8	98.7	98.7	98.7	98.8
Target 4	ACT	26.4	49.1	48.9	49.0	48.7
	NSW	42.2	60.1	59.9	60.0	59.6
	NT	18.2	43.4	43.2	43.3	43.0
	Qld	33.5	54.1	53.9	53.9	53.6
	SA	29.0	50.9	50.8	50.8	50.5
	Tas	37.5	56.9	56.7	56.8	56.4
	Vic	35.1	55.2	55.0	55.0	54.7
	WA	31.4	52.6	52.4	52.5	52.1
Target 5	ACT	77.4	97.5	97.5	97.5	97.5
	NSW	64.3	96.1	96.1	96.1	96.1
	NT	37.5	93.2	93.2	93.2	93.1
	Qld	69.5	96.7	96.7	96.7	96.6
	SA	61.4	95.8	95.8	95.8	95.7
	Tas	62.7	95.9	95.9	95.9	95.9
	Vic	69.6	96.7	96.7	96.7	96.6
	WA	57.4	95.4	95.3	95.4	95.3
Target 6	ACT	62.1	80.1	79.8	80.0	79.5

Target	Jurisdiction	Value in baseline year	Target value in target year			
			ABS (2019) projections	ABS (2024) projections	2021 Census-based population estimates	Extrapolation of 2001–2021 growth rates to 2031
	NSW	48.3	72.9	72.7	72.8	72.4
	NT	18.1	57.2	57.1	57.2	56.9
	Qld	42.4	69.8	69.7	69.8	69.4
	SA	39.8	68.5	68.3	68.4	68.0
	Tas	47.0	72.2	72.0	72.2	71.7
	Vic	56.5	77.2	76.9	77.1	76.6
	WA	33.8	65.4	65.2	65.3	64.9
Target 7	ACT	73.7	79.8	79.6	79.7	79.2
	NSW	61.7	70.5	70.3	70.4	70.0
	NT	40.0	53.8	53.6	53.7	53.4
	Qld	55.4	65.7	65.5	65.6	65.2
	SA	57.6	67.4	67.2	67.3	66.9
	Tas	62.4	71.1	70.9	71.0	70.5
	Vic	65.4	73.4	73.2	73.3	72.8
	WA	51.5	62.7	62.5	62.6	62.2
Target 8	ACT	70.1	76.6	76.4	76.5	76.0
	NSW	54.6	64.6	64.4	64.6	64.2
	NT	35.4	49.8	49.6	49.7	49.4
	Qld	52.1	62.7	62.5	62.6	62.2
	SA	46.4	58.3	58.1	58.3	57.9
	Tas	59.0	68.0	67.8	67.9	67.5
	Vic	57.3	66.7	66.5	66.6	66.2
	WA	44.7	57.0	56.8	56.9	56.6
Target 9	ACT	91.6	95.1	94.8	95.0	94.4
	NSW	85.9	91.9	91.6	91.8	91.2
	NT	38.4	64.9	64.7	64.8	64.4
	Qld	79.4	88.2	87.9	88.1	87.5
	SA	82.5	89.9	89.7	89.8	89.3
	Tas	89.9	94.1	93.8	94.0	93.5
	Vic	87.6	92.8	92.5	92.7	92.2
	WA	75.2	85.8	85.5	85.7	85.2
Target 10	ACT	1703.9	1465.3	1470.6	1467.6	1483.6
	NSW	1868.9	1607.2	1613.0	1609.7	1627.2
	NT	2450.8	2107.6	2115.3	2110.9	2133.9
	Qld	1814.5	1560.4	1566.1	1562.9	1579.9
	SA	2395.5	2060.0	2067.5	2063.3	2085.7
	Tas	729.7	627.5	629.8	628.5	635.3
	Vic	2114.3	1818.2	1824.8	1821.1	1840.9
	WA	3581.8	3080.2	3091.4	3085.1	3118.7

Target	Jurisdiction	Value in baseline year	Target value in target year			
			ABS (2019) projections	ABS (2024) projections	2021 Census-based population estimates	Extrapolation of 2001–2021 growth rates to 2031
Target 11	ACT	15.3	10.7	10.7	10.8	11.0
	NSW	22.3	15.6	15.6	15.7	16.0
	NT	30.9	21.6	21.7	21.8	22.2
	Qld	41.2	28.8	28.9	29.1	29.5
	SA	27.4	19.2	19.2	19.3	19.7
	Tas	8.5	5.9	5.9	6.0	6.1
	Vic	18.5	12.9	13.0	13.1	13.3
	WA	55.1	38.5	38.6	38.8	39.5
Target 12	ACT	68.5	37.6	37.3	37.3	36.9
	NSW	60.2	33.0	32.8	32.8	32.4
	NT	36.6	20.1	19.9	19.9	19.7
	Qld	37.0	20.3	20.1	20.1	19.9
	SA	75.3	41.3	41.0	41.0	40.5
	Tas	32.7	17.9	17.8	17.8	17.6
	Vic	89.9	49.3	49.0	49.0	48.4
	WA	64.2	35.2	35.0	35.0	34.6
Target 13	ACT	7.4	3.8	3.8	3.8	3.7
	NSW	10.0	5.1	5.1	5.1	5.1
	NT	7.5	3.8	3.8	3.8	3.8
	Qld	6.4	3.3	3.3	3.3	3.2
	SA	7.2	3.7	3.7	3.7	3.6
	Tas	8.3	4.2	4.2	4.2	4.2
	Vic	7.5	3.8	3.8	3.8	3.8
	WA	9.0	4.6	4.6	4.6	4.6

Table 11: Jurisdictional relative population weights

Jurisdiction	ABS (2019) projections for 2031		ABS (2024) projections for 2031		Extrapolation of 2001–2021 growth rates to 2031		Land (time invariant)		Sea (time invariant)	
	Persons	%	Persons	%	Persons	%	km ²	%	km ²	%
ACT	11 285	1.0	11 913	1.0	14 868	1.0	2 358	0.03	–	0
NSW	353 667	34.5	404 365	34.3	539 108	36.9	800 642	10.4	9 336	2.3
NT	84 683	7.8	81 597	6.9	88 699	6.1	1 349 129	17.5	71 872	17.4
Qld	307 547	27.8	341 705	29.0	402 252	27.5	1 730 648	22.5	121 730	29.4
SA	56 100	5.3	60 776	5.2	74 340	5.1	983 482	12.8	60 225	14.5
Tas	36 307	3.4	38 605	3.3	47 250	3.2	68 401	0.9	23 859	5.8
Vic	83 966	8.0	96 608	8.2	132 296	9.1	227 416	3.0	10 031	2.4
WA	131 361	12.2	143 248	12.2	161 905	11.1	2 529 875	32.9	117 098	28.3

Appendix 3: State and territory outcomes under the different contribution calculation methods

Table 12: State and territory contributions for Target 1 - Females

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
NSW	EAI	8.6	0	0%	100%	0%	0%
	EO	8.6	0	0%	100%	0%	0%
	ERI	8.6	0	0%	100%	0%	0%
	ERI2SD	8.6	0	0%	100%	0%	0%
NT	EAI	11.6	0	0%	7%	4%	89%
	EO	11.6	0	0%	7%	4%	89%
	ERI	11.6	0	0%	7%	4%	89%
	ERI2SD	11.6	0	0%	7%	4%	89%
Qld	EAI	10.0	0	0%	97%	1%	2%
	EO	10.0	0	0%	97%	1%	2%
	ERI	10.0	0	0%	97%	1%	2%
	ERI2SD	10.0	0	0%	97%	1%	2%
WA	EAI	12.9	0	0%	77%	7%	15%
	EO	12.9	0	0%	77%	7%	15%
	ERI	12.9	0	0%	77%	7%	15%
	ERI2SD	12.9	0	0%	77%	7%	15%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 13: State and territory contributions for Target 1 - Males

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
NSW	EAI	10.5	0	0%	100%	0%	0%
	EO	10.5	0	0%	100%	0%	0%
	ERI	10.5	0	0%	100%	0%	0%
	ERI2SD	10.5	0	0%	100%	0%	0%
NT	EAI	14.0	0	0%	55%	6%	39%
	EO	14.0	0	0%	55%	6%	39%
	ERI	14.0	0	0%	55%	6%	39%
	ERI2SD	14.0	0	0%	55%	6%	39%
Qld	EAI	11.8	0	0%	98%	1%	1%
	EO	11.8	0	0%	98%	1%	1%
	ERI	11.8	0	0%	98%	1%	1%
	ERI2SD	11.8	0	0%	98%	1%	1%
WA	EAI	14.7	0	0%	93%	3%	4%
	EO	14.7	0	0%	93%	3%	4%
	ERI	14.7	0	0%	93%	3%	4%
	ERI2SD	14.7	0	0%	93%	3%	4%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 14: State and territory contributions for Target 2

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	88.6	90.7	48%	6%	0%	46%
	EO	88.6	91.0	47%	7%	0%	46%
	ERI	88.6	90.7	47%	6%	0%	46%
	ERI2SD	88.6	90.7	47%	6%	0%	46%
NSW	EAI	90.4	92.5	12%	25%	2%	61%
	EO	90.4	91.0	29%	9%	0%	62%
	ERI	90.4	92.2	14%	23%	1%	61%
	ERI2SD	90.4	92.2	14%	23%	1%	61%
NT	EAI	85.6	87.7	30%	12%	1%	57%
	EO	85.6	91.0	15%	27%	2%	56%
	ERI	85.6	88.3	27%	16%	1%	57%
	ERI2SD	85.6	88.3	27%	16%	1%	57%
Qld	EAI	89.1	91.2	89%	9%	0%	2%
	EO	89.1	91.0	90%	8%	0%	2%
	ERI	89.1	91.1	89%	9%	0%	2%
	ERI2SD	89.1	91.1	89%	9%	0%	2%
SA	EAI	88.4	90.5	26%	10%	1%	63%
	EO	88.4	91.0	24%	12%	1%	63%
	ERI	88.4	90.6	26%	10%	1%	63%
	ERI2SD	88.4	90.6	26%	10%	1%	63%
Tas	EAI	88.5	90.6	74%	7%	0%	18%
	EO	88.5	91.0	72%	9%	0%	18%
	ERI	88.5	90.7	74%	8%	0%	18%
	ERI2SD	88.5	90.7	74%	8%	0%	18%
Vic	EAI	88.8	90.9	87%	7%	0%	7%
	EO	88.8	91.0	86%	7%	0%	7%
	ERI	88.8	90.9	87%	7%	0%	7%
	ERI2SD	88.8	90.9	87%	7%	0%	7%
WA	EAI	86.9	89.0	54%	21%	1%	24%
	EO	86.9	91.0	33%	42%	2%	23%
	ERI	86.9	89.4	50%	25%	1%	24%
	ERI2SD	86.9	89.4	50%	25%	1%	24%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 15: State and territory contributions for Target 3

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	85.4	100.0	56%	42%	0%	1%
	EO	85.4	94.9	82%	17%	0%	1%
	ERI	85.4	96.7	75%	24%	0%	1%
	ERI2SD	85.4	98.3	67%	32%	0%	1%
NSW	EAI	60.1	85.5	100%	0%	0%	0%
	EO	60.1	94.9	97%	3%	0%	0%
	ERI	60.1	91.3	99%	1%	0%	0%
	ERI2SD	60.1	88.5	100%	0%	0%	0%
NT	EAI	79.5	100.0	0%	3%	1%	97%
	EO	79.5	94.9	0%	3%	1%	97%
	ERI	79.5	95.4	0%	3%	1%	97%
	ERI2SD	79.5	97.0	0%	3%	1%	97%
Qld	EAI	82.2	100.0	68%	32%	0%	0%
	EO	82.2	94.9	97%	3%	0%	0%
	ERI	82.2	96.0	95%	5%	0%	0%
	ERI2SD	82.2	97.6	89%	11%	0%	0%
SA	EAI	96.3	100.0	54%	44%	0%	2%
	EO	96.3	96.3	0%	0%	0%	100%
	ERI	96.3	99.0	74%	24%	0%	2%
	ERI2SD	96.3	100.0	54%	44%	0%	2%
Tas	EAI	90.9	100.0	65%	35%	0%	0%
	EO	90.9	94.9	98%	2%	0%	0%
	ERI	90.9	97.9	87%	13%	0%	0%
	ERI2SD	90.9	99.5	72%	28%	0%	0%
Vic	EAI	88.1	100.0	70%	30%	0%	0%
	EO	88.1	94.9	98%	2%	0%	0%
	ERI	88.1	97.3	91%	9%	0%	0%
	ERI2SD	88.1	98.9	81%	19%	0%	0%
WA	EAI	94.8	100.0	74%	26%	0%	0%
	EO	94.8	94.9	100%	0%	0%	0%
	ERI	94.8	98.7	95%	5%	0%	0%
	ERI2SD	94.8	100.0	74%	26%	0%	0%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 16: State and territory contributions for Target 4

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	26.4	46.4	2%	69%	6%	23%
	EO	26.4	55.0	0%	69%	8%	22%
	ERI	26.4	49.0	1%	69%	7%	23%
	ERI2SD	26.4	49.0	1%	69%	7%	23%
NSW	EAI	42.2	62.2	0%	1%	1%	99%
	EO	42.2	55.0	0%	1%	0%	99%
	ERI	42.2	60.0	0%	1%	0%	99%
	ERI2SD	42.2	60.0	0%	1%	0%	99%
NT	EAI	18.2	38.1	0%	11%	3%	86%
	EO	18.2	55.0	0%	10%	6%	85%
	ERI	18.2	43.3	0%	10%	4%	86%
	ERI2SD	18.2	43.3	0%	10%	4%	86%
Qld	EAI	33.5	53.5	11%	42%	3%	44%
	EO	33.5	55.0	9%	43%	4%	44%
	ERI	33.5	53.9	10%	43%	3%	44%
	ERI2SD	33.5	53.9	10%	43%	3%	44%
SA	EAI	29.0	49.0	15%	75%	2%	8%
	EO	29.0	55.0	6%	84%	3%	7%
	ERI	29.0	50.8	12%	78%	3%	7%
	ERI2SD	29.0	50.8	12%	78%	3%	7%
Tas	EAI	37.5	57.5	6%	56%	5%	33%
	EO	37.5	55.0	9%	54%	4%	33%
	ERI	37.5	56.8	7%	56%	4%	33%
	ERI2SD	37.5	56.8	7%	56%	4%	33%
Vic	EAI	35.1	55.1	0%	81%	11%	7%
	EO	35.1	55.0	0%	82%	11%	7%
	ERI	35.1	55.0	0%	81%	11%	7%
	ERI2SD	35.1	55.0	0%	81%	11%	7%
WA	EAI	31.4	51.3	0%	43%	7%	50%
	EO	31.4	55.0	0%	43%	8%	49%
	ERI	31.4	52.5	0%	43%	7%	50%
	ERI2SD	31.4	52.5	0%	43%	7%	50%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 17: State and territory contributions for Target 5

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	77.4	100.0	22%	73%	1%	4%
	EO	77.4	96.0	35%	60%	1%	4%
	ERI	77.4	97.5	30%	65%	1%	4%
	ERI2SD	77.4	97.9	29%	66%	1%	4%
NSW	EAI	64.3	98.7	0%	100%	0%	0%
	EO	64.3	96.0	0%	100%	0%	0%
	ERI	64.3	96.1	0%	100%	0%	0%
	ERI2SD	64.3	96.5	0%	100%	0%	0%
NT	EAI	37.5	71.5	3%	75%	5%	17%
	EO	37.5	96.0	0%	76%	9%	15%
	ERI	37.5	93.2	0%	76%	9%	15%
	ERI2SD	37.5	88.9	0%	76%	8%	16%
Qld	EAI	69.5	100.0	0%	100%	0%	0%
	EO	69.5	96.0	0%	100%	0%	0%
	ERI	69.5	96.7	0%	100%	0%	0%
	ERI2SD	69.5	97.1	0%	100%	0%	0%
SA	EAI	61.4	95.8	1%	85%	4%	9%
	EO	61.4	96.0	1%	85%	4%	9%
	ERI	61.4	95.8	1%	85%	4%	9%
	ERI2SD	61.4	96.2	1%	85%	4%	9%
Tas	EAI	62.7	97.1	6%	91%	1%	2%
	EO	62.7	96.0	7%	90%	1%	2%
	ERI	62.7	95.9	7%	90%	1%	2%
	ERI2SD	62.7	96.3	7%	90%	1%	2%
Vic	EAI	69.6	100.0	0%	96%	2%	2%
	EO	69.6	96.0	0%	96%	2%	2%
	ERI	69.6	96.7	0%	96%	2%	2%
	ERI2SD	69.6	97.1	0%	96%	2%	2%
WA	EAI	57.4	91.7	1%	90%	3%	6%
	EO	57.4	96.0	0%	90%	4%	6%
	ERI	57.4	95.4	1%	90%	4%	6%
	ERI2SD	57.4	95.7	0%	90%	4%	6%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 18: State and territory contributions for Target 6

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	62.1	89.1	0%	89%	4%	7%
	EO	62.1	70.0	51%	40%	1%	8%
	ERI	62.1	80.0	7%	83%	3%	7%
	ERI2SD	62.1	80.0	7%	83%	3%	7%
NSW	EAI	48.3	75.4	18%	82%	0%	0%
	EO	48.3	70.0	39%	61%	0%	0%
	ERI	48.3	72.8	27%	73%	0%	0%
	ERI2SD	48.3	72.8	27%	73%	0%	0%
NT	EAI	18.1	45.5	0%	70%	12%	18%
	EO	18.1	70.0	0%	64%	22%	14%
	ERI	18.1	57.2	0%	67%	17%	16%
	ERI2SD	18.1	57.2	0%	67%	17%	16%
Qld	EAI	42.4	69.6	11%	87%	1%	1%
	EO	42.4	70.0	10%	88%	1%	1%
	ERI	42.4	69.8	11%	88%	1%	1%
	ERI2SD	42.4	69.8	11%	88%	1%	1%
SA	EAI	39.8	67.0	1%	86%	5%	9%
	EO	39.8	70.0	0%	86%	5%	9%
	ERI	39.8	68.4	1%	86%	5%	9%
	ERI2SD	39.8	68.4	1%	86%	5%	9%
Tas	EAI	47.0	74.1	3%	96%	1%	0%
	EO	47.0	70.0	9%	90%	0%	1%
	ERI	47.0	72.2	5%	94%	1%	1%
	ERI2SD	47.0	72.2	5%	94%	1%	1%
Vic	EAI	56.5	83.6	2%	73%	5%	20%
	EO	56.5	70.0	21%	55%	3%	21%
	ERI	56.5	77.1	6%	69%	4%	20%
	ERI2SD	56.5	77.1	6%	69%	4%	20%
WA	EAI	33.8	61.0	4%	90%	2%	4%
	EO	33.8	70.0	0%	93%	3%	3%
	ERI	33.8	65.3	1%	92%	3%	4%
	ERI2SD	33.8	65.3	1%	92%	3%	4%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 19: State and territory contributions for Target 7

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	73.7	83.5	0%	78%	6%	16%
	EO	73.7	73.7	0%	0%	0%	100%
	ERI	73.7	79.7	6%	73%	4%	18%
	ERI2SD	73.7	79.7	6%	73%	4%	18%
NSW	EAI	61.7	71.5	1%	57%	6%	37%
	EO	61.7	66.9	11%	48%	3%	38%
	ERI	61.7	70.4	2%	56%	5%	37%
	ERI2SD	61.7	70.4	2%	56%	5%	37%
NT	EAI	40.0	49.8	0%	2%	0%	97%
	EO	40.0	66.9	0%	2%	1%	97%
	ERI	40.0	53.7	0%	2%	0%	97%
	ERI2SD	40.0	53.7	0%	2%	0%	97%
Qld	EAI	55.4	65.2	42%	48%	1%	9%
	EO	55.4	66.9	32%	58%	2%	9%
	ERI	55.4	65.6	39%	50%	1%	9%
	ERI2SD	55.4	65.6	39%	50%	1%	9%
SA	EAI	57.6	67.4	0%	5%	1%	94%
	EO	57.6	66.9	0%	5%	1%	94%
	ERI	57.6	67.3	0%	5%	1%	94%
	ERI2SD	57.6	67.3	0%	5%	1%	94%
Tas	EAI	62.4	72.2	0%	100%	0%	0%
	EO	62.4	66.9	1%	99%	0%	0%
	ERI	62.4	71.0	0%	100%	0%	0%
	ERI2SD	62.4	71.0	0%	100%	0%	0%
Vic	EAI	65.4	75.2	0%	51%	12%	37%
	EO	65.4	66.9	23%	33%	2%	42%
	ERI	65.4	73.3	0%	52%	9%	38%
	ERI2SD	65.4	73.3	0%	52%	9%	38%
WA	EAI	51.5	61.3	7%	85%	2%	5%
	EO	51.5	66.9	0%	92%	3%	5%
	ERI	51.5	62.6	4%	89%	2%	5%
	ERI2SD	51.5	62.6	4%	89%	2%	5%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 20: State and territory contributions for Target 8

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	70.1	80.7	36%	63%	0%	1%
	EO	70.1	70.1	0%	0%	0%	100%
	ERI	70.1	76.5	75%	24%	0%	1%
	ERI2SD	70.1	76.5	75%	24%	0%	1%
NSW	EAI	54.6	65.3	99%	1%	0%	0%
	EO	54.6	61.9	100%	0%	0%	0%
	ERI	54.6	64.6	99%	1%	0%	0%
	ERI2SD	54.6	64.6	99%	1%	0%	0%
NT	EAI	35.4	46.2	1%	25%	3%	70%
	EO	35.4	61.9	0%	25%	8%	68%
	ERI	35.4	49.7	0%	26%	4%	69%
	ERI2SD	35.4	49.7	0%	26%	4%	69%
Qld	EAI	52.1	62.8	82%	18%	0%	0%
	EO	52.1	61.9	85%	15%	0%	0%
	ERI	52.1	62.6	82%	17%	0%	0%
	ERI2SD	52.1	62.6	82%	17%	0%	0%
SA	EAI	46.4	57.2	61%	39%	0%	0%
	EO	46.4	61.9	22%	78%	0%	0%
	ERI	46.4	58.3	51%	49%	0%	0%
	ERI2SD	46.4	58.3	51%	49%	0%	0%
Tas	EAI	59.0	69.7	52%	48%	0%	1%
	EO	59.0	61.9	96%	3%	0%	1%
	ERI	59.0	67.9	66%	33%	0%	1%
	ERI2SD	59.0	67.9	66%	33%	0%	1%
Vic	EAI	57.3	68.0	94%	6%	0%	0%
	EO	57.3	61.9	100%	0%	0%	0%
	ERI	57.3	66.6	98%	2%	0%	0%
	ERI2SD	57.3	66.6	98%	2%	0%	0%
WA	EAI	44.7	55.5	77%	22%	0%	1%
	EO	44.7	61.9	49%	50%	0%	1%
	ERI	44.7	56.9	71%	28%	0%	1%
	ERI2SD	44.7	56.9	71%	28%	0%	1%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 21: State and territory contributions for Target 9

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	91.6	100.0	1%	26%	3%	69%
	EO	91.6	91.6	0%	0%	0%	100%
	ERI	91.6	95.0	10%	18%	1%	70%
	ERI2SD	91.6	95.9	7%	21%	2%	70%
NSW	EAI	85.9	94.6	0%	100%	0%	0%
	EO	85.9	87.9	99%	1%	0%	0%
	ERI	85.9	91.8	21%	79%	0%	0%
	ERI2SD	85.9	92.7	7%	93%	0%	0%
NT	EAI	38.4	47.3	99%	1%	0%	0%
	EO	38.4	87.9	0%	100%	0%	0%
	ERI	38.4	64.8	1%	99%	0%	0%
	ERI2SD	38.4	54.4	61%	39%	0%	0%
Qld	EAI	79.4	88.2	7%	92%	0%	0%
	EO	79.4	87.9	9%	90%	0%	0%
	ERI	79.4	88.1	8%	91%	0%	0%
	ERI2SD	79.4	88.9	4%	96%	0%	0%
SA	EAI	82.5	91.2	4%	51%	4%	41%
	EO	82.5	87.9	15%	41%	2%	42%
	ERI	82.5	89.8	7%	48%	3%	41%
	ERI2SD	82.5	90.7	5%	50%	4%	41%
Tas	EAI	89.9	98.6	0%	0%	1%	99%
	EO	89.9	89.9	0%	0%	0%	100%
	ERI	89.9	94.0	0%	1%	0%	99%
	ERI2SD	89.9	95.0	0%	1%	0%	99%
Vic	EAI	87.6	96.3	0%	100%	0%	0%
	EO	87.6	87.9	100%	0%	0%	0%
	ERI	87.6	92.7	6%	94%	0%	0%
	ERI2SD	87.6	93.6	1%	99%	0%	0%
WA	EAI	75.2	84.0	76%	24%	0%	0%
	EO	75.2	87.9	36%	64%	0%	0%
	ERI	75.2	85.7	59%	41%	0%	0%
	ERI2SD	75.2	86.5	50%	50%	0%	0%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 22: State and territory contributions for Target 10

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	1703.9	1404.2	49%	16%	1%	34%
	EO	1703.9	1703.9	0%	0%	0%	100%
	ERI	1703.9	1467.6	53%	12%	1%	34%
	ERI2SD	1703.9	1467.6	53%	12%	1%	34%
NSW	EAI	1868.9	1571.8	32%	45%	2%	21%
	EO	1868.9	1868.9	0%	0%	0%	100%
	ERI	1868.9	1609.7	39%	39%	1%	21%
	ERI2SD	1868.9	1609.7	39%	39%	1%	21%
NT	EAI	2450.8	2162.8	0%	0%	0%	100%
	EO	2450.8	1894.5	0%	0%	0%	100%
	ERI	2450.8	2110.9	0%	0%	0%	100%
	ERI2SD	2450.8	2110.9	0%	0%	0%	100%
Qld	EAI	1814.5	1516.5	0%	0%	0%	100%
	EO	1814.5	1814.5	0%	0%	0%	100%
	ERI	1814.5	1562.9	0%	0%	0%	100%
	ERI2SD	1814.5	1562.9	0%	0%	0%	100%
SA	EAI	2395.5	2106.6	32%	23%	1%	44%
	EO	2395.5	1894.5	16%	38%	2%	44%
	ERI	2395.5	2063.3	28%	27%	1%	44%
	ERI2SD	2395.5	2063.3	28%	27%	1%	44%
Tas	EAI	729.7	414.7	0%	14%	2%	84%
	EO	729.7	729.7	0%	0%	0%	100%
	ERI	729.7	628.5	6%	9%	1%	85%
	ERI2SD	729.7	628.5	6%	9%	1%	85%
Vic	EAI	2114.3	1821.0	86%	8%	0%	6%
	EO	2114.3	1894.5	88%	5%	0%	6%
	ERI	2114.3	1821.1	86%	8%	0%	6%
	ERI2SD	2114.3	1821.1	86%	8%	0%	6%
WA	EAI	3581.8	3311.6	27%	18%	1%	54%
	EO	3581.8	1894.5	0%	43%	6%	51%
	ERI	3581.8	3085.1	15%	30%	2%	53%
	ERI2SD	3581.8	3085.1	15%	30%	2%	53%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 23: State and territory contributions for Target 11

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	15.3	5.7	1%	4%	0%	95%
	EO	15.3	15.3	0%	0%	0%	100%
	ERI	15.3	10.8	3%	2%	0%	95%
	ERI2SD	15.3	10.8	3%	2%	0%	95%
NSW	EAI	22.3	12.8	36%	44%	1%	19%
	EO	22.3	22.3	0%	0%	0%	100%
	ERI	22.3	15.7	54%	26%	1%	19%
	ERI2SD	22.3	15.7	54%	26%	1%	19%
NT	EAI	30.9	21.5	3%	6%	0%	90%
	EO	30.9	23.9	5%	4%	0%	90%
	ERI	30.9	21.8	4%	6%	0%	90%
	ERI2SD	30.9	21.8	4%	6%	0%	90%
Qld	EAI	41.2	32.0	5%	13%	1%	81%
	EO	41.2	23.9	1%	17%	2%	81%
	ERI	41.2	29.1	3%	15%	1%	81%
	ERI2SD	41.2	29.1	3%	15%	1%	81%
SA	EAI	27.4	18.0	96%	4%	0%	0%
	EO	27.4	23.9	99%	1%	0%	0%
	ERI	27.4	19.3	97%	3%	0%	0%
	ERI2SD	27.4	19.3	97%	3%	0%	0%
Tas	EAI	8.5	0.0	0%	62%	1%	37%
	EO	8.5	8.5	0%	0%	0%	100%
	ERI	8.5	6.0	54%	8%	0%	37%
	ERI2SD	8.5	6.0	54%	8%	0%	37%
Vic	EAI	18.5	9.0	96%	3%	0%	0%
	EO	18.5	18.5	0%	0%	0%	100%
	ERI	18.5	13.1	99%	1%	0%	0%
	ERI2SD	18.5	13.1	99%	1%	0%	0%
WA	EAI	55.1	46.0	100%	0%	0%	0%
	EO	55.1	23.9	97%	3%	0%	0%
	ERI	55.1	38.8	100%	0%	0%	0%
	ERI2SD	55.1	38.8	100%	0%	0%	0%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 24: State and territory contributions for Target 12

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	68.5	43.4	20%	63%	2%	16%
	EO	68.5	29.8	1%	81%	3%	15%
	ERI	68.5	37.3	7%	75%	2%	16%
	ERI2SD	68.5	37.3	7%	75%	2%	16%
NSW	EAI	60.2	35.2	0%	100%	0%	0%
	EO	60.2	29.8	0%	100%	0%	0%
	ERI	60.2	32.8	0%	100%	0%	0%
	ERI2SD	60.2	32.8	0%	100%	0%	0%
NT	EAI	36.6	12.0	0%	100%	0%	0%
	EO	36.6	29.8	100%	0%	0%	0%
	ERI	36.6	19.9	1%	99%	0%	0%
	ERI2SD	36.6	19.9	1%	99%	0%	0%
Qld	EAI	37.0	12.4	0%	0%	0%	100%
	EO	37.0	29.8	0%	0%	0%	100%
	ERI	37.0	20.1	0%	0%	0%	100%
	ERI2SD	37.0	20.1	0%	0%	0%	100%
SA	EAI	75.3	50.1	0%	0%	0%	100%
	EO	75.3	29.8	0%	0%	0%	100%
	ERI	75.3	41.0	0%	0%	0%	100%
	ERI2SD	75.3	41.0	0%	0%	0%	100%
Tas	EAI	32.7	8.1	0%	16%	13%	71%
	EO	32.7	29.8	3%	18%	2%	77%
	ERI	32.7	17.8	0%	18%	8%	74%
	ERI2SD	32.7	17.8	0%	18%	8%	74%
Vic	EAI	89.9	64.4	0%	0%	0%	100%
	EO	89.9	29.8	0%	0%	0%	100%
	ERI	89.9	49.0	0%	0%	0%	100%
	ERI2SD	89.9	49.0	0%	0%	0%	100%
WA	EAI	64.2	39.1	0%	45%	5%	50%
	EO	64.2	29.8	0%	44%	7%	49%
	ERI	64.2	35.0	0%	44%	6%	49%
	ERI2SD	64.2	35.0	0%	44%	6%	49%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 25: State and territory contributions for Target 15A

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
ACT	EAI	0.0	7.7	0%	0%	100%	0%
	EO	0.0	40.4	0%	0%	100%	0%
	ERI	0.0	15.6	0%	0%	100%	0%
	ERI2SD	0.0	15.6	0%	0%	100%	0%
NSW	EAI	0.8	8.5	0%	0%	100%	0%
	EO	0.8	40.4	0%	0%	100%	0%
	ERI	0.8	16.3	0%	0%	100%	0%
	ERI2SD	0.8	16.3	0%	0%	100%	0%
NT	EAI	70.0	77.6	94%	6%	0%	0%
	EO	70.0	70.0	0%	0%	0%	100%
	ERI	70.0	74.7	98%	1%	0%	0%
	ERI2SD	70.0	74.7	98%	1%	0%	0%
Qld	EAI	30.6	38.3	100%	0%	0%	0%
	EO	30.6	40.4	99%	1%	0%	0%
	ERI	30.6	41.5	96%	4%	0%	0%
	ERI2SD	30.6	41.5	96%	4%	0%	0%
SA	EAI	76.6	84.2	0%	100%	0%	0%
	EO	76.6	76.6	0%	0%	0%	100%
	ERI	76.6	80.2	0%	100%	0%	0%
	ERI2SD	76.6	80.2	0%	100%	0%	0%
Tas	EAI	0.9	8.6	0%	0%	100%	0%
	EO	0.9	40.4	0%	0%	100%	0%
	ERI	0.9	16.4	0%	0%	100%	0%
	ERI2SD	0.9	16.4	0%	0%	100%	0%
Vic	EAI	6.6	14.2	0%	97%	2%	1%
	EO	6.6	40.4	0%	87%	13%	0%
	ERI	6.6	21.1	0%	96%	4%	0%
	ERI2SD	6.6	21.1	0%	96%	4%	0%
WA	EAI	65.6	73.3	100%	0%	0%	0%
	EO	65.6	65.6	0%	0%	0%	100%
	ERI	65.6	71.0	100%	0%	0%	0%
	ERI2SD	65.6	71.0	100%	0%	0%	0%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Table 26: State and territory contributions for Target 15B

Jurisdiction	Contribution calculation method	Baseline value	Target value	Probability of outcome in target year			
				Target met	Improved but not met	No noticeable change	Worsened
NSW	EAI	0.2	3.5	0%	0%	100%	0%
	EO	0.2	25.1	0%	0%	100%	0%
	ERI	0.2	4.4	0%	0%	100%	0%
	ERI2SD	0.2	4.4	0%	0%	100%	0%
NT	EAI	4.5	7.8	0%	0%	100%	0%
	EO	4.5	25.1	0%	0%	100%	0%
	ERI	4.5	8.5	0%	0%	100%	0%
	ERI2SD	4.5	8.5	0%	0%	100%	0%
Qld	EAI	19.8	23.1	98%	1%	0%	1%
	EO	19.8	25.1	97%	2%	0%	1%
	ERI	19.8	23.2	98%	1%	0%	1%
	ERI2SD	19.8	23.2	98%	1%	0%	1%
SA	EAI	0.6	3.9	90%	10%	0%	0%
	EO	0.6	25.1	38%	61%	1%	0%
	ERI	0.6	4.8	86%	13%	0%	0%
	ERI2SD	0.6	4.8	86%	13%	0%	0%
Tas	EAI	0.0	3.3	0%	0%	100%	0%
	EO	0.0	25.1	0%	0%	100%	0%
	ERI	0.0	4.2	0%	0%	100%	0%
	ERI2SD	0.0	4.2	0%	0%	100%	0%
Vic	EAI	2.6	5.9	0%	99%	1%	0%
	EO	2.6	25.1	0%	85%	15%	0%
	ERI	2.6	6.7	0%	98%	1%	0%
	ERI2SD	2.6	6.7	0%	98%	1%	0%
WA	EAI	34.2	37.5	0%	92%	8%	0%
	EO	34.2	34.2	0%	0%	0%	100%
	ERI	34.2	37	0%	94%	6%	0%
	ERI2SD	34.2	37	0%	94%	6%	0%

Note: EAI = equal absolute improvement, EO = equal outcomes, ERI = equal relative improvement, ERI2SD = equal relative improvement constrained to within 2 standard deviations.

Appendix 4: Comparison of the Likelihood-Ratio Test and Spearman Rank Correlation

A Likelihood-Ratio test and Spearman Rank Correlation analysis were conducted using data for Closing the Gap targets with at least three data points. The results from the two assessment methods are large comparable in terms of the 'No change' category. While the possible values of Spearman correlation coefficient ranges from -1 to +1, qualitatively, a value $>|0.2|$ is considered non-trivial (Prion & Haerling, 2014; Schober, Boer & Schwarte, 2018; Xiao, et al., 2016).

Table 27: Comparison of the performance of the Likelihood-Ratio Test and Spearman Rank Correlation on national target data

Target	Data point	OLS		LR Test		Spearman Rank Correlation Coefficient
		Coeff.	p-value	LR Chi2(1)	Prob >chi2	
2	5	0.170	0.155	3.92	0.048	0.9
3	7	3.7286	0.000	24.61	0.000	1.0
10	5	30.990	0.192	3.3	0.069	0.8
11	5	-0.210	0.872	0.05	0.822	-0.1
12	5	0.660	0.120	4.67	0.031	0.7
14	5	0.920	0.071	6.27	0.012	0.7
15 (Land)	4	103123	0.004	18.96	0.000	1.0
15 (Sea)	4	7018.3	0.000	82.1	0.000	1.0

Cases where Spearman Rank correlation and the LR test might provide different results

Spearman correlation is a non-parametric measure of a monotonic relationship between variables. LR test compares the goodness of fit of nested models. Therefore, these tests may produce different results, especially when regression model assumptions are violated. More specific examples:

- **Small sample size:** The power of the LR test depends heavily on sample size, and significant relationships might not be detected when there are only a few data points to run the regression, whereas Spearman correlation is less affected by small sample sizes and might still detect a significant monotonic relationship.
- **Presence of outliers:** The LR test is sensitive to outliers and might fail to detect significant relationships when there are outliers in the data; Spearman correlation might indicate a significant relationship even if there are outliers.
- **Skewed distribution:** Spearman correlation may indicate a significant relationship, whereas the LR test may not as it relies on specific assumptions about the distribution of the data (i.e., normal distribution for linear regressions).

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