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# Regional variation in uptake of Indigenous health checks and in preventable hospitalisations and deaths

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**Australian Institute of  
Health and Welfare**

# **Regional variation in uptake of Indigenous health checks and in preventable hospitalisations and deaths**

Australian Institute of Health and Welfare  
Canberra

Cat. no. IHW 216

**The Australian Institute of Health and Welfare is a major national agency whose purpose is to create authoritative and accessible information and statistics that inform decisions and improve the health and welfare of all Australians.**

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# Summary

Potentially preventable hospitalisations (PPH) and potentially avoidable deaths (PAD) are hospitalisations and deaths that are considered potentially preventable through timely access to appropriate health care. While the risk of these health outcomes depends on population characteristics to some degree, relatively high rates indicate a lack of access to effective health care. In Australia, Aboriginal and Torres Strait Islander people have PPH and PAD rates that are more than 3 times as high as those for non-Indigenous people.

All Indigenous Australians are eligible for Indigenous-specific health checks, which are a part of the Australian Government's efforts to improve Indigenous health outcomes. The health checks are conducted by GPs and are listed as item 715 on the Medicare Benefits Schedule.

In this report, we contrast the geographical variation in Indigenous PPH and PAD with the variation in uptake of Indigenous-specific health checks at the local-area level (Statistical Area Level 3), by Primary Health Network and by state or territory. Overall, areas with large Indigenous populations tend to have high rates of PPH and PAD and high uptake rates of Indigenous health checks. That areas with high rates of health checks also tend to have high rates of PPH and PAD may seem counterintuitive. However, any effects of the health checks on the rates of PPH and PAD are likely to become more apparent over time as there has recently been a dramatic increase in the rates of Indigenous health checks in many parts of Australia. It is reasonable to expect that there will be some lag time between an increase in the uptake of health checks and when positive effects on health outcomes can be seen.

We use a regression model to identify areas with unexpectedly high or low rates of PPH given the demographic composition of their populations and other characteristics of the areas (such as remoteness). Cape York, Tasmania and the northern parts of the Northern Territory stand out as regions with unexpectedly low rates of PPH. Regions with unexpectedly high rates include Central Australia, the Kimberley and some inner parts of Darwin, Perth and Brisbane.

Unexpectedly high or low rates of PPH can be due to a number of factors including:

- performance of the local health-care services, including past performance affecting the health of local people
- accessibility of hospitals and relative use of hospitals or other health-care services
- people with poor health moving from areas without services to areas with services (for high rates)
- unaccounted factors that influence the risk of PPH
- data issues.

These factors are all potentially important. How they influence reported health outcomes needs to be better understood to ensure that policy and management decisions are based on the best available information.





# 1 Introduction

This report shows how rates of potentially preventable hospitalisations (PPH) and potentially avoidable deaths (PAD) vary among Aboriginal and Torres Strait Islander populations across the states and territories of Australia. This variation is also contrasted with the geographical variation in uptake rates of Indigenous-specific health checks.

The main geographical unit used in this study is the Statistical Area Level 3 (SA3) of the Australian Bureau of Statistics' (ABS's) 2011 Australian Statistical Geography Standard (ASGS). There are 333 spatial SA3s in the 2011 ASGS, making the SA3 a relatively local level of reporting. A target total population size of approximately 30,000 to 100,000 was used when the SA3s were defined. They therefore vary in size, with SA3s in sparsely populated parts of Australia being larger than SA3s in densely populated parts.

By focusing on local-level variation in key health indicators within the Indigenous population, important patterns that are masked in more traditional higher level comparisons between the Indigenous and non-Indigenous populations can be uncovered. For example, earlier work by the Australian Institute of Health and Welfare (AIHW) has shown that local-level variation in physical access to health services is linked to variation in health outcomes, including hospitalisations, deaths and low birthweight (AIHW 2014, 2017b). This report also presents higher level geographical variation in outcomes at the Primary Health Network (PHN) and state or territory level.

The risks of PPH and PAD depend on health service availability as well as on other characteristics of areas and local populations (Falster et al. 2015; Turrell & Mathers 2000). As a consequence, areas with similar characteristics tend to have similar rates of PPH and PAD. This study used data on the characteristics of Indigenous populations and the areas where they live to identify SA3s with unexpectedly high or low PPH rates, given their local circumstances. Unexpected rates can be caused by a number of factors, ranging from the effectiveness of available health services and health promotion programs to issues with data collection. This means that further investigation of areas with unexpected PPH rates may yield insights into unknown drivers of preventable health conditions and/or the quality of Indigenous and other health data.

## 1.1 Potentially preventable hospitalisations

Commonly used as an indicator of the effectiveness of the health care system, PPH include conditions for which hospitalisation might have been avoided through effective preventive measures or early diagnosis and treatment in primary health care (Duckett & Griffiths 2016; Falster & Jorm 2017; Page et al. 2007). These conditions can be grouped into 3 categories, based on the underlying reason for the hospitalisation:

- vaccine-preventable conditions—including invasive pneumococcal disease, influenza, tetanus, measles, mumps, rubella, pertussis and polio
- acute conditions—including dehydration/gastroenteritis; kidney infection; perforated ulcer; cellulitis; pelvic inflammatory disease; dental conditions; and ear, nose and throat infections
- chronic conditions—including diabetes, asthma, angina, hypertension, congestive heart failure and chronic obstructive pulmonary disease.

PPH were selected as one of the key health outcomes for this project for a number of reasons:

- Indigenous Australians are much more likely than non-Indigenous Australians to experience hospitalisations that are potentially preventable: age-standardised rates of PPH are more than 3 times as high for Indigenous as non-Indigenous Australians (AHMAC 2017).
- By definition, PPHs are outcomes that are modifiable, so that identifying factors associated with high or low rates may yield policy-relevant information.

Because PPH are not rare, the numbers are able to support analysis for small geographic areas.

See Appendix B for more information on PPH and hospitals data.

## 1.2 Potentially avoidable deaths

PAD are deaths of people under age 75 that could potentially have been prevented by timely health care or treatment, administered through primary or hospital care. Like PPH, PAD is used in a number of countries, including Australia, as a performance indicator with which to measure the effectiveness of the health-care system.

PAD cover a range of causes including selected infections, diabetes, cancer, external causes, respiratory diseases, digestive system diseases and perinatal complications. This is not to say that all deaths from such causes could have been prevented by health treatment or management—only that the health-care system may prevent some deaths from occurring from these causes. Some causes, like transport accidents, may reflect the effectiveness of emergency care or safety campaigns.

As for PPH, PAD was selected as a key health outcome because:

- age-standardised rates of PAD are more than 3 times as high for Indigenous Australians as for non-Indigenous Australians (AIHW 2018a)
- by definition, PAD are outcomes that are modifiable, so that identifying factors associated with high or low rates may yield policy-relevant information.

See Appendix B for more information on PAD and mortality data.

## 1.3 Indigenous health checks

All Indigenous people, regardless of age, are eligible for an annual Indigenous-specific health check. These health checks aim to provide Indigenous people with primary health care matched to their needs and are part of the Australian Government's commitment to [Closing the Gap](#) in both life expectancy and deaths (AIHW 2017a). The health checks are conducted by GPs and are listed as item 715 on the Medicare Benefits Schedule (MBS).

The uptake rates of Indigenous health checks have increased dramatically in parts of Australia over the past 10 years (AIHW 2017a). It seems reasonable to expect that there will be some lag time between an increase in the uptake of health checks and when positive effects on health outcomes such as PPH and PAD can be seen. This may make it difficult to see any association between health checks and preventable health outcomes in the current data.

See Appendix B for more information on Indigenous health checks and MBS data.

## 2 Methods

### 2.1 Potentially preventable hospitalisations

We used data on PPH from the AIHW's National Hospital Morbidity Database (NHMD). These data reflect episodes of care (hospital separations) as provided by the states and territories. Data for the financial years 2013–14, 2014–15 and 2015–16 were pooled to ensure that the numbers were big enough for meaningful comparisons at the SA3 geographical level.

We calculated rates as separations per 1,000 Indigenous usual residents and year, using an average of 2014 and 2015 Indigenous population estimates, as this aligned with the midpoint of the hospitalisations data. The 2014 and 2015 population estimates were produced by Prometheus Information Pty Ltd, based on ABS population estimates and projections.

The 2018 AIHW National Healthcare Agreement definition was used for PPH, listed in Appendix C (Appendix Table C1) and available at <https://meteor.aihw.gov.au/content/index.phtml/itemId/658499>.

See Appendix B for more details and a data quality statement.

### 2.2 Potentially avoidable deaths

Data on PAD came from the AIHW's National Mortality Database (NMD). Annual rates were calculated based on deaths recorded in the 5-year period 2012–2016 to ensure that numbers were big enough for meaningful comparisons at the SA3 level.

We calculated rates as deaths per 100,000 Indigenous usual residents and year, using the 2014 population estimates produced by Prometheus Information Pty Ltd.

As is customary in AIHW reporting, PAD rates for PHNs and SA3s in the Australian Capital Territory, Victoria and Tasmania are not presented due to concerns over the reliability of identification of Indigenous deaths in these jurisdictions. Note that comparisons of PHNs and SA3s in different remoteness categories should be done with great care as accurate identification of Indigenous deaths is thought to increase with increasing remoteness. A failure to record all Indigenous deaths as Indigenous makes Indigenous death rates seem lower than they really are. PHNs and SA3s where this is a relatively big issue could therefore appear to have relatively low rates compared with PHNs and SA3s where this is not an issue.

The 2018 AIHW National Healthcare Agreement definition was used for PAD, listed in Appendix D (Appendix Table D1) and available at <http://meteor.aihw.gov.au/content/index.phtml/itemId/658503>.

See Appendix B for more details and a data quality statement.

### 2.3 Indigenous health checks

Uptake rates of Indigenous health checks were calculated using the MBS 715 item from the 2014–15 financial year MBS data (by date of service), and the same population denominators used for PPH rates (see Section 2.1).

The postcode associated with each MBS 715 record was used to derive the residential PHN and SA3 of each person having had an Indigenous health check. Different approaches to

such postcode-to-PHN/SA3 correspondence can have some effect on the estimated uptake rates in some areas, especially when substantial numbers of patients have non-residential postcodes (for example, postal boxes) recorded. For more details on this, and a data quality statement, see Appendix B.

## **2.4 Modelling**

We used linear regression models of the association between PPH rates and the characteristics of SA3s and their Indigenous populations to identify SA3s with unexpectedly high or low rates of preventable health outcomes. In this analysis, available data on; for example, local demographic composition, access to health services and remoteness are used to find models that can explain as much of the observed variation in PPH as possible. These models describe the overall association between the analysed SA3 characteristics and PPH and can therefore be used to calculate the expected PPH of an area based on its characteristics. SA3s with much higher or much lower PPH rates than what is expected, based on their characteristics, can be said to have unexpected rates of PPH. See Appendix B for more details on the modelling methodology and the data used in the models.

## 3 Results

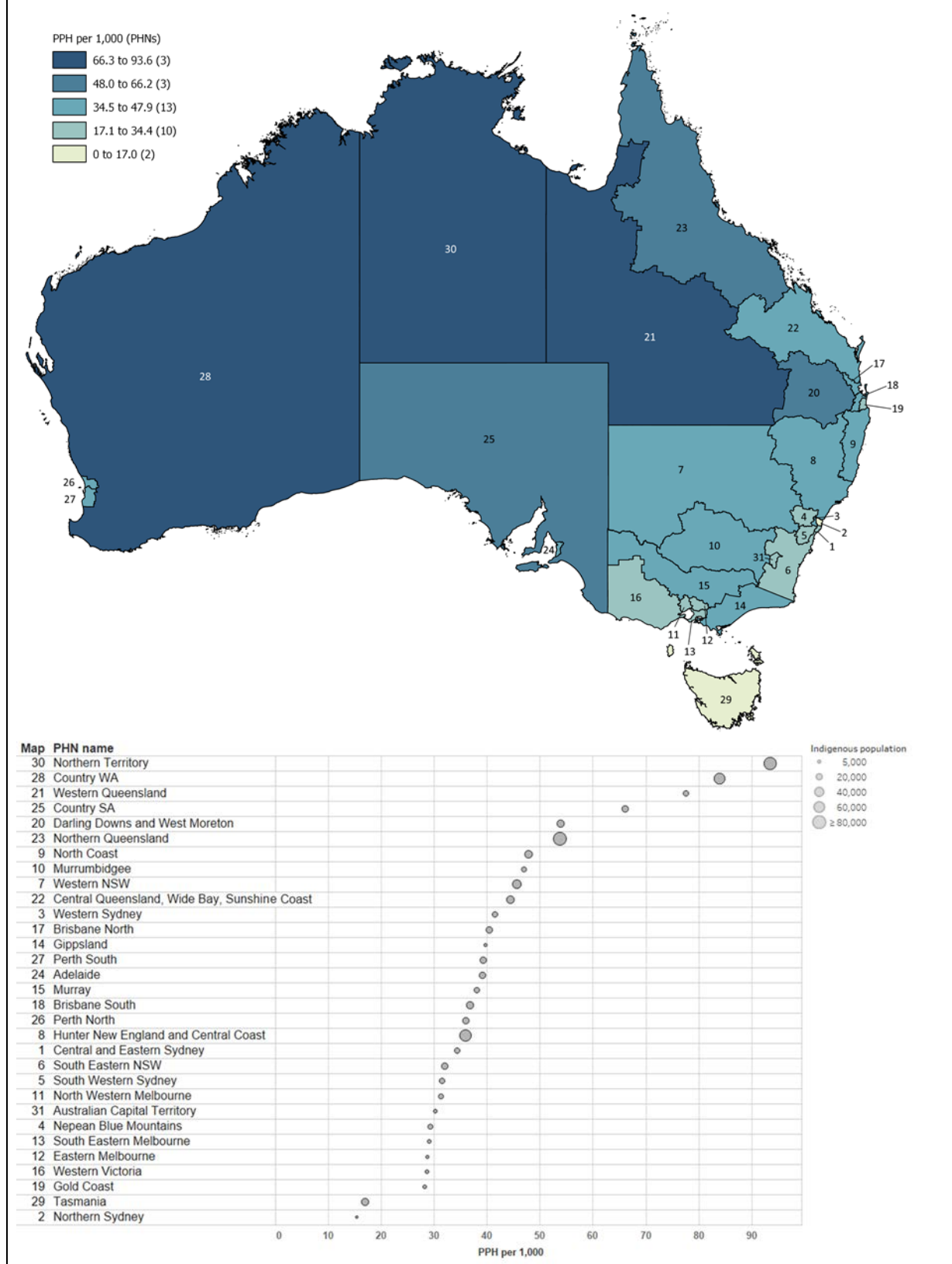
### 3.1 Variation across Primary Health Networks

This section presents maps that give an overview of the PHN-level variation in rates of PPH and PAD, and in uptake rates of Indigenous health checks. The variation in PHN-level rates is also presented in 'waterfall' graphs where the PHNs are ordered based on their rates.

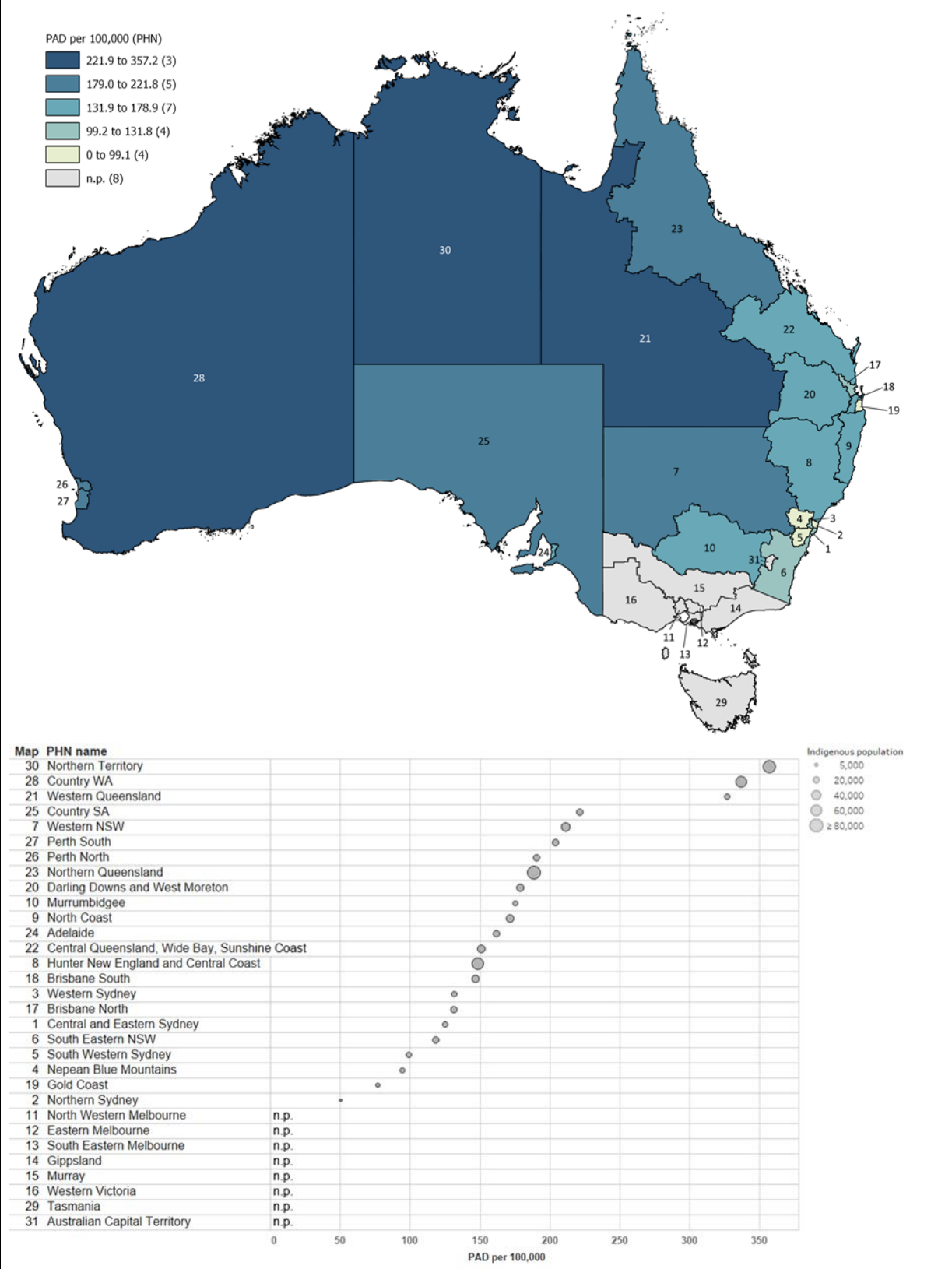
Rates of PPH, PAD and health checks are presented in separate graphs. For PPH and PAD, PHNs with the highest rates are shown at the top of the graph. For Indigenous health checks, on the other hand, PHNs with the lowest uptake rates are shown at the top of the graph. This is done as high rates of PPH and PAD and low uptake rates of Indigenous health checks can be considered the most undesirable outcomes.

As is clear from figures 3.1, 3.2 and 3.3, there is considerable variation between PHNs in rates of PPH and PAD and in uptake rates of Indigenous health checks.

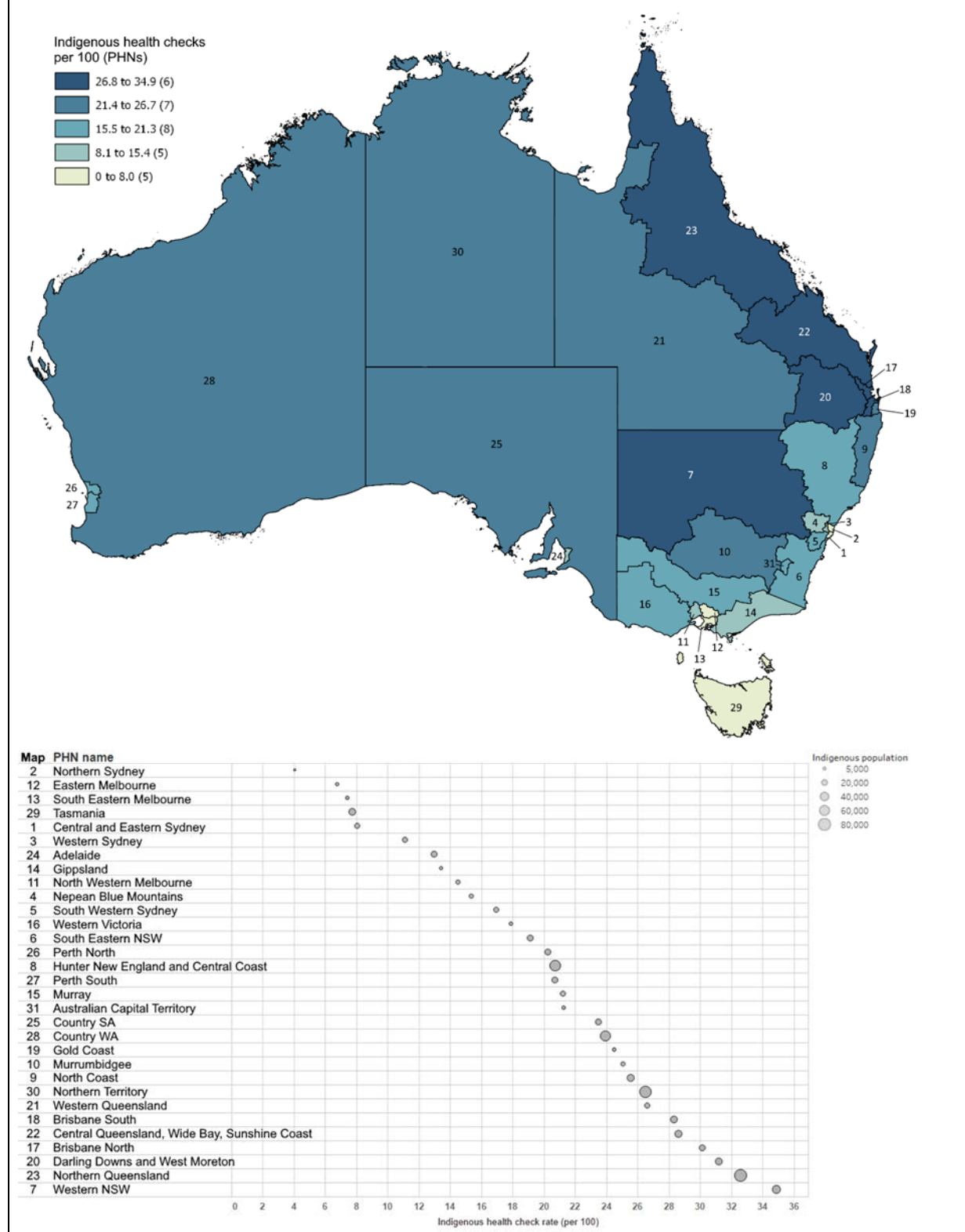
**Figure 3.1: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, by PHN**



**Figure 3.2: PAD per 100,000 Indigenous persons per annum, 2012 to 2016, by PHN**



**Figure 3.3: Indigenous health checks per 100 Indigenous persons, 2014–15, by PHN**





## 3.2 Variation within states and territories

To give an overview of the PPH, PAD and Indigenous health check rates experienced by Indigenous people in different jurisdictions, SA3 rates were divided into 'high', 'medium' and 'low'. SA3s in each category contain approximately one-third of the Indigenous population of Australia. In other words, for each measure, one-third of the Indigenous population live in 'high' SA3s, one-third in 'medium' SA3s and one-third in 'low' SA3s (Table 3.1). Table 3.2 uses those national cut-offs to depict the distribution of Indigenous persons (2014–15 estimates) and SA3s within each state and territory. Supplementary tables can be found in Appendix A3.

**Table 3.1: Cut-off values for high-medium-low classification**

Classification	Indigenous PPH per 1,000 persons (crude)	Indigenous PAD per 100,000 persons (crude)	Indigenous health checks per 100 persons (crude)
High	>52.4–157.0	>236.6–560.2	>27.5–52.8
Medium	>33.9–52.4	>154.0–236.6	>18.0–27.5
Low	7.8–33.9	54.1–154.0	1.7–18.0

*Notes*

1. For health checks and PPH, all SA3s with 100 or more Indigenous people and 5 or more records were included in the high-medium-low classification. For PAD, only SA3s in NSW, Qld, WA, SA and NT with 100 or more Indigenous people and 5 or more records were included.
2. SA3s are classified independently across the 3 columns (for example, a given SA3 could be high for health checks but low for PPH and PAD).

*Source:* AIHW analysis of MBS data, NHMD data, NMD data, and Prometheus Information Pty Ltd population projections.

**Table 3.2: Distribution of estimated Indigenous resident population (2014–15) across SA3s, based on the classification scheme in Table 3.1**

Classification by state or territory	Indigenous PPH per 1,000 persons (crude)		Indigenous PAD per 100,000 persons (crude)		Indigenous health checks per 100 persons (crude)	
	psns (no.)	SA3s (no.)	psns (no.)	SA3s (no.)	psns (no.)	SA3s (no.)
<b>NSW</b>						
High rate	39,389	8	27,422	7	48,912	11
Medium rate	78,453	28	66,825	20	84,226	22
Low rate	105,116	51	110,619	34	89,983	55
Suppressed	169	4	18,261	30	6	3
<i>Total NSW</i>	<i>223,127</i>	<i>91</i>	<i>223,127</i>	<i>91</i>	<i>223,127</i>	<i>91</i>
<b>Vic</b>						
High rate	2,156	2	n.p.	n.p.	7,262	4
Medium rate	16,905	18	n.p.	n.p.	9,821	7
Low rate	32,348	42	n.p.	n.p.	34,302	51
Suppressed	233	3	51,642	65	257	3
<i>Total Vic</i>	<i>51,642</i>	<i>65</i>	<i>51,642</i>	<i>65</i>	<i>51,642</i>	<i>65</i>

(continued)

**Table 3.2 (continued): Distribution of estimated Indigenous resident population (2014–15) across SA3s, based on the classification scheme in Table 3.1**

Classification by state or territory	Indigenous PPH per 1,000 (crude)		Indigenous PAD per 100,000 (crude)		Indigenous health checks per 100 (crude)	
	psns (no.)	SA3s (no.)	psns (no.)	SA3s (no.)	psns (no.)	SA3s (no.)
<b>Qld</b>						
High rate	67,523	13	33,570	11	110,489	32
Medium rate	93,552	33	92,384	20	64,740	31
Low rate	44,459	34	62,266	25	30,305	17
Suppressed	—	—	17,314	24	—	—
<i>Total Qld</i>	<i>205,534</i>	<i>80</i>	<i>205,534</i>	<i>80</i>	<i>205,534</i>	<i>80</i>
<b>WA</b>						
High rate	54,001	12	55,911	13	22,678	7
Medium rate	25,716	12	26,681	13	53,904	15
Low rate	15,027	9	10,843	4	18,162	11
Suppressed	—	—	1,309	3	—	—
<i>Total WA</i>	<i>94,744</i>	<i>33</i>	<i>94,744</i>	<i>33</i>	<i>94,744</i>	<i>33</i>
<b>SA</b>						
High rate	18,351	7	13,162	6	11,218	2
Medium rate	10,257	10	10,006	4	3,513	4
Low rate	11,617	11	12,422	6	25,494	22
Suppressed	—	—	4,635	12	—	—
<i>Total SA</i>	<i>40,225</i>	<i>28</i>	<i>40,225</i>	<i>28</i>	<i>40,225</i>	<i>28</i>
<b>Tas</b>						
High rate	—	—	n.p.	n.p.	—	—
Medium rate	—	—	n.p.	n.p.	698	1
Low rate	26,145	15	n.p.	n.p.	25,447	14
Suppressed	—	—	26,145	15	—	—
<i>Total Tas</i>	<i>26,145</i>	<i>15</i>	<i>26,145</i>	<i>15</i>	<i>26,145</i>	<i>15</i>
<b>ACT</b>						
High rate	—	—	n.p.	n.p.	940	2
Medium rate	2,119	5	n.p.	n.p.	3,095	3
Low rate	4,637	3	n.p.	n.p.	2,618	2
Suppressed	49	1	6,805	9	152	2
<i>Total ACT</i>	<i>6,805</i>	<i>9</i>	<i>6,805</i>	<i>9</i>	<i>6,805</i>	<i>9</i>
<b>NT</b>						
High rate	58,926	8	71,011	8	39,478	5
Medium rate	13,898	1	1,813	1	19,448	3
Low rate	—	—	—	—	13,898	1
Suppressed	—	—	—	—	—	—
<i>Total NT</i>	<i>72,824</i>	<i>9</i>	<i>72,824</i>	<i>9</i>	<i>72,824</i>	<i>9</i>

(continued)

**Table 3.2 (continued): Distribution of estimated Indigenous resident population (2014–15) across SA3s, based on the classification scheme in Table 3.1**

Classification by state or territory	Indigenous PPH per 1,000 (crude)		Indigenous PAD per 100,000 (crude)		Indigenous health checks per 100 (crude)	
	psns (no.)	SA3s (no.)	psns (no.)	SA3s (no.)	psns (no.)	SA3s (no.)
<b>Australia</b>						
High rate	240,346	50	201,076	45	240,977	63
Medium rate	241,170	108	197,709	58	239,445	86
Low rate	239,349	165	196,150	69	240,209	173
Suppressed	462	10	126,392	161	696	11
<b>Total Aus</b>	<b>721,327</b>	<b>333</b>	<b>721,327</b>	<b>333</b>	<b>721,327</b>	<b>333</b>

Source: AIHW analysis of MBS data, NHMD data, NMD data, and Prometheus Information Pty Ltd population projections.

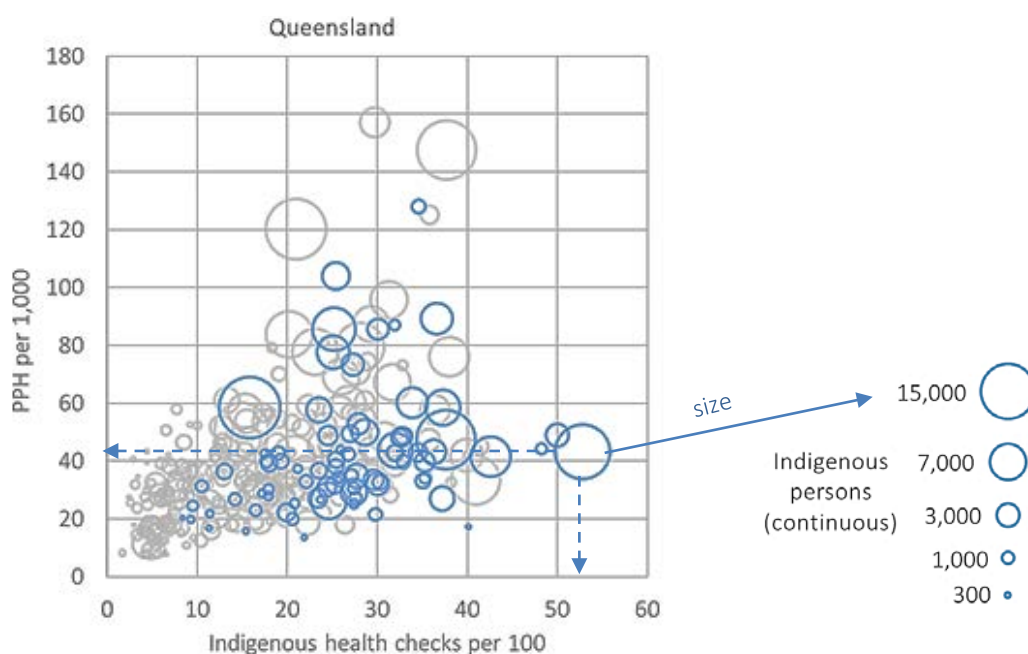
### 3.2.1 State and territory scatter plots

This section visualises the SA3-level variation in rates of PPH and PAD within each state and territory. Rates of PPH and PAD are both plotted against rates of health checks. Indigenous population size is also presented, showing that SA3s with bigger Indigenous populations tend to have higher rates of PPH and PAD as well as higher uptake rates of Indigenous health checks. See Box 3.1 for a walk-through of Queensland's PPH scatter plot.

Intuitively, we might expect areas with the highest uptake of health checks to have the lowest rates of PPH and PAD. However, the data tend to show the opposite pattern. Health check rates have increased fastest in areas with large Indigenous populations, which also tend to have poorer health outcomes, including, for example, many remote areas.

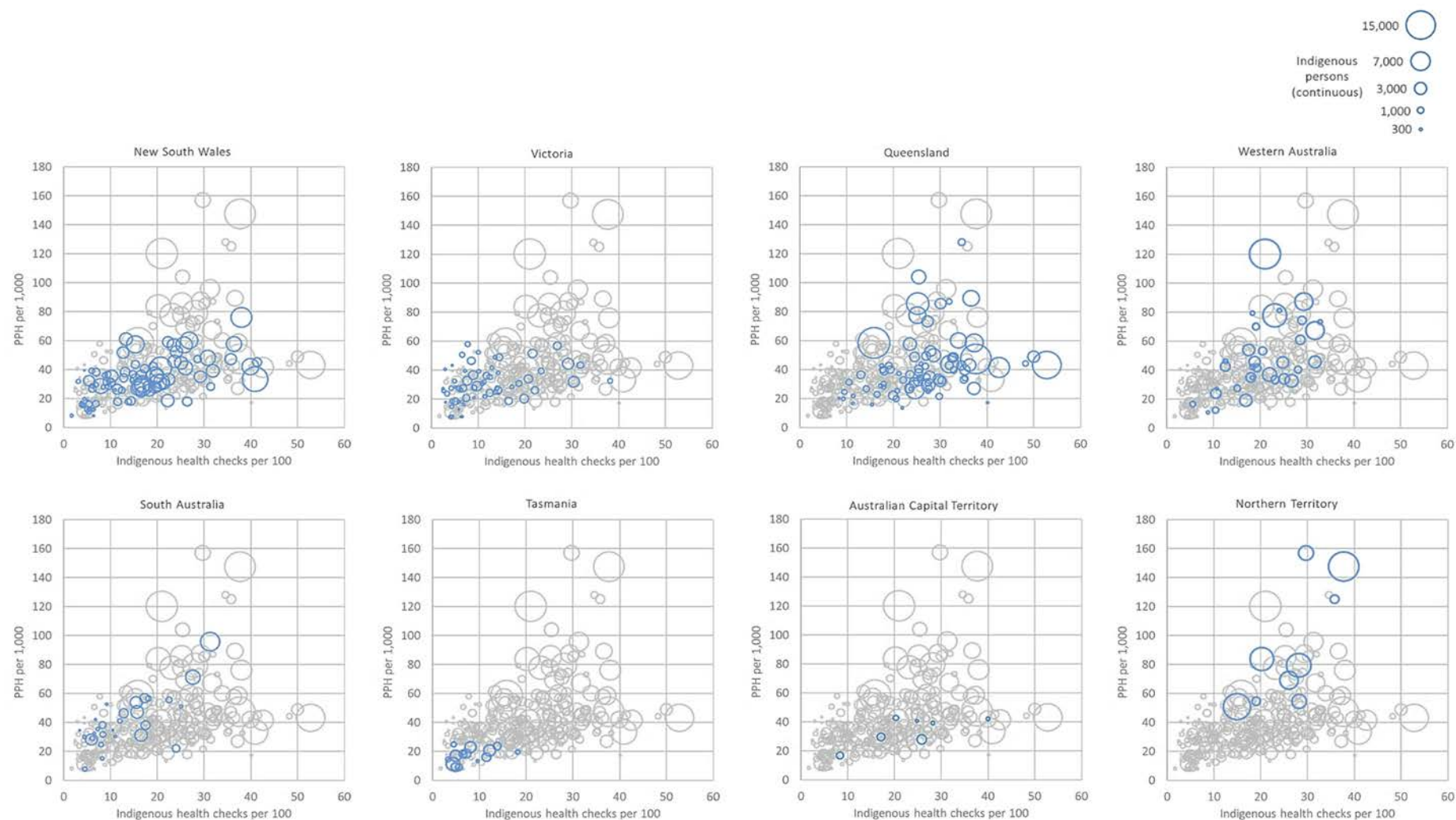
Figures 3.4 (PPH) and 3.5 (PAD) show the SA3s within each state/territory, overlaid on a background showing the SA3s of the rest of the country.

**Box 3.1: Queensland example**



- Queensland has a large number of SA3s, with most having Indigenous populations of fewer than 3,000 people.
- There are still several SA3s with large Indigenous populations ( $\geq 3,000$ ), and these tend to have higher PPH rates than the others.
- Some of these also have very high rates of Indigenous health checks—for example, 'Townsville' (represented by the circle on the far right), which has the country's highest rate of all SA3s at 52.8 per 100 Indigenous people (the dashed lines indicate Townsville's health check and PPH rates).
- Compared with the rest of Australia (grey in the background), Queensland's SA3s are broadly skewed towards higher rates of health checks.

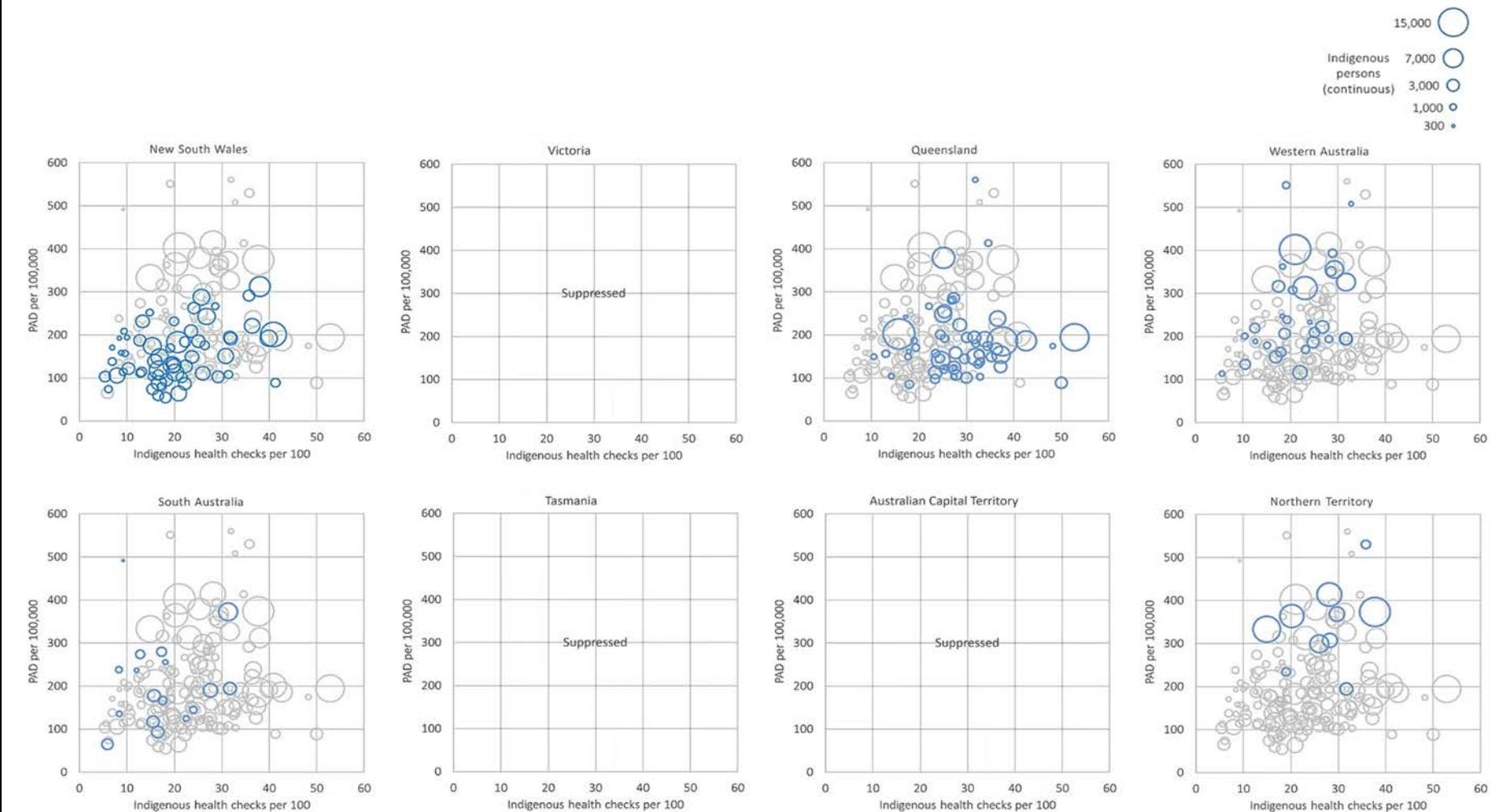
**Figure 3.4: Crude rates of PPH by crude rates of Indigenous health checks in each SA3<sup>(a)</sup>, by state/territory<sup>(b)</sup>, and estimated size of the Indigenous population (2014–15)**



(a) Excludes SA3s with fewer than 100 Indigenous people in 2014–15 (based on Prometheus Information Pty Ltd Indigenous SA3 estimates) or fewer than 5 PPH over the 3 years.

(b) State/territory SA3s coloured blue. Other jurisdictions coloured grey. Other territories not included.

**Figure 3.5: Crude rates of PAD by crude rates of Indigenous health checks in each SA3<sup>(a)</sup>, by state/territory<sup>(b)</sup>, and estimated size of the Indigenous population (2014–15)**



(a) Excludes SA3s with fewer than 100 Indigenous people in 2014 (based on Prometheus Information Pty Ltd Indigenous SA3 estimates) or fewer than 5 PAD over the 5 years.

(b) State/territory SA3s coloured blue. Other jurisdictions coloured grey. Other territories not included.

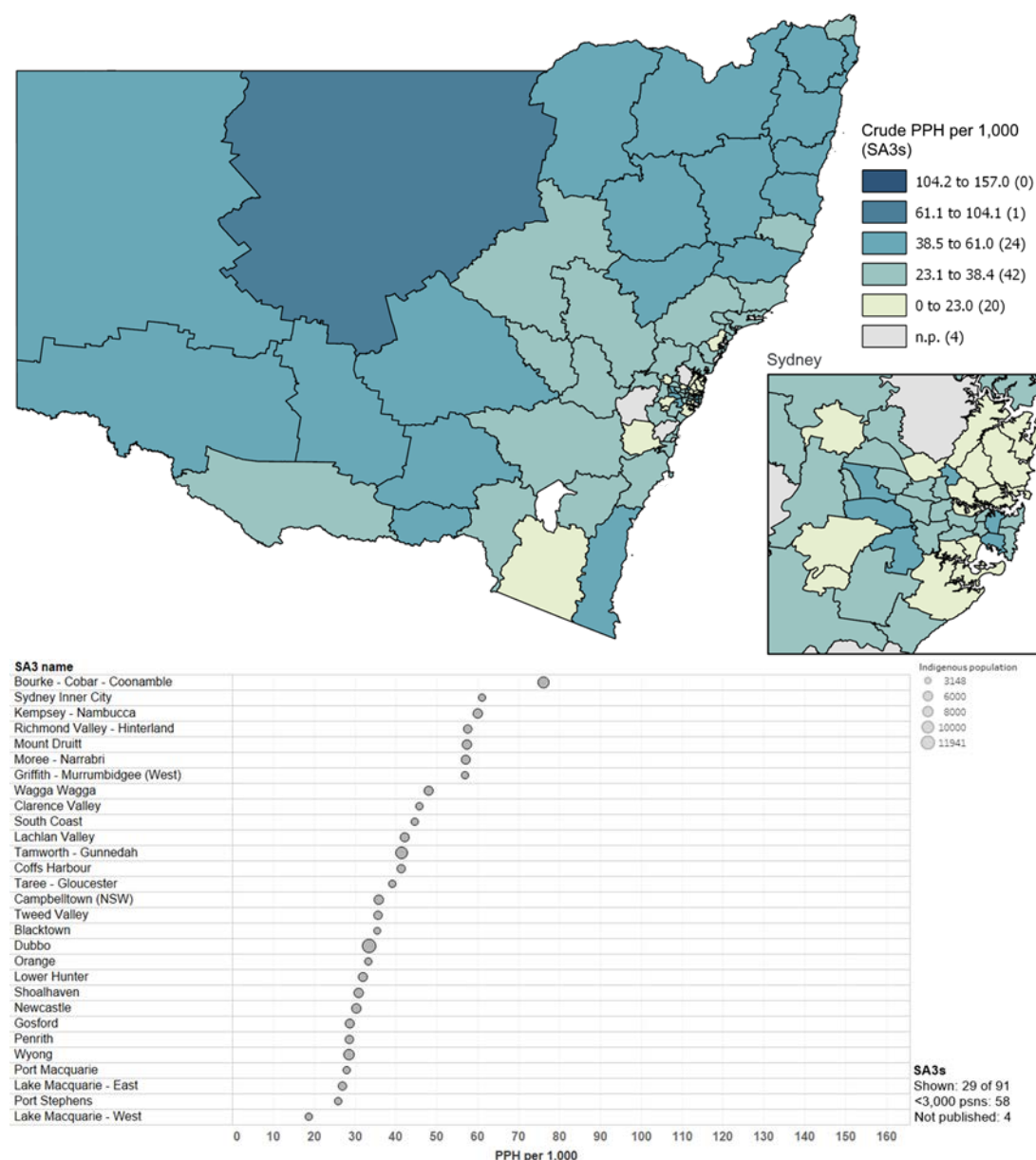
### **3.2.2 State and territory profiles**

The figures that follow show the profiles for each state and territory: figures 3.6 to 3.8 for New South Wales, 3.9 and 3.10 for Victoria, 3.11 to 3.13 for Queensland, 3.14 to 3.16 for Western Australia, 3.17 to 3.19 for South Australia, 3.20 and 3.21 for Tasmania, 3.22 and 3.23 for the Australian Capital Territory and figures 3.24 to 3.26 for the Northern Territory.

## New South Wales

New South Wales' profile is similar to that of the overall country, with most smaller SA3 populations reporting low rates of PPH and health checks, and rates increasing in the SA3s with more Indigenous people (Figure 3.4). The remote SA3 'Bourke – Cobar – Coonamble' has the state's highest rates of PPH and PAD (Figures 3.6, 3.7). At 38 per 100, its health check uptake rate is among the highest in the country, much like certain other populous regional and remote SA3s in New South Wales: 'Dubbo', 'Lachlan Valley', and 'Richmond Valley – Hinterland' (Figure 3.8).

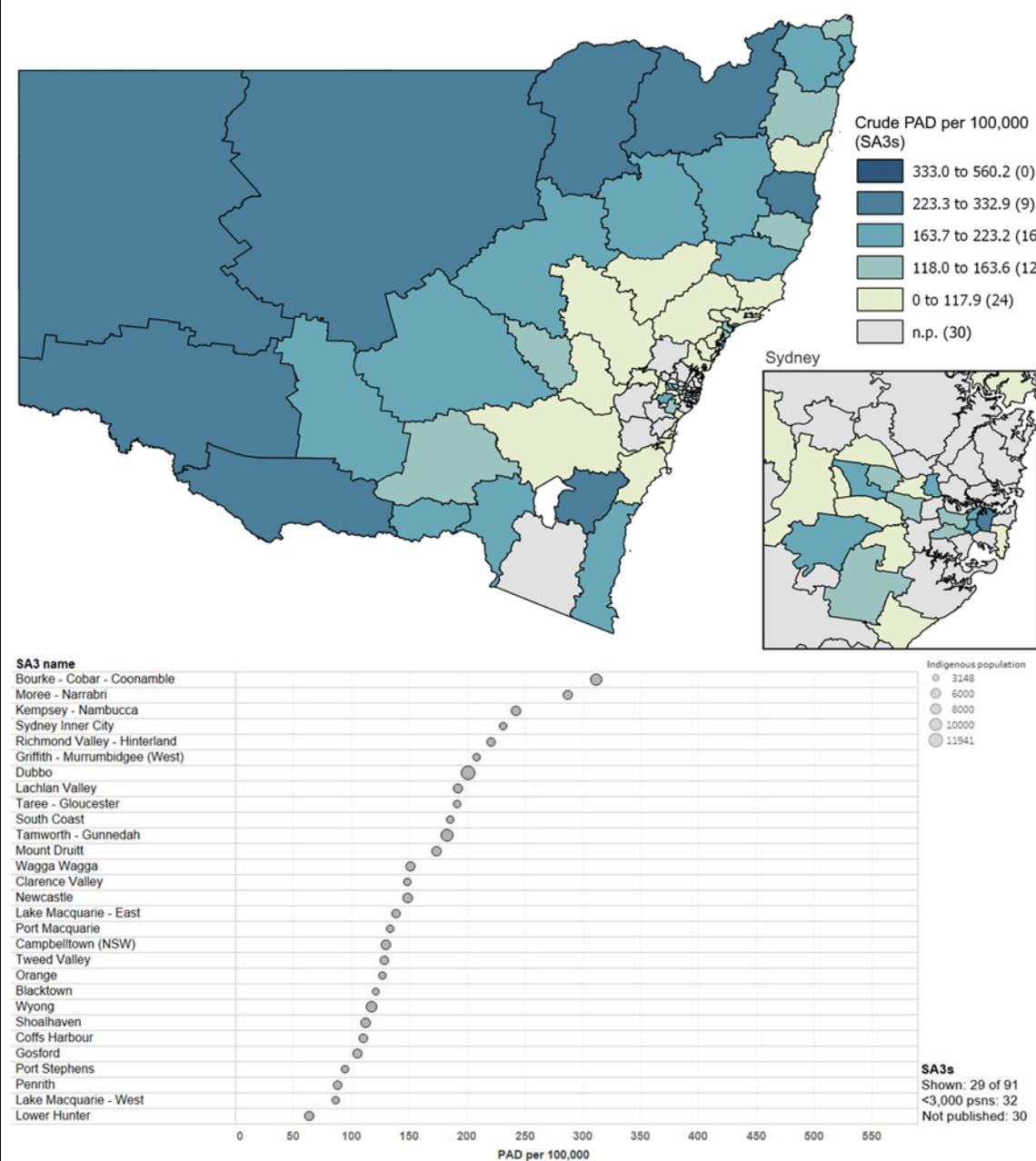
**Figure 3.6: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, New South Wales**



Note: Waterfall graph limited to SA3s with ≥3,000 Indigenous residents.

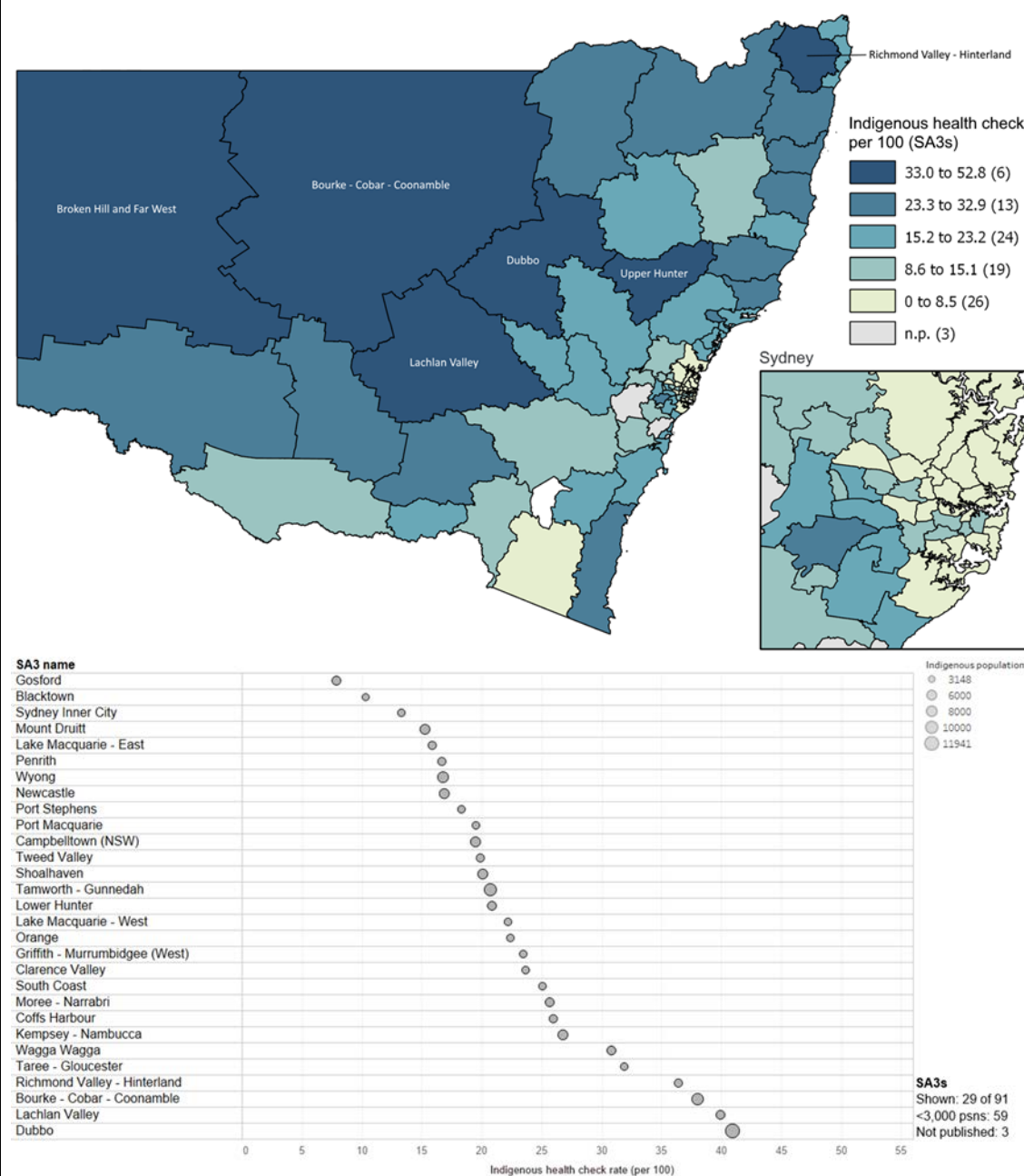


**Figure 3.7: PAD per 100,000 Indigenous persons per annum, 2012 to 2016, New South Wales**



Note: Waterfall graph limited to SA3s with ≥3,000 Indigenous residents.

**Figure 3.8: Indigenous health checks per 100 Indigenous persons, 2014–15, New South Wales**

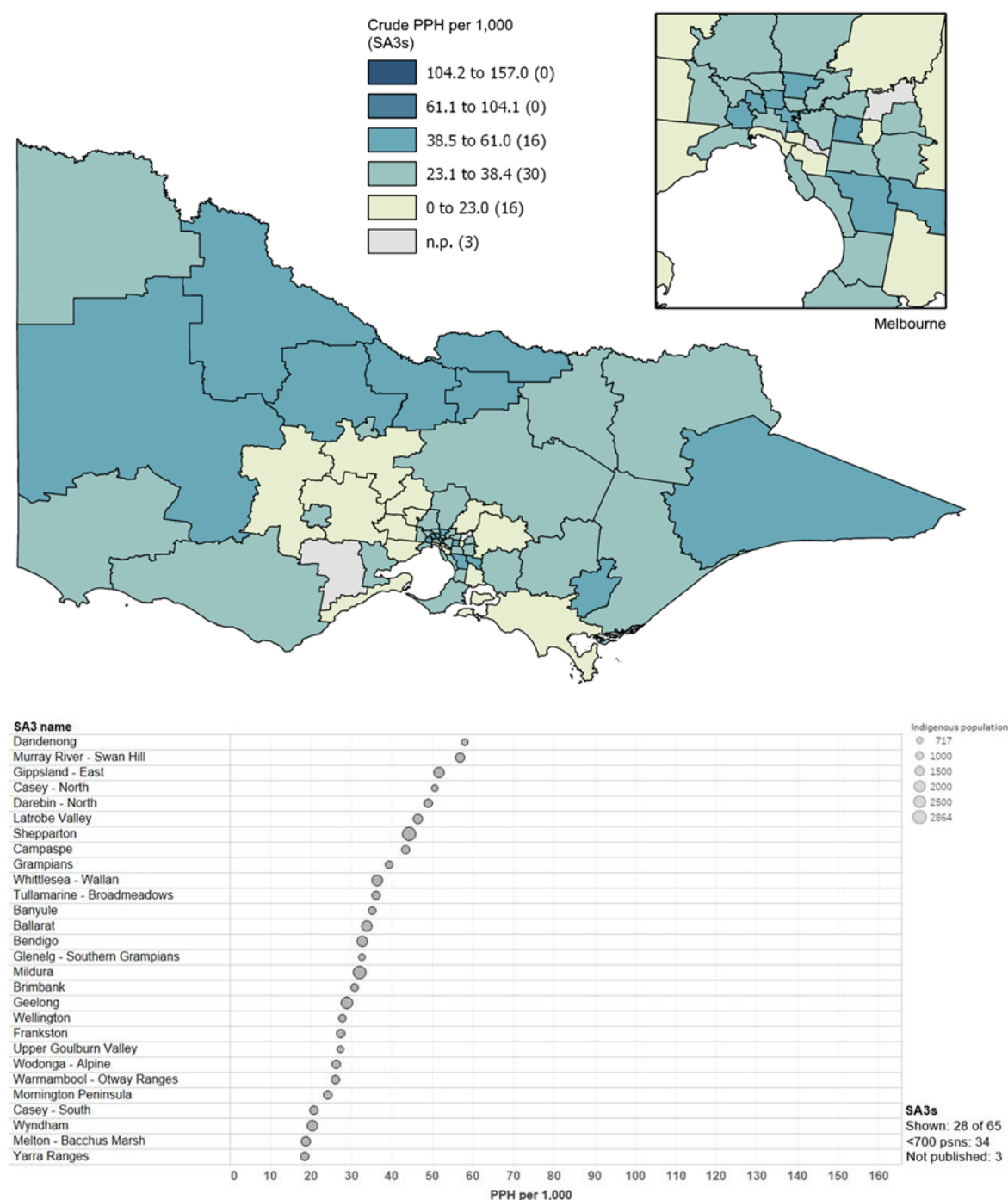


Note: Waterfall graph limited to SA3s with ≥3,000 Indigenous residents.

## Victoria

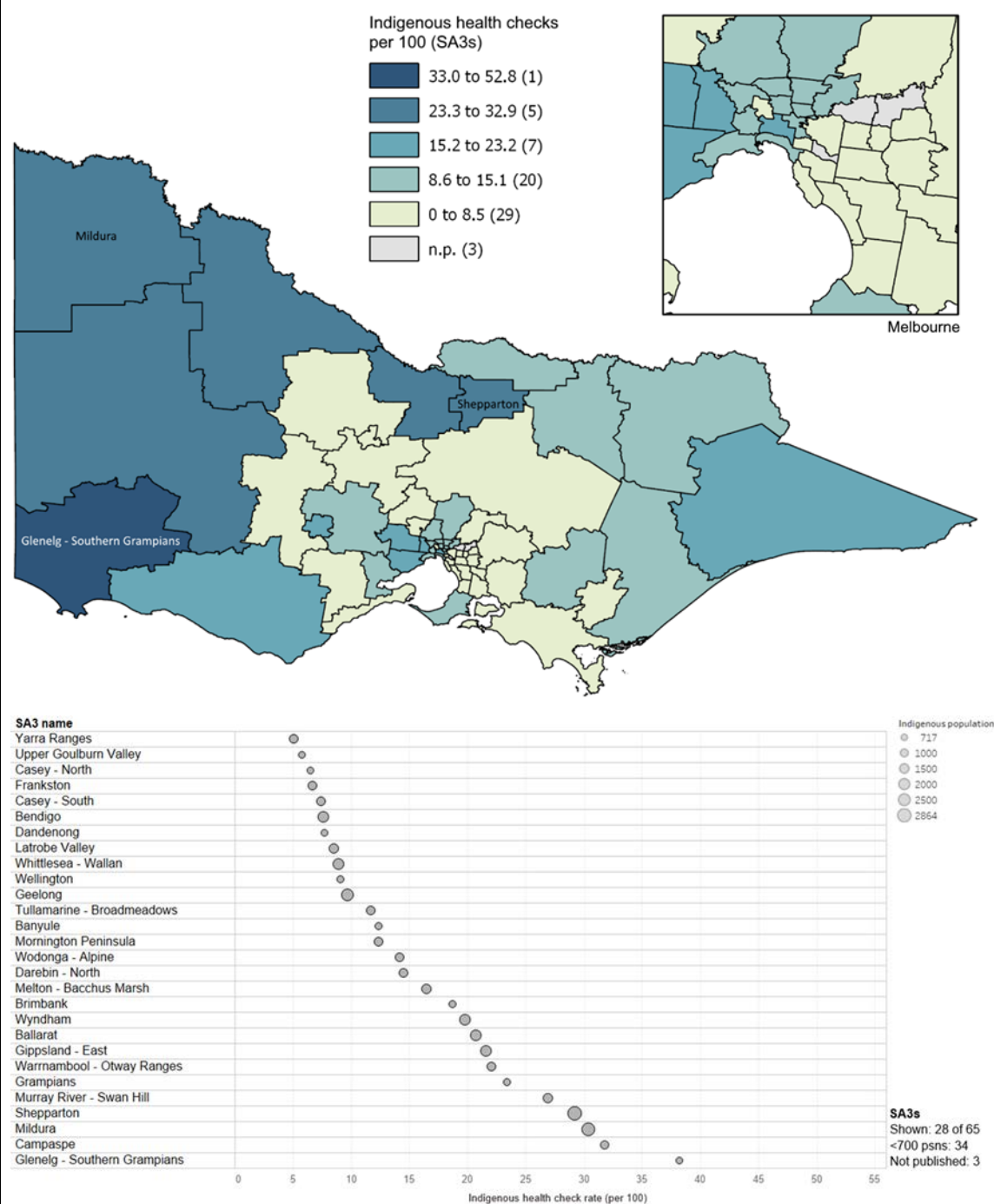
Victoria generally has low PPH rates, as well as small Indigenous populations (Figures 3.4, 3.9). Rates of Indigenous health checks are mostly below 20 per 100 persons but are higher in regional centres like 'Mildura' and 'Shepparton', where the Indigenous population is higher, and peak at 38 per 100 in 'Glenelg – Southern Grampians' (Figure 3.10). Deaths data are not shown because of concerns about Indigenous under-identification.

**Figure 3.9: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, Victoria**



Note: Waterfall graph limited to SA3s with ≥700 Indigenous residents.

**Figure 3.10: Indigenous health checks per 100 Indigenous persons, 2014–15, Victoria**

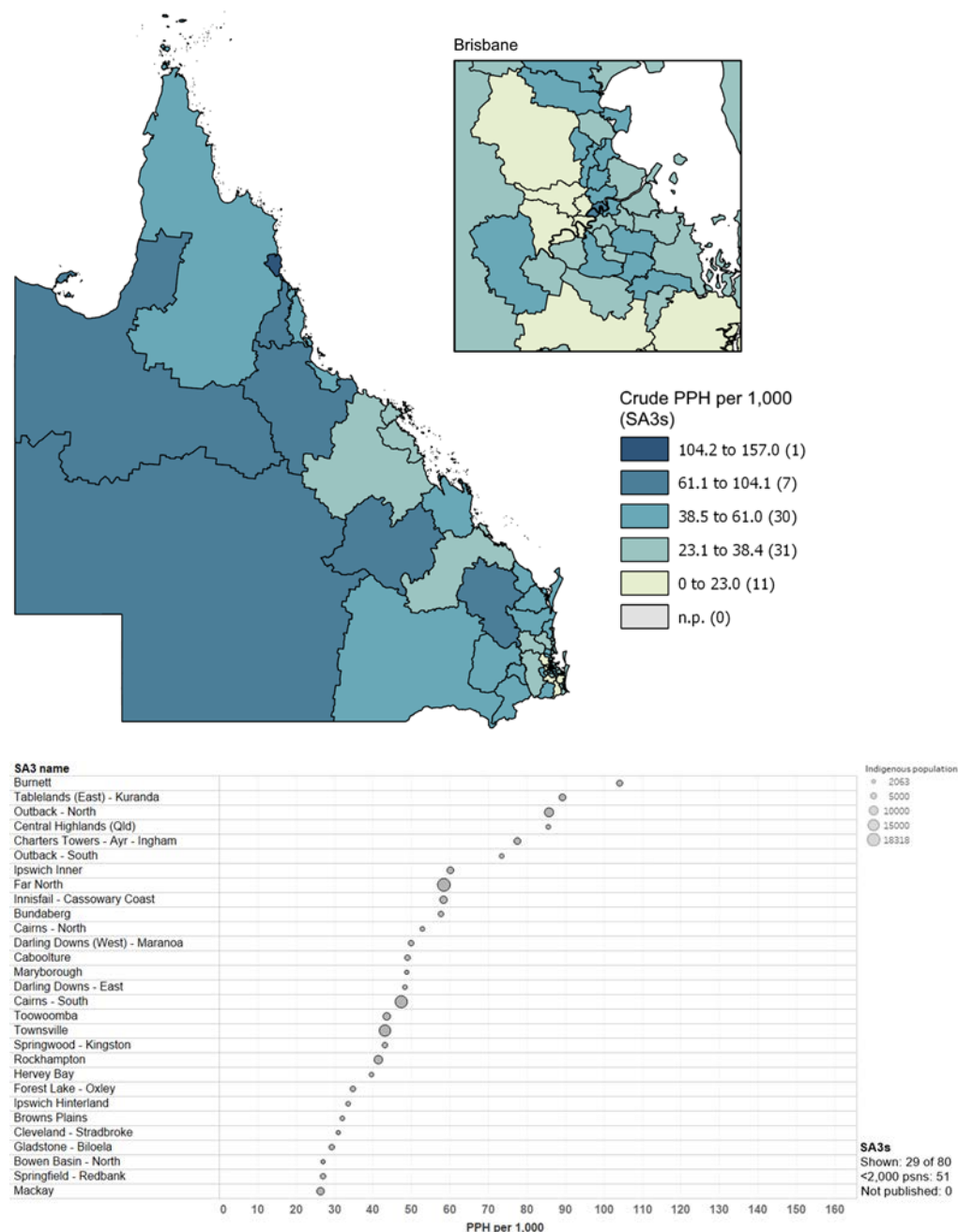


Note: Waterfall graph limited to SA3s with ≥700 Indigenous residents.

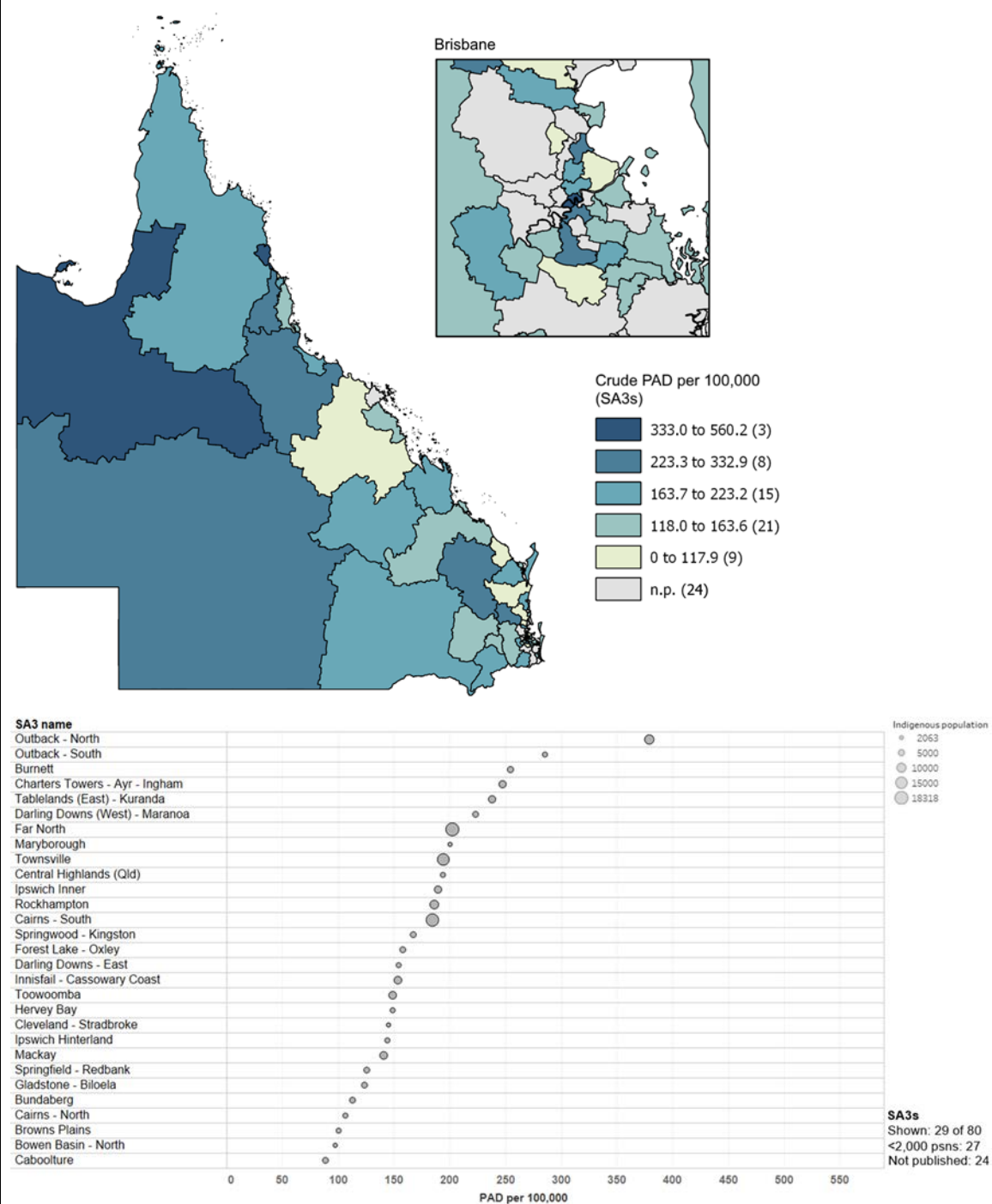
## Queensland

Queensland has the 4 SA3s with the highest uptake rates of Indigenous health checks of any SA3 in any jurisdiction (Figure 3.4). 'Townsville', 'Caboolture', 'Beaudesert' and 'Rockhampton'—all of which are primarily urban SA3s with higher proportions of Indigenous people than the state at large—have health check rates of over 40 per 100 persons (Figure 3.13). 'Far North' stands out with a low rate of health checks, at 16 per 100 (Figure 3.13). The 'Outback – North' SA3 stands out as an area with a substantial Indigenous population and high rates of both PPH and PAD (figures 3.11, 3.12).

**Figure 3.11: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, Queensland**



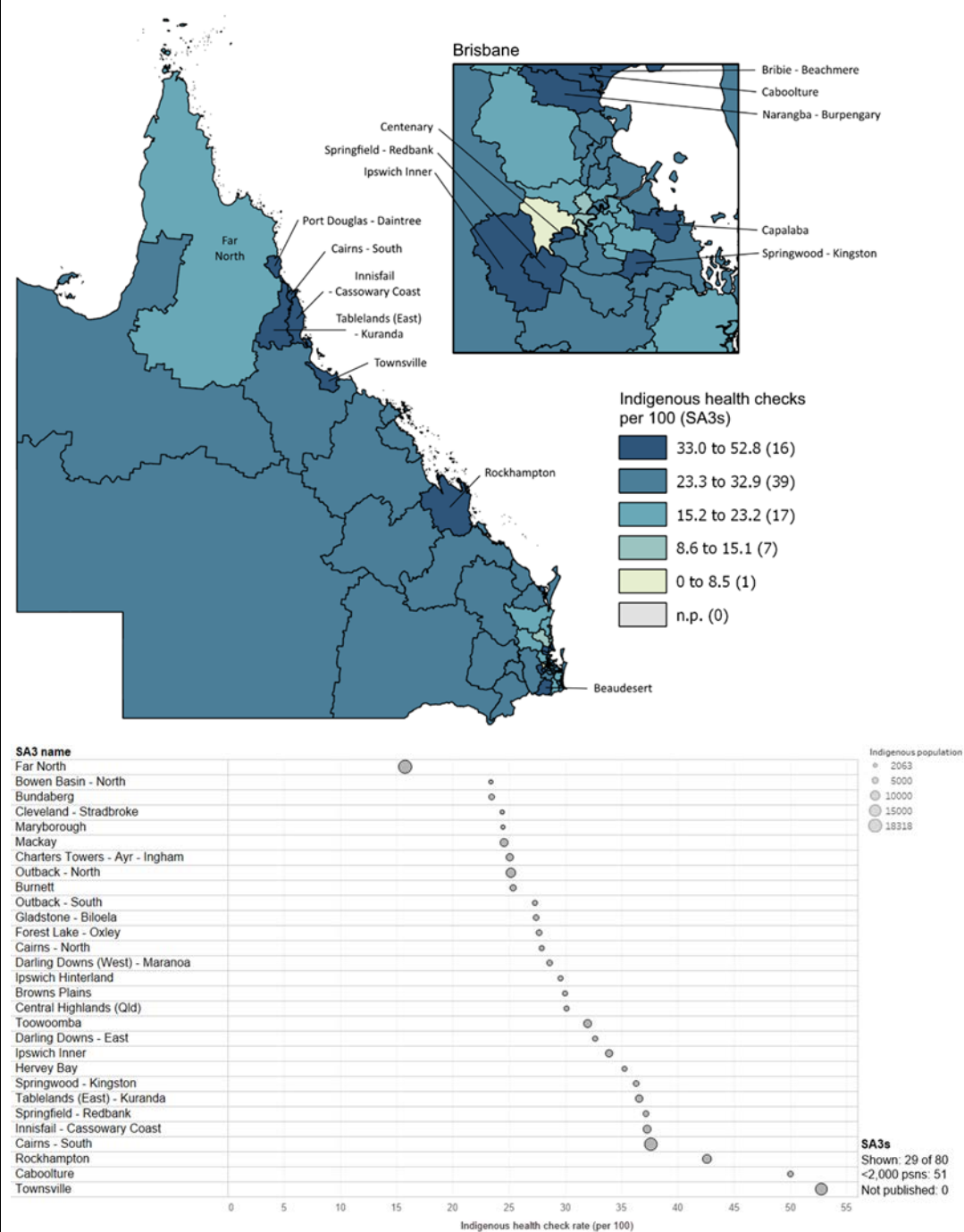
**Figure 3.12: PAD per 100,000 Indigenous persons per annum, 2012 to 2016, Queensland**



Note: Waterfall graph limited to SA3s with ≥2,000 Indigenous residents.



**Figure 3.13: Indigenous health checks per 100 Indigenous persons, 2014–15, Queensland**

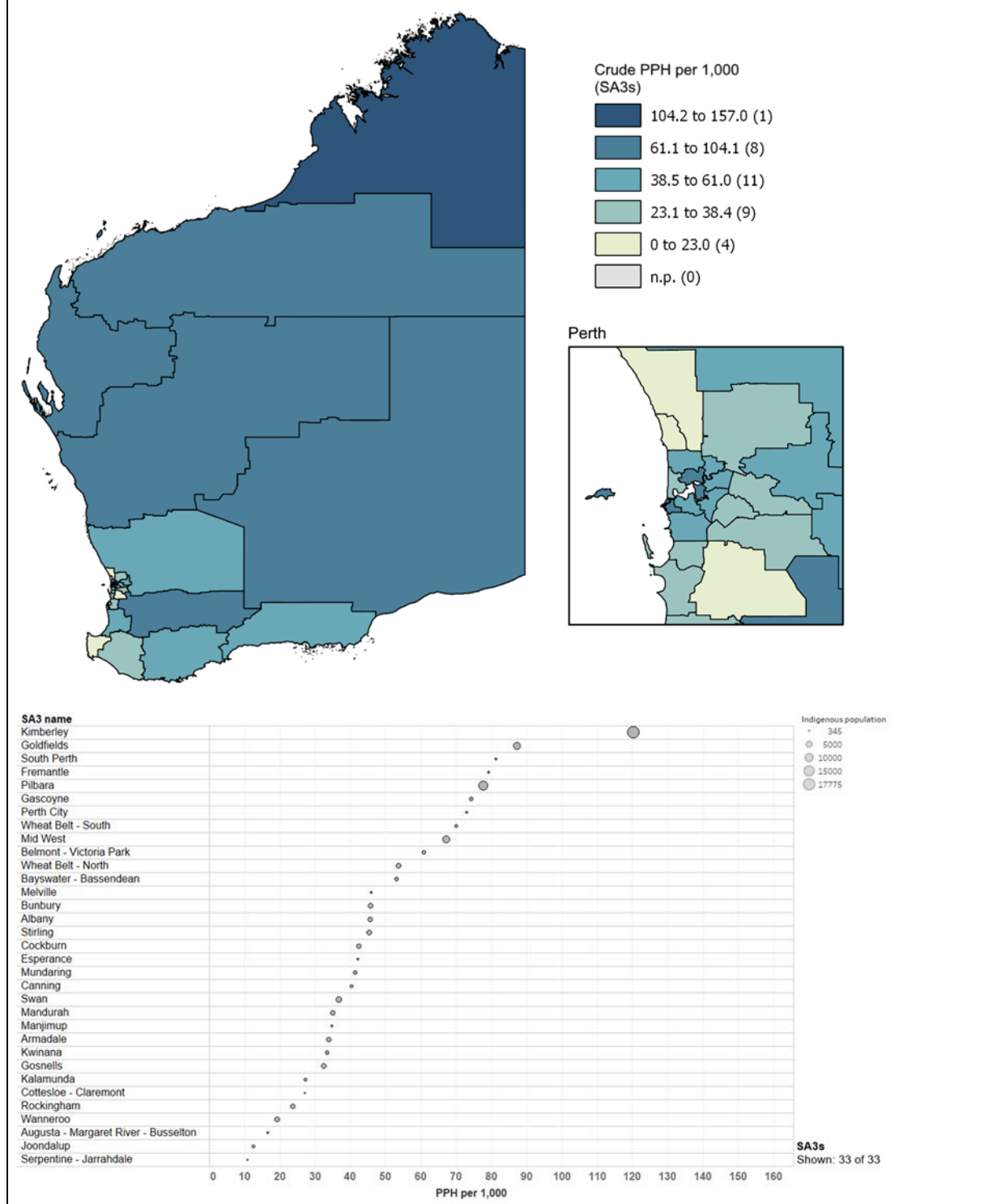


Note: Waterfall graph limited to SA3s with ≥2,000 Indigenous residents.

## Western Australia

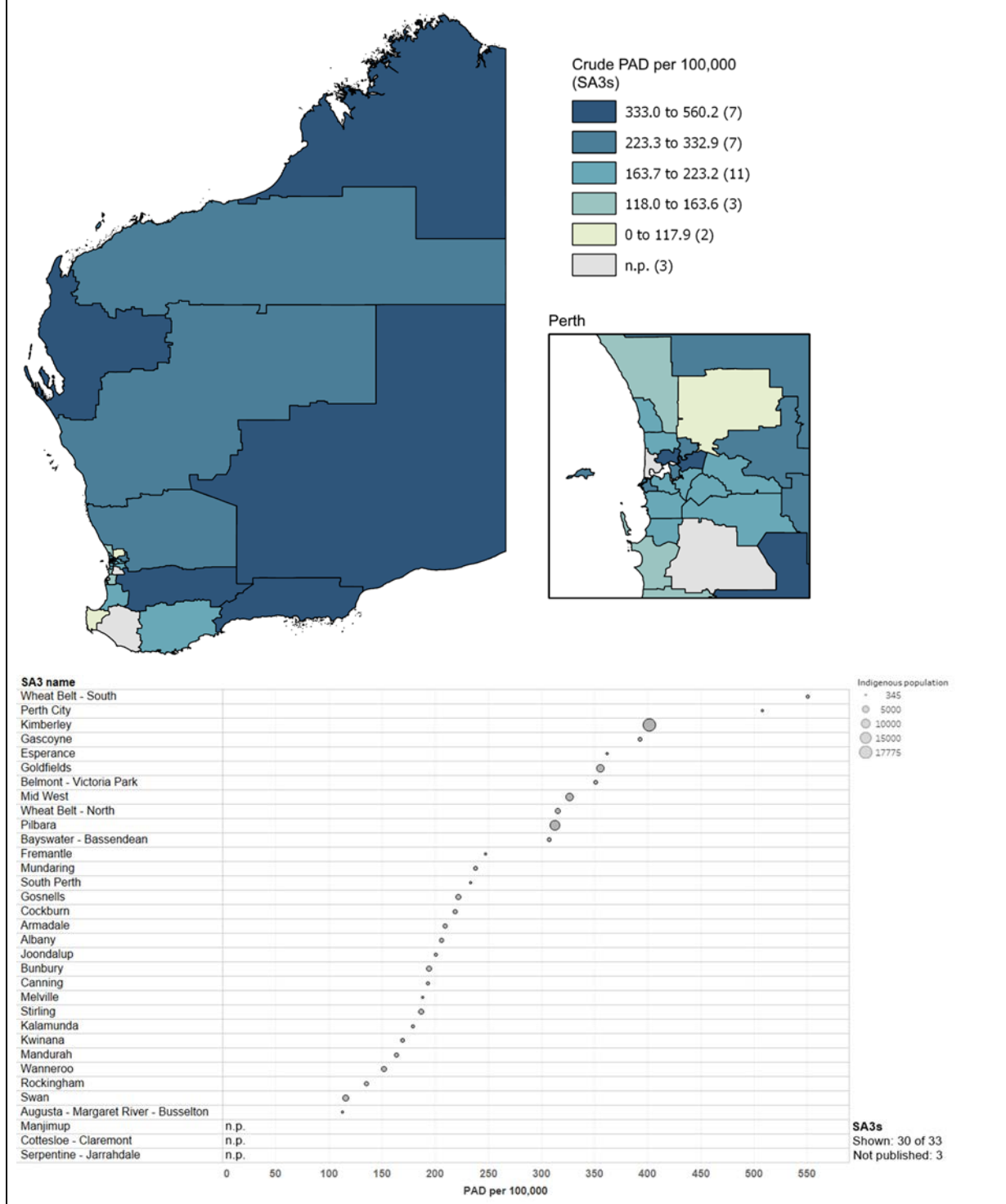
Western Australia has SA3s with large Indigenous populations and relatively high rates of PPH and PAD. This is particularly the case for the 'Kimberley' SA3 (figures 3.14, 3.15). Indigenous health checks are close to 20% in most SA3s, including the 'Kimberley', which is relatively low compared with SA3s with similarly large Indigenous populations in other jurisdictions (figures 3.4, 3.16).

**Figure 3.14: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, Western Australia**

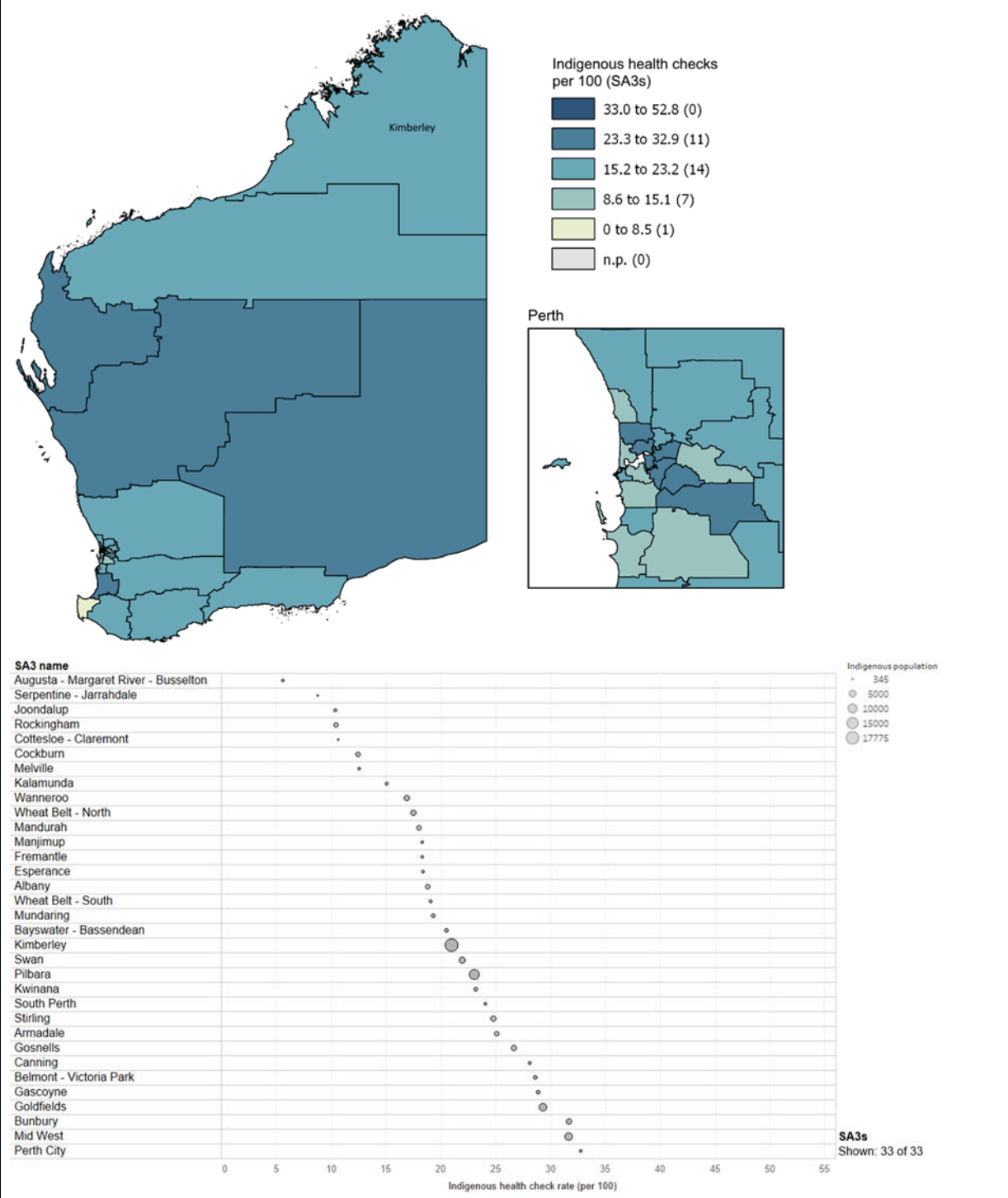




**Figure 3.15: PAD per 100,000 Indigenous persons per annum, 2012 to 2016, Western Australia**



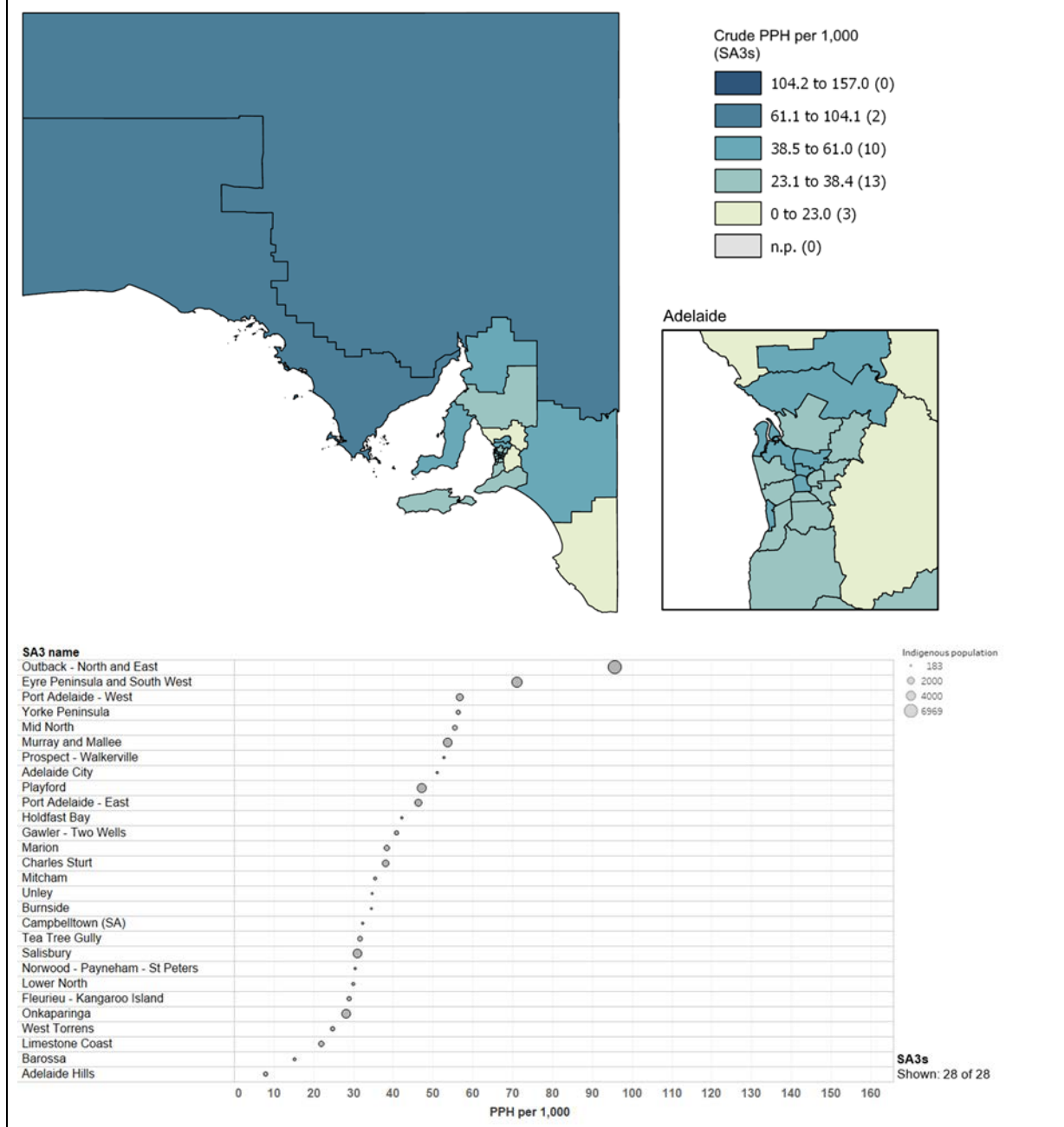
**Figure 3.16: Indigenous health checks per 100 Indigenous persons, 2014–15, Western Australia**



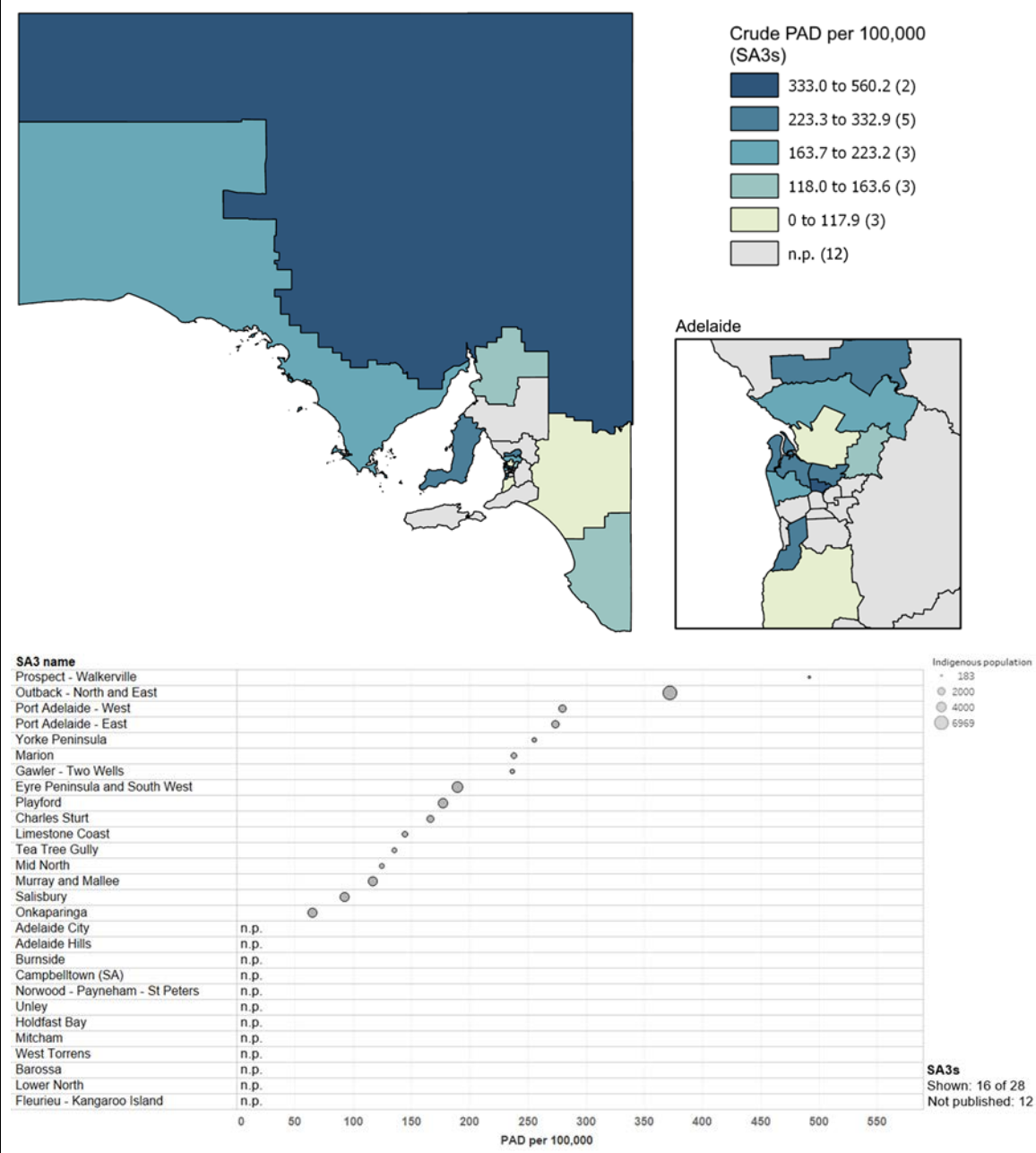
## South Australia

South Australia generally has lower rates of health checks than other jurisdictions (Figure 3.4). The most remote SA3, 'Outback – North and East', contains the APY lands, and around 7,000 Indigenous people (see Appendix A2). This SA3 has the highest rates of PPH in the state (Figure 3.17), one-third of the state's avoidable deaths (see Appendix A2) and the highest rates of health checks (30 per 100 persons) (Figure 3.19).

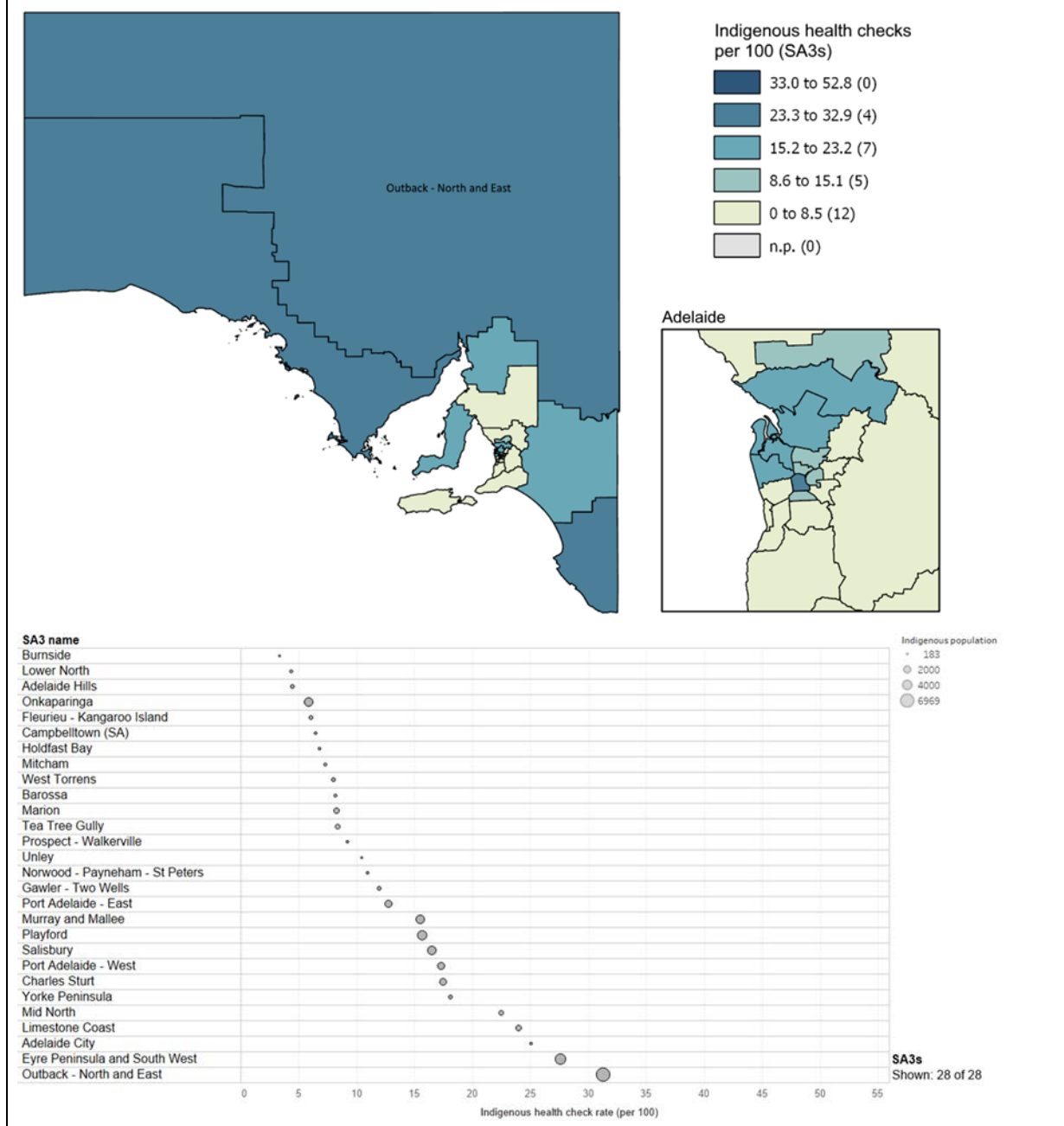
**Figure 3.17: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, South Australia**



**Figure 3.18: PAD per 100,000 Indigenous persons per annum, 2012 to 2016, South Australia**



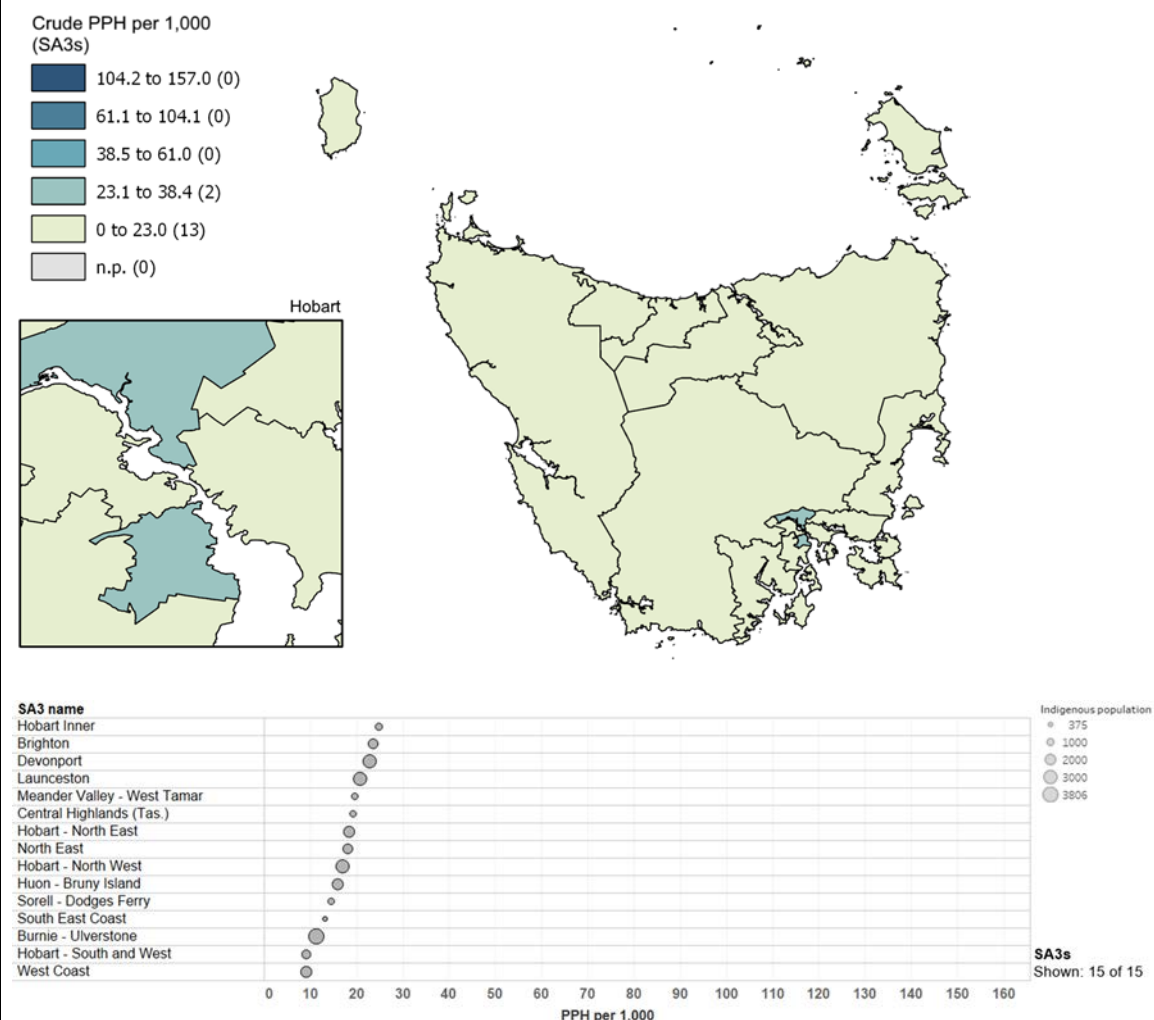
**Figure 3.19: Indigenous health checks per 100 Indigenous persons, 2014–15, South Australia**



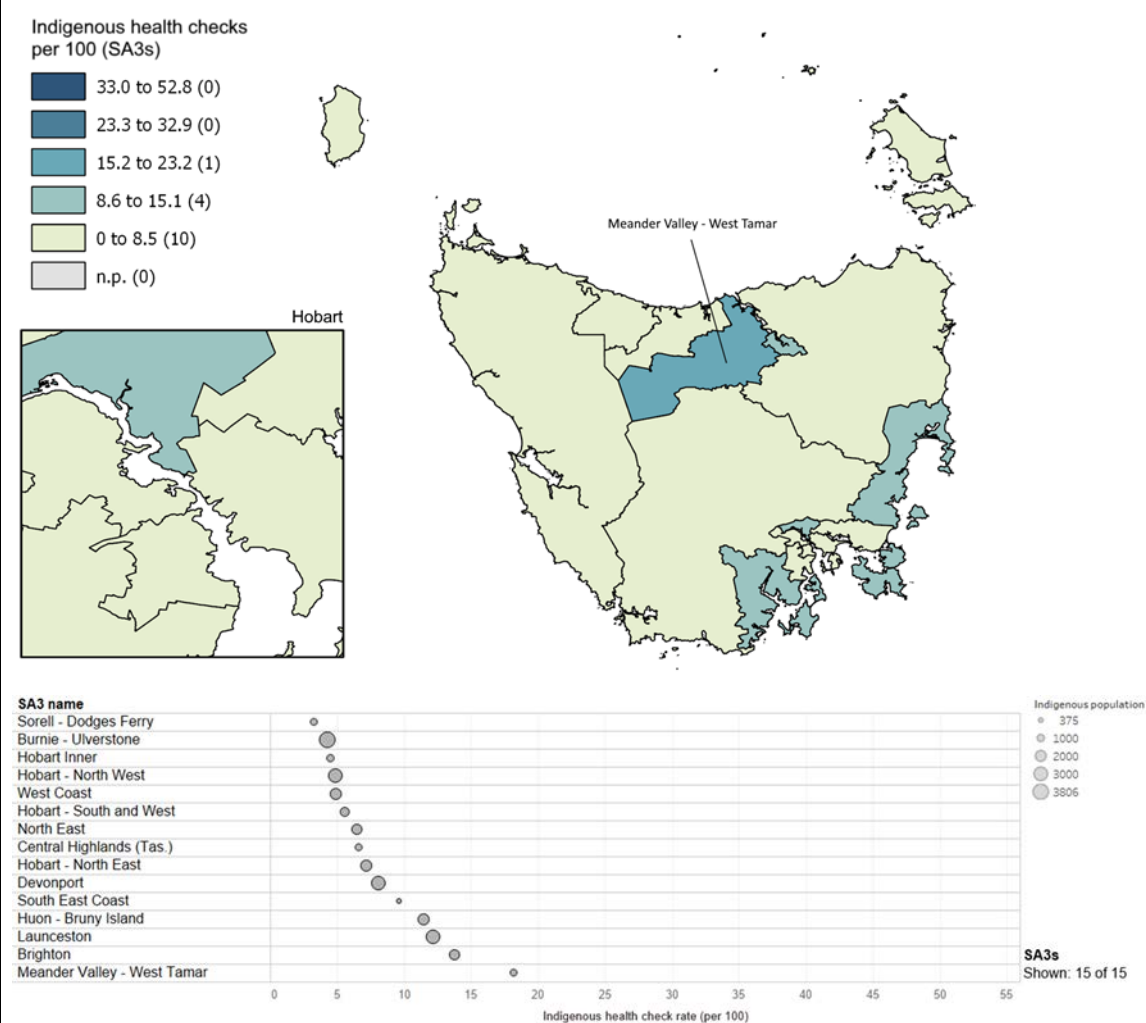
## Tasmania

Tasmania's SA3s all have low rates of PPH (Figure 3.20) and typically low uptake rates of Indigenous health checks (Figure 3.21). Tasmanian deaths data cannot be reliably reported due to concerns about under-identification.

**Figure 3.20: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, Tasmania**



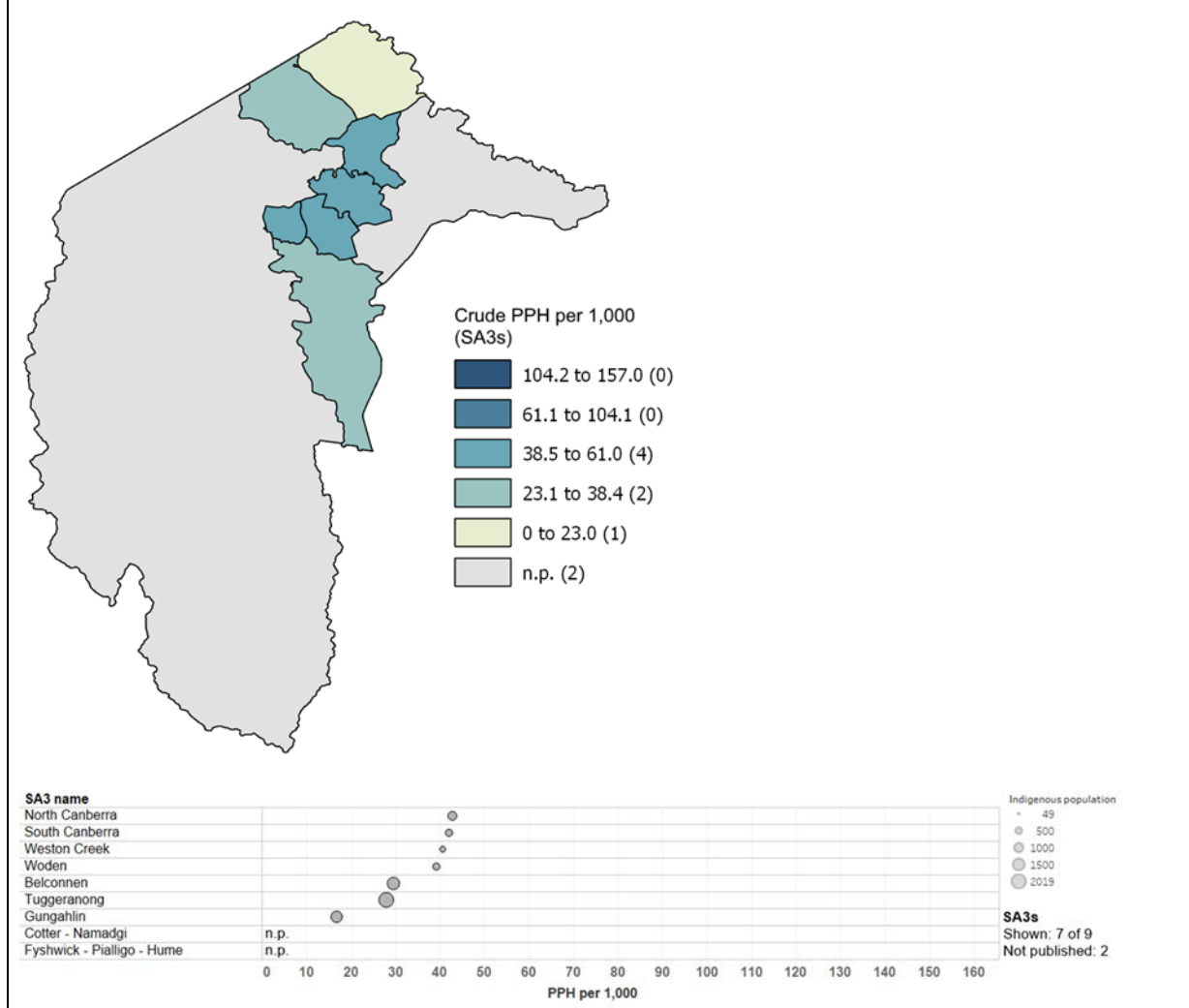
**Figure 3.21: Indigenous health checks per 100 Indigenous persons, 2014–15, Tasmania**



## Australian Capital Territory

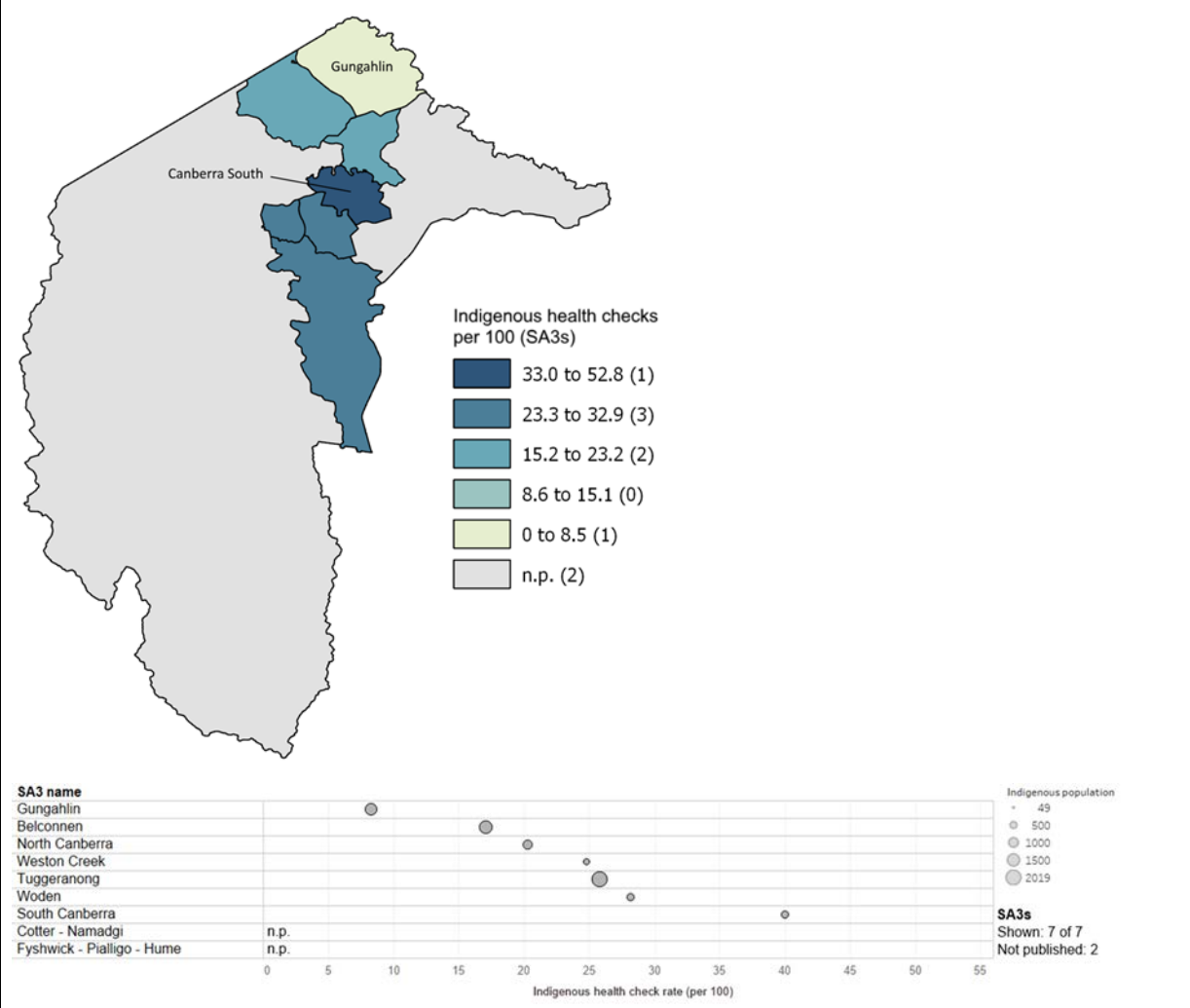
The Australian Capital Territory's overall health check rate (21.3%) is similar to that for the New South Wales cities of comparable size—Newcastle (22.2%) and Wollongong (18.1%) (see Appendix A2)—but there is considerable variation between SA3s (Figure 3.23). Low rates in 'Gungahlin' could be due to the types of health services available (Figure 3.23), but based on the newly released 2016 estimated Indigenous resident population for this area, the true health check rate is likely to be higher. The SA3s in the Australian Capital Territory generally have low rates of PPH (figures 3.4, 3.22). Deaths data for the Australian Capital Territory are not reported due to concerns about Indigenous under-identification.

**Figure 3.22: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, Australian Capital Territory**





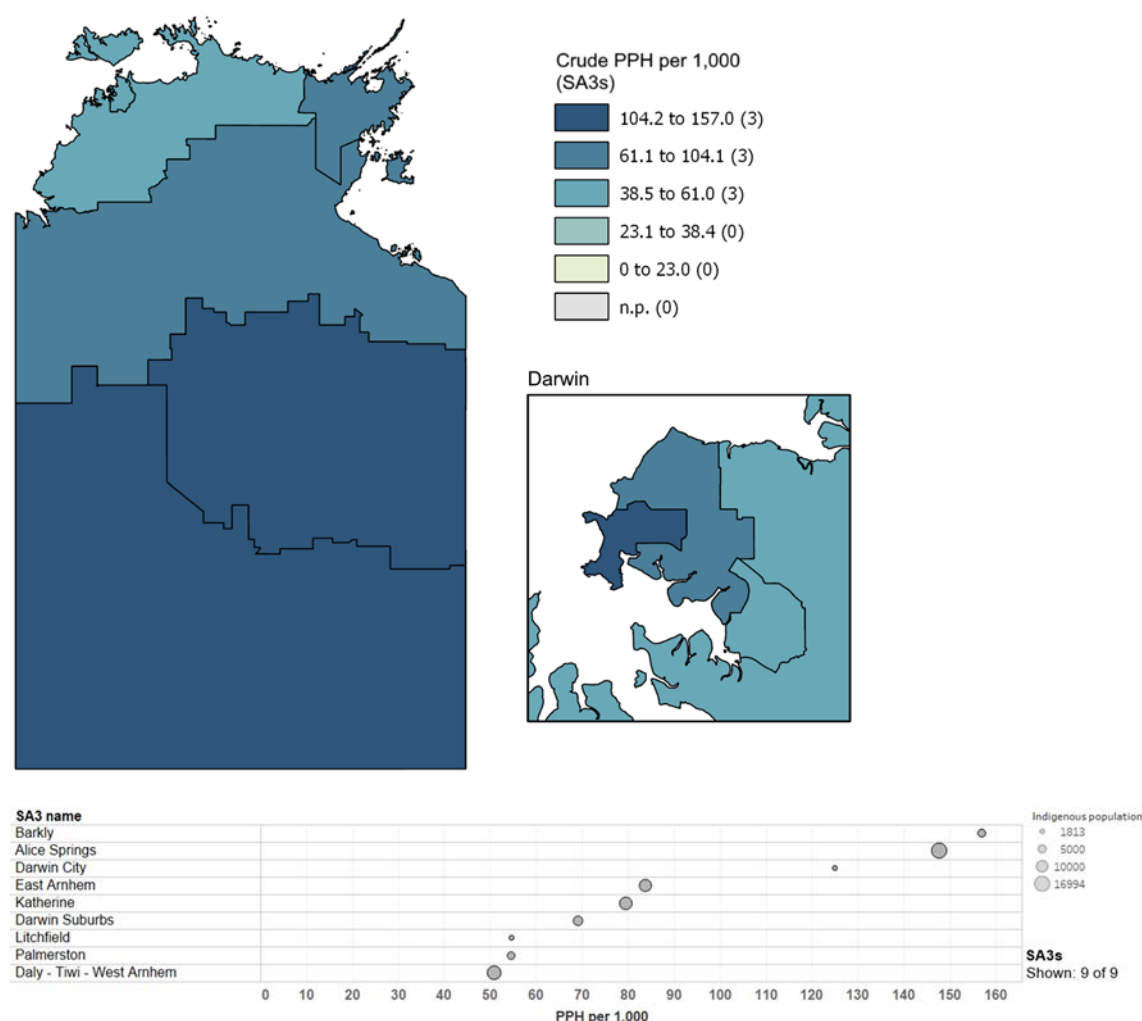
**Figure 3.23: Indigenous health checks per 100 Indigenous persons, 2014–15, Australian Capital Territory**



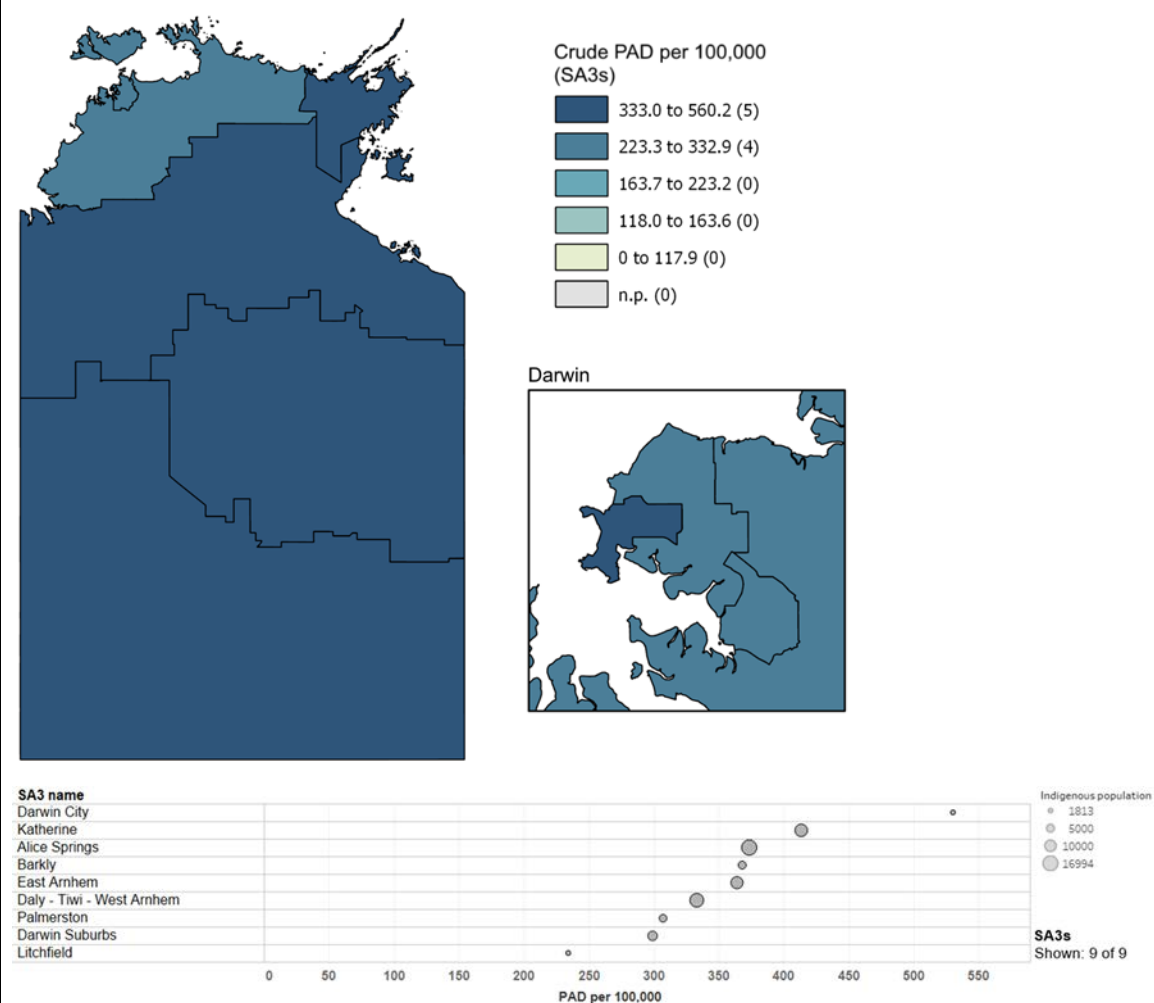
## Northern Territory

The Northern Territory has the 2 SA3s with the highest PPH rates of any SA3 in any jurisdiction (Figure 3.4). These SA3s, 'Barkly' and 'Alice Springs', both have large Indigenous populations, making up very high proportions of the total populations (see Appendix A2). Except for the 'Darwin City' SA3, the remaining SA3s in the Northern Territory have PPH rates that are noticeably lower, but still relatively high or intermediate compared with all SA3s (Figure 3.24). 'Alice Springs' and 'Darwin City' also stand out as SA3s with relatively high uptake rates of Indigenous health checks (Figure 3.26). Rates of avoidable deaths are generally high across Northern Territory SA3s (Figure 3.25).

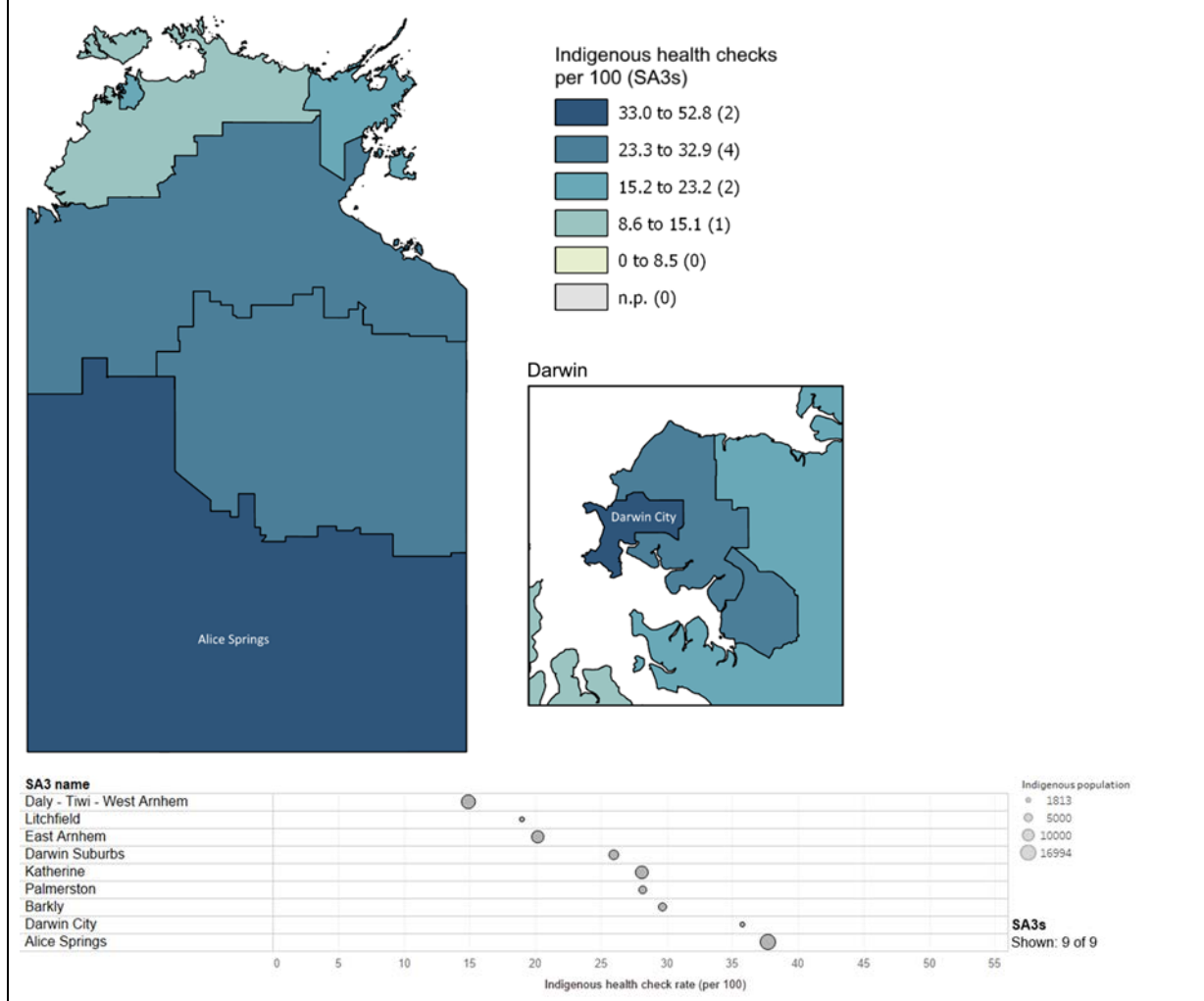
**Figure 3.24: PPH per 1,000 Indigenous persons per annum, 2013–14 to 2015–16, Northern Territory**



**Figure 3.25: PAD per 100,000 Indigenous persons per annum, 2012 to 2016, Northern Territory**



**Figure 3.26: Indigenous health checks per 100 Indigenous persons, 2014–15, Northern Territory**



### 3.3 Areas with unexpected rates

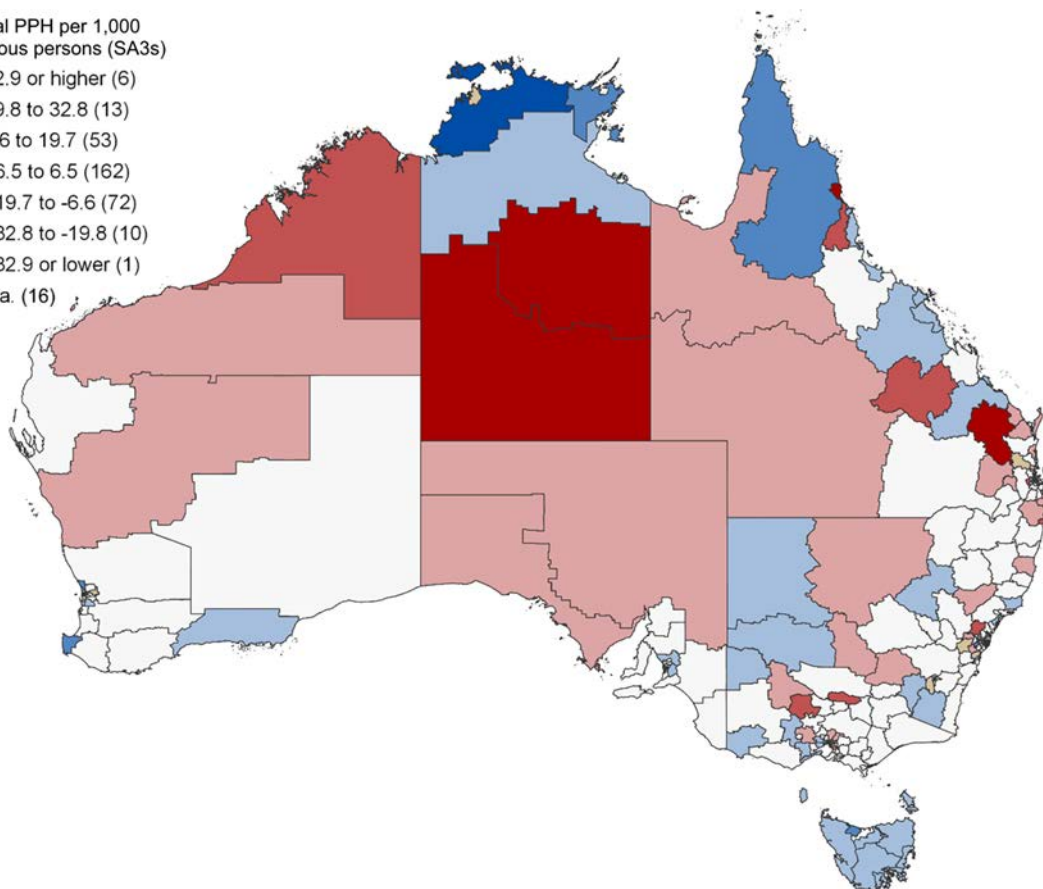
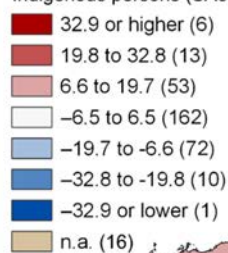
Much of the geographical variation in PPH rate outlined in the previous section is associated with geographical variation in the characteristics of SA3s and their Indigenous populations. We explored this association in regression models to identify areas with unexpectedly high or low crude PPH rates (see 'Modelling PPH rates' in Appendix B for detailed methodological information, and for information on the variables used in the modelling and those included in the best model). Our best model could explain as much as 63% of the variation in PPH rates at the SA3 level. This model included socioeconomic factors and age structure, which are both known to be related to need for primary health care (AIHW 2014). It also included geographical factors that are associated with access to health services (AIHW 2014).

The maps in figures 3.27 and 3.28 show how much the PPH rate of each SA3 deviates from what is expected, based on our model—so called residual rates. For example, SA3s shown as dark red in the maps have at least 32.9 PPH per 1,000 Indigenous persons more than would be expected, based on the characteristics of those SA3s. SA3s shown as dark blue have at least 32.9 PPH per 1,000 Indigenous persons fewer than expected. (Note that the average residual rate was 0.0 PPH per 1,000 Indigenous persons, and standard deviation was 13.1 PPH per 1,000 Indigenous persons.)

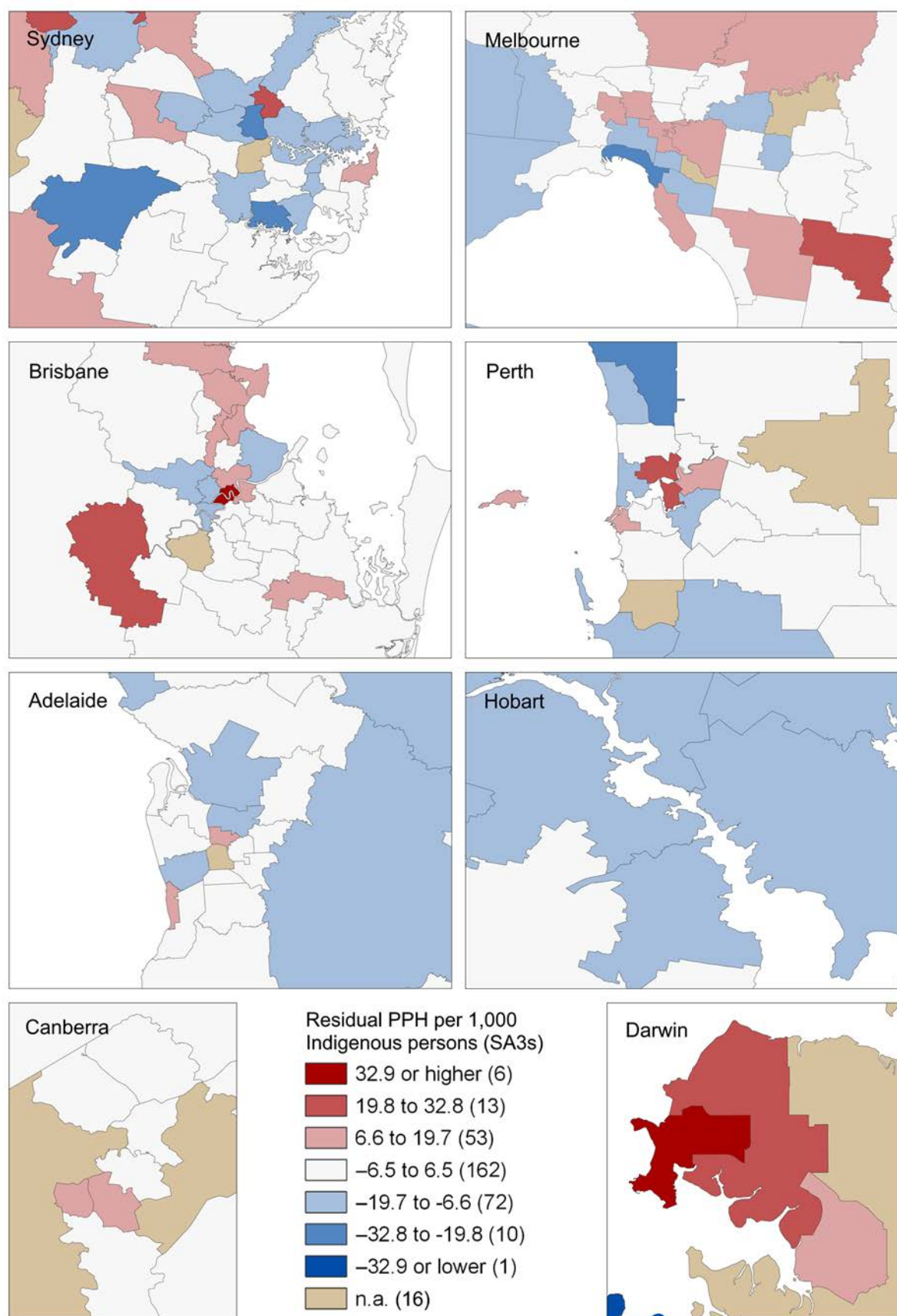
- Whereas much of Central Australia ('Alice Springs' and 'Barkly' SA3s) and the Kimberley ('Kimberley') stand out as having higher than expected rates, Arnhem Land ('Daly – Tiwi – West Arnhem' and 'East Arnhem') and Cape York ('Far North (Qld)') have unexpectedly low PPH rates (Figure 3.27).
- Darwin has much higher than expected rates as does 'Port Douglas – Daintree' and 'Tablelands (East) – Kuranda' near Cairns (Figure 3.28).
- Other capital cities also have some standout areas including inner Brisbane and Perth, which have higher than expected rates (Figure 3.28).
- Large adjoining areas extending across remote parts of New South Wales, Queensland, Western Australia and South Australia have rates that are slightly higher than expected (Figure 3.27).
- Tasmania broadly has lower than expected rates (Figure 3.27).
- In Southern and Central Queensland, the SA3s 'Burnett', 'Central Highlands (Qld)' and 'Richmond Valley – Coastal' have higher than expected rates (Figure 3.27).

**Figure 3.27: SA3s with unexpectedly high (red) or low (blue) reported rates of Indigenous PPH relative to predicted rates**

Residual PPH per 1,000  
Indigenous persons (SA3s)



**Figure 3.28: Capital city SA3s with unexpectedly high (red) or low (blue) reported rates of Indigenous PPH relative to predicted rates**



## 4 Discussion

There are big differences in Indigenous rates of PPH and PAD between SA3s, between states and territories, and between PHNs. The same is true for uptake rates of Indigenous health checks. Many of the areas that have reached the highest uptake rates are areas with relatively poor outcomes and large Indigenous populations. These are arguably the areas where the need for effective primary health care and early detection of health issues is greatest.

It may seem counter-intuitive that the areas with the highest rates of Indigenous health checks are often not those with the lowest PPH and PAD rates. However, 3 things should be noted:

- First, national uptake rates are known to have nearly tripled between 2010–11 and 2016–17 (AIHW 2017a). It seems reasonable to expect that there will be some lag time between an increase in the uptake of health checks and when positive effects on health outcomes can be seen.
- Second, areas with relatively good health outcomes tend to be areas with characteristics that may make them less likely to see quick increases in the uptake of Indigenous health checks. For example, health outcomes are often relatively good in urban areas where services with a strong focus on Indigenous clients typically make up a relatively small proportion of the available services, and of the services used by Indigenous people (AIHW 2015a).
- Third, how effective health checks are at preventing PPH and PAD will depend on how the results of the health checks are followed up. Geographical variation in the rate of follow-up care is, for the first time, shown in the latest update of the AIHW's Indigenous health check tool. Preliminary analysis suggests that areas where a relatively high proportion of health checks result in follow-up care also tend to have relatively high rates of PPH. Again, this may seem counter-intuitive, but more health checks are likely to result in follow-up care being recommended in areas with relatively poor health outcomes. Further analysis with data from a longer time period is needed to assess the impact of appropriate follow-up care on health outcomes. For more information on the Indigenous health checks and follow-up care, see the Indigenous health check tool on the AIHW website at <https://www.aihw.gov.au/reports/indigenous-health-welfare-services/indigenous-health-check-mbs-715-data-tool/contents/dynamic-data-displays>.

### Areas with unexpected PPH rates

There are interesting examples of areas with unexpected PPH rates based on the regression model and the characteristics of the areas and populations. Most notably, whereas the northern parts of the Northern Territory (except Darwin) have unexpectedly low rates, the southern parts have unexpectedly high rates. The Kimberley region has unexpectedly high rates and the Cape York region has unexpectedly low rates. The Tasmanian SA3s and the SA3s covering Arnhem Land in the Northern Territory all have unexpectedly low PPH rates.

There are a number of reasons why an area might have unexpectedly low PPH rates, including:

- effective local primary health care
- population characteristics not captured by the analysed Census data (see 'Modelling PPH rates' in Appendix B)
- people not always being hospitalised when they should be



- Indigenous under-identification in hospital records
- emigration to areas with services for health reasons
- incomplete hospital reporting; for example, from private hospitals and in-prison treatment
- inaccurate address information or concordance with statistical areas
- Indigenous population estimates that are too high.

Similarly, there are a number of reasons why an area might have unexpectedly high PPH rates, including:

- ineffective local primary health care
- non-physical barriers to primary health care, including cultural safety and financial costs
- population characteristics not captured by the analysed Census data
- high prevalence of certain diseases or conditions
- contributory environmental factors and food sources
- immigration to areas with services for health reasons
- an unusually high rate of inter-hospital transfers
- inaccurate address information or concordance with statistical areas
- Indigenous population estimates that are too low.

The importance of each of the factors that might cause unexpectedly low or high PPH rates is currently not well understood and may vary from area to area. All the factors listed would be worth investigating in areas with unexpected PPH rates to add to our understanding of what drives the variation in Indigenous PPH rates. Identifying areas with data issues may also assist to ensure that policy and management decisions are based on accurate information.

# Appendix A

## Appendix A1: Crude rates of PPH (2013–14 to 2015–16 pooled), PAD (2012 to 2016 pooled) and Indigenous health checks (2014–15), by PHN

Table A1: Detailed results for Indigenous population, by PHN

PHN code	PHN name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
101	Central and Eastern Sydney	15,343	1.0	1,583	34.4	96	125.4	1,232	8.0
102	Northern Sydney	3,158	0.4	146	15.4	8	50.7	128	4.1
103	Western Sydney	15,034	1.6	1,872	41.5	99	131.8	1,668	11.1
104	Nepean Blue Mountains	11,615	3.2	1,020	29.3	55	94.6	1,786	15.4
105	South Western Sydney	16,695	1.8	1,576	31.5	83	99.1	2,831	17.0
106	South Eastern NSW	21,274	3.5	2,045	32.0	126	118.5	4,073	19.1
107	Western NSW	35,888	11.5	4,919	45.7	379	211.3	12,510	34.9
108	Hunter New England and Central Coast	63,153	5.1	6,820	36.0	469	148.4	13,077	20.7
109	North Coast	27,768	5.5	3,987	47.9	238	171.8	7,102	25.6
110	Murrumbidgee	12,036	5.0	1,699	47.0	106	175.7	3,027	25.1
201	North Western Melbourne	10,684	0.7	1,004	31.3	n.p.	n.p.	1,551	14.5
202	Eastern Melbourne	6,643	0.5	574	28.8	n.p.	n.p.	450	6.8
203	South Eastern Melbourne	7,514	0.5	657	29.1	n.p.	n.p.	559	7.4
204	Gippsland	5,141	1.9	613	39.7	n.p.	n.p.	689	13.4
205	Murray	15,075	2.6	1,721	38.0	n.p.	n.p.	3,204	21.3
206	Western Victoria	8,017	1.3	689	28.6	n.p.	n.p.	1,433	17.9
301	Brisbane North	19,517	2.1	2,370	40.5	129	131.7	5,880	30.1
302	Brisbane South	26,255	2.4	2,899	36.8	193	147.0	7,435	28.3
303	Gold Coast	8,581	1.5	726	28.2	33	76.9	2,102	24.5
304	Darling Downs and West Moreton	25,240	4.6	4,079	53.9	226	178.9	7,878	31.2
305	Western Queensland	14,314	19.9	3,333	77.6	234	326.9	3,816	26.7
306	Central Queensland, Wide Bay, Sunshine Coast	31,153	3.8	4,160	44.5	236	151.3	8,906	28.6
307	Northern Queensland	80,475	11.5	12,994	53.8	759	188.6	26,243	32.6
401	Adelaide	20,112	1.7	2,364	39.2	163	162.1	2,606	13.0
402	Country SA	20,111	4.1	3,994	66.2	223	221.8	4,727	23.5
501	Perth North	17,310	1.6	1,870	36.0	165	190.6	3,504	20.2
502	Perth South	20,824	2.1	2,458	39.3	212	204.1	4,316	20.7
503	Country WA	56,619	10.3	14,273	84.0	955	337.2	13,565	24.0
601	Tasmania	26,142	5.1	1,337	17.0	n.p.	n.p.	2,017	7.7
701	Northern Territory	72,823	29.4	20,450	93.6	1,301	357.2	19,309	26.5
801	Australian Capital Territory	6,804	1.8	619	30.3	n.p.	n.p.	1,447	21.3

## Appendix A2: Crude rates of PPH (2013–14 to 2015–16 pooled), PAD (2012 to 2016 pooled) and Indigenous health checks (2014–15), by SA3

**Table A2: New South Wales, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
10101	Goulburn - Yass	2,296	3.2	183	26.6	12	105.3	262	11.4
10102	Queanbeyan	1,836	3.2	151	27.4	21	231.2	365	19.9
10103	Snowy Mountains	499	2.5	19	12.7	n.p.	n.p.	30	6.0
10104	South Coast	3,476	4.9	466	44.7	32	185.7	871	25.1
10201	Gosford	4,792	2.8	412	28.7	25	105.8	376	7.9
10202	Wyong	7,223	4.5	617	28.5	42	117.9	1,215	16.8
10301	Bathurst	2,406	5.1	261	36.2	7	59.1	400	16.6
10302	Lachlan Valley	5,551	9.7	701	42.1	53	192.6	2,217	39.9
10303	Lithgow - Mudgee	2,449	5.2	181	24.6	13	107.2	406	16.6
10304	Orange	3,350	5.7	335	33.3	21	126.9	749	22.4
10401	Clarence Valley	3,509	7.0	481	45.7	26	148.9	831	23.7
10402	Coffs Harbour	4,204	4.9	521	41.3	23	110.9	1,095	26.0
10501	Bourke - Cobar - Coonamble	8,121	30.1	1,854	76.1	126	312.2	3,089	38.0
10502	Broken Hill and Far West	2,761	12.7	392	47.3	40	291.8	985	35.7
10503	Dubbo	11,941	16.8	1,196	33.4	119	201.1	4,879	40.9
10601	Lower Hunter	4,767	5.4	456	31.9	15	63.9	997	20.9
10602	Maitland	2,986	4.1	314	35.1	15	102.8	871	29.2
10603	Port Stephens	3,193	4.4	248	25.9	15	95.1	585	18.3
10604	Upper Hunter	1,827	5.8	247	45.1	8	88.6	754	41.3
10701	Dapto - Port Kembla	2,570	3.4	233	30.2	13	101.3	552	21.5
10702	Illawarra Catchment Reserve	1	3.9	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
10703	Kiama - Shellharbour	2,701	3.0	268	33.1	10	74.2	417	15.4
10704	Wollongong	2,591	2.0	222	28.6	7	54.1	468	18.1
10801	Great Lakes	1,495	4.7	127	28.3	8	107.8	469	31.4
10802	Kempsey - Nambucca	5,752	11.6	1,037	60.1	69	242.7	1,540	26.8
10803	Lord Howe Island	4	1.0	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
10804	Port Macquarie	3,176	4.1	266	27.9	21	134.0	620	19.5
10805	Taree - Gloucester	3,465	6.4	407	39.2	33	191.7	1,106	31.9
10901	Albury	1,680	2.7	213	42.3	14	169.0	322	19.1
10902	Lower Murray	1,291	10.0	183	47.2	17	266.6	369	28.6
10903	Upper Murray exc. Albury	1,200	2.8	133	37.0	15	252.2	178	14.8
11001	Armidale	2,906	7.7	452	51.8	27	187.2	370	12.7
11002	Inverell - Tenterfield	2,994	7.6	471	52.4	39	262.5	721	24.1
11003	Moree - Narrabri	5,303	19.7	908	57.1	76	287.2	1,362	25.7
11004	Tamworth - Gunnedah	9,090	11.0	1,131	41.5	82	183.0	1,879	20.7

(continued)

**Table A2 (continued): New South Wales, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
11101	Lake Macquarie - East	4,082	3.3	331	27.0	28	139.0	648	15.9
11102	Lake Macquarie - West	3,288	3.3	184	18.7	14	86.6	731	22.2
11103	Newcastle	5,740	4.3	521	30.3	42	148.8	968	16.9
11201	Richmond Valley - Coastal	2,530	3.4	449	59.2	23	184.2	564	22.3
11202	Richmond Valley - Hinterland	4,655	6.4	805	57.6	51	221.1	1,692	36.4
11203	Tweed Valley	3,943	4.3	422	35.7	25	128.9	786	19.9
11301	Griffith - Murrumbidgee (West)	3,483	7.1	595	56.9	36	208.5	818	23.5
11302	Tumut - Tumbarumba	728	4.8	71	32.5	7	194.3	73	10.0
11303	Wagga Wagga	4,819	5.1	695	48.1	36	151.1	1,486	30.8
11401	Shoalhaven	5,771	5.8	537	31.0	32	112.5	1,158	20.1
11402	Southern Highlands	1,044	2.2	56	17.9	n.p.	n.p.	144	13.8
11501	Baulkham Hills	502	0.3	19	12.6	n.p.	n.p.	28	5.5
11502	Dural - Wisemans Ferry	163	0.6	n.p.	n.p.	n.p.	n.p.	10	6.3
11503	Hawkesbury	503	2.0	50	33.1	n.p.	n.p.	74	14.6
11504	Rouse Hill - McGraths Hill	296	1.0	23	25.9	n.p.	n.p.	33	11.0
11601	Blacktown	3,148	2.3	335	35.5	19	121.6	324	10.3
11602	Blacktown - North	1,373	1.5	111	26.9	5	74.0	83	6.1
11603	Mount Druitt	6,028	5.3	1,038	57.4	52	173.8	920	15.3
11701	Botany	852	1.9	100	39.1	n.p.	n.p.	51	6.0
11702	Marrickville - Sydenham - Petersham	1,061	1.9	117	36.8	11	208.4	100	9.4
11703	Sydney Inner City	3,517	1.7	644	61.0	40	231.6	467	13.3
11801	Eastern Suburbs - North	544	0.4	52	31.9	n.p.	n.p.	17	3.1
11802	Eastern Suburbs - South	2,545	1.8	247	32.4	13	103.3	138	5.4
11901	Bankstown	1,664	0.9	155	31.0	n.p.	n.p.	168	10.1
11902	Canterbury	762	0.6	83	36.3	6	158.1	67	8.8
11903	Hurstville	901	0.7	34	12.6	n.p.	n.p.	46	5.1
11904	Kogarah - Rockdale	863	0.6	29	11.2	n.p.	n.p.	47	5.4
12001	Canada Bay	389	0.4	23	19.7	n.p.	n.p.	17	4.4
12002	Leichhardt	709	1.2	63	29.6	6	170.7	49	6.9
12003	Strathfield - Burwood - Ashfield	1,026	0.7	87	28.3	8	156.8	98	9.6
12101	Chatswood - Lane Cove	272	0.2	12	14.7	n.p.	n.p.	10	3.8
12102	Hornsby	423	0.5	16	12.6	n.p.	n.p.	27	6.4
12103	Ku-ring-gai	195	0.2	11	18.8	n.p.	n.p.	10	5.0

(continued)

**Table A2 (continued): New South Wales, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
12104	North Sydney - Mosman	228	0.2	12	17.5	n.p.	n.p.	9	3.8
12201	Manly	155	0.3	6	12.9	n.p.	n.p.	8	5.2
12202	Pittwater	326	0.5	8	8.2	n.p.	n.p.	6	1.7
12203	Warringah	776	0.5	37	15.9	n.p.	n.p.	30	3.9
12301	Camden	1,396	2.3	75	17.9	n.p.	n.p.	160	11.5
12302	Campbelltown (NSW)	5,865	3.7	630	35.8	38	129.9	1,143	19.5
12303	Wollondilly	1,110	2.8	86	25.8	n.p.	n.p.	138	12.4
12401	Blue Mountains	1,622	2.0	167	34.3	9	111.0	207	12.8
12402	Blue Mountains - South	1	21.3	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
12403	Penrith	4,567	3.3	393	28.7	20	88.3	765	16.7
12404	Richmond - Windsor	1,628	4.3	90	18.4	n.p.	n.p.	234	14.4
12405	St Marys	2,119	3.7	244	38.4	12	113.9	277	13.1
12501	Auburn	692	0.8	60	28.9	n.p.	n.p.	42	6.1
12502	Carlingford	526	0.8	44	27.9	5	192.2	44	8.4
12503	Merrylands - Guildford	1,461	1.0	167	38.1	10	138.0	101	6.9
12504	Parramatta	1,421	1.0	135	31.7	8	114.0	131	9.2
12601	Pennant Hills - Epping	135	0.3	16	39.4	n.p.	n.p.	6	4.4
12602	Ryde - Hunters Hill	532	0.4	24	15.0	n.p.	n.p.	22	4.1
12701	Bringelly - Green Valley	1,855	2.0	100	18.0	16	175.7	490	26.4
12702	Fairfield	1,545	0.8	202	43.6	8	103.8	236	15.3
12703	Liverpool	1,775	1.5	216	40.6	7	79.3	306	17.3
12801	Cronulla - Miranda - Caringbah	1,066	0.9	52	16.3	n.p.	n.p.	57	5.4
12802	Sutherland - Menai - Heathcote	1,101	1.0	54	16.4	n.p.	n.p.	76	6.9
<b>Total</b>	<b>New South Wales</b>	<b>223,125</b>	<b>3.0</b>	<b>25,824</b>	<b>38.6</b>	<b>1,672</b>	<b>151.4</b>	<b>47,694</b>	<b>21.4</b>

**Table A3: Victoria, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
20101	Ballarat	1,650	1.6	168	33.9	n.p.	n.p.	342	20.7
20102	Creswick - Daylesford - Ballan	255	0.9	16	20.9	n.p.	n.p.	23	9.1
20103	Maryborough - Pyrenees	330	1.3	18	18.2	n.p.	n.p.	19	5.7
20201	Bendigo	1,795	1.9	176	32.7	n.p.	n.p.	136	7.6

(continued)

**Table A3 (continued): Victoria, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
20202	Heathcote - Castlemaine - Kyneton	499	1.1	22	14.7	n.p.	n.p.	21	4.3
20203	Loddon - Elmore	201	1.8	26	43.2	n.p.	n.p.	9	4.4
20301	Barwon - West	128	0.7	n.p.	n.p.	n.p.	n.p.	8	6.2
20302	Geelong	2,155	1.2	187	28.9	n.p.	n.p.	208	9.7
20303	Surf Coast - Bellarine Peninsula	515	0.8	12	7.8	n.p.	n.p.	21	4.1
20401	Upper Goulburn Valley	717	1.4	59	27.4	n.p.	n.p.	42	5.8
20402	Wangaratta - Benalla	607	1.4	58	31.8	n.p.	n.p.	68	11.2
20403	Wodonga - Alpine	1,349	2.0	106	26.2	n.p.	n.p.	191	14.2
20501	Baw Baw	590	1.3	44	24.8	n.p.	n.p.	80	13.6
20502	Gippsland - East	1,790	4.1	277	51.6	n.p.	n.p.	387	21.6
20503	Gippsland - South West	591	1.0	33	18.6	n.p.	n.p.	26	4.4
20504	Latrobe Valley	1,392	1.9	194	46.5	n.p.	n.p.	118	8.5
20505	Wellington	778	1.9	65	27.8	n.p.	n.p.	71	9.1
20601	Brunswick - Coburg	477	0.5	56	39.1	n.p.	n.p.	48	10.1
20602	Darebin - South	429	0.8	49	38.1	n.p.	n.p.	61	14.2
20603	Essendon	296	0.4	35	39.5	n.p.	n.p.	21	7.1
20604	Melbourne City	446	0.4	38	28.4	n.p.	n.p.	77	17.2
20605	Port Phillip	443	0.4	29	21.8	n.p.	n.p.	51	11.4
20606	Stonnington - West	213	0.3	5	7.8	n.p.	n.p.	14	6.5
20607	Yarra	491	0.6	77	52.3	n.p.	n.p.	49	10.0
20701	Boroondara	296	0.2	25	28.2	n.p.	n.p.	15	5.2
20702	Manningham - West	152	0.2	11	24.1	n.p.	n.p.	n.p.	n.p.
20703	Whitehorse - West	238	0.2	29	40.6	n.p.	n.p.	7	2.9
20801	Bayside	207	0.2	17	27.4	n.p.	n.p.	5	2.4
20802	Glen Eira	336	0.2	8	7.9	n.p.	n.p.	14	4.3
20803	Kingston	419	0.4	32	25.5	n.p.	n.p.	11	2.6
20804	Stonnington - East	59	0.1	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
20901	Banyule	804	0.6	85	35.2	n.p.	n.p.	99	12.4
20902	Darebin - North	1,137	1.2	167	48.9	n.p.	n.p.	165	14.5
20903	Nillumbik - Kinglake	287	0.4	14	16.3	n.p.	n.p.	20	6.9
20904	Whittlesea - Wallan	1,845	0.9	202	36.5	n.p.	n.p.	164	8.9
21001	Keilor	169	0.3	12	23.6	n.p.	n.p.	24	14.3
21002	Macedon Ranges	181	0.6	7	12.9	n.p.	n.p.	11	5.8
21003	Moreland - North	509	0.7	47	30.8	n.p.	n.p.	55	10.8
21004	Sunbury	348	0.9	19	18.2	n.p.	n.p.	23	6.5
21005	Tullamarine - Broadmeadows	1,170	0.8	127	36.2	n.p.	n.p.	137	11.7
21101	Knox	659	0.4	47	23.8	n.p.	n.p.	22	3.3
21102	Manningham - East	46	0.2	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
21103	Maroondah	522	0.5	41	26.2	n.p.	n.p.	32	6.2
21104	Whitehorse - East	168	0.3	9	17.8	n.p.	n.p.	5	3.0

(continued)

**Table A3 (continued): Victoria, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
21105	Yarra Ranges	1,173	0.8	65	18.5	n.p.	n.p.	60	5.1
21201	Cardinia	619	0.7	51	27.5	n.p.	n.p.	26	4.2
21202	Casey - North	745	0.6	113	50.6	n.p.	n.p.	48	6.5
21203	Casey - South	1,185	0.8	74	20.8	n.p.	n.p.	87	7.4
21204	Dandenong	742	0.4	129	57.9	n.p.	n.p.	57	7.7
21205	Monash	452	0.3	44	32.5	n.p.	n.p.	22	4.9
21301	Brimbank	907	0.5	84	30.9	n.p.	n.p.	170	18.7
21302	Hobsons Bay	467	0.5	39	27.8	n.p.	n.p.	65	14.0
21303	Maribyrnong	473	0.6	59	41.6	n.p.	n.p.	61	12.9
21304	Melton - Bacchus Marsh	1,385	0.9	78	18.8	n.p.	n.p.	229	16.5
21305	Wyndham	1,799	0.9	110	20.4	n.p.	n.p.	356	19.8
21401	Frankston	1,296	1.0	107	27.5	n.p.	n.p.	87	6.7
21402	Mornington Peninsula	1,249	0.8	91	24.3	n.p.	n.p.	155	12.4
21501	Grampians	932	1.6	110	39.4	n.p.	n.p.	218	23.4
21502	Mildura	2,576	4.8	248	32.1	n.p.	n.p.	782	30.4
21503	Murray River - Swan Hill	1,414	3.9	241	56.8	n.p.	n.p.	381	26.9
21601	Campaspe	1,097	3.0	143	43.5	n.p.	n.p.	349	31.8
21602	Moira	524	1.8	77	49.0	n.p.	n.p.	71	13.6
21603	Shepparton	2,864	4.5	381	44.3	n.p.	n.p.	837	29.2
21701	Glenelg - Southern Grampians	725	2.1	71	32.7	n.p.	n.p.	277	38.2
21702	Warrnambool - Otway Ranges	1,329	1.5	104	26.1	n.p.	n.p.	294	22.1
<b>Total</b>	<b>Victoria</b>	<b>51,641</b>	<b>0.9</b>	<b>5,074</b>	<b>32.8</b>	<b>n.p.</b>	<b>n.p.</b>	<b>7,584</b>	<b>14.7</b>

**Table A4: Queensland, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
30101	Capalaba	1,330	1.8	132	33.1	n.p.	n.p.	467	35.1
30102	Cleveland - Stradbroke	2,088	2.5	195	31.1	15	145.4	509	24.4
30103	Wynnum - Manly	1,845	2.6	176	31.8	11	120.6	466	25.3
30201	Bald Hills - Everton Park	532	1.3	70	43.8	n.p.	n.p.	138	25.9
30202	Chermside	1,581	2.2	192	40.5	15	191.7	402	25.4
30203	Nundah	993	2.6	91	30.5	5	102.4	272	27.4
30204	Sandgate	1,659	2.8	246	49.4	23	280.9	448	27.0
30301	Carindale	752	1.5	68	30.1	6	161.2	134	17.9
30302	Holland Park - Yeronga	1,065	1.5	105	32.9	14	266.7	235	22.1
30303	Mt Gravatt	1,086	1.5	130	39.9	8	149.0	192	17.7

(continued)

**Table A4 (continued): Queensland, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
30304	Nathan	574	1.4	48	27.9	n.p.	n.p.	102	17.9
30305	Rocklea - Acacia Ridge	1,090	1.8	138	42.2	15	279.2	292	26.8
30306	Sunnybank	589	1.2	66	37.3	n.p.	n.p.	125	21.2
30401	Centenary	231	0.7	12	17.3	n.p.	n.p.	93	40.1
30402	Kenmore - Brookfield - Moggill	213	0.4	13	20.3	n.p.	n.p.	18	8.4
30403	Sherwood - Indooroopilly	278	0.5	14	16.8	n.p.	n.p.	31	11.3
30404	The Gap - Enoggera	955	1.8	66	23.0	n.p.	n.p.	157	16.5
30501	Brisbane Inner	800	1.2	209	87.1	22	560.2	255	31.9
30502	Brisbane Inner - East	587	1.4	75	42.6	n.p.	n.p.	103	17.5
30503	Brisbane Inner - North	1,092	1.3	140	42.7	10	186.4	208	19.0
30504	Brisbane Inner - West	460	0.8	30	21.7	n.p.	n.p.	52	11.4
30601	Cairns - North	2,486	4.7	394	52.8	13	106.8	694	27.9
30602	Cairns - South	16,733	16.1	2,378	47.4	152	185.0	6,289	37.6
30603	Innisfail - Cassowary Coast	6,405	18.3	1,123	58.4	49	154.0	2,391	37.3
30604	Port Douglas - Daintree	1,230	10.6	472	127.9	25	412.8	425	34.6
30605	Tablelands (East) - Kuranda	5,216	12.8	1396	89.2	61	237.9	1,908	36.6
30701	Darling Downs (West) - Maranoa	3,800	8.3	570	50.0	42	223.2	1,088	28.6
30702	Darling Downs - East	2,229	5.2	323	48.3	17	154.3	729	32.7
30703	Granite Belt	1,569	3.9	202	42.9	14	180.1	502	32.0
30801	Central Highlands (Qld)	2,502	7.6	642	85.5	24	194.1	753	30.1
30802	Gladstone - Biloela	3,797	4.6	334	29.3	23	124.0	1,039	27.4
30803	Rockhampton	8,296	6.9	1,032	41.5	76	186.1	3,538	42.6
30901	Broadbeach - Burleigh	724	1.1	55	25.3	n.p.	n.p.	150	20.8
30902	Coolangatta	1,287	2.4	126	32.6	n.p.	n.p.	390	30.3
30903	Gold Coast - North	984	1.5	81	27.4	6	123.5	271	27.6
30904	Gold Coast Hinterland	271	1.4	11	13.5	n.p.	n.p.	59	21.9
30905	Mudgeeraba - Tallebudgera	428	1.3	34	26.5	n.p.	n.p.	101	23.7
30906	Nerang	1,155	1.7	121	34.9	7	122.5	313	27.1
30907	Ormeau - Oxenford	1,830	1.6	122	22.2	n.p.	n.p.	363	19.9
30908	Robina	570	1.1	58	33.9	n.p.	n.p.	147	25.9
30909	Southport	977	1.6	101	34.4	6	123.9	252	25.7
30910	Surfers Paradise	358	0.9	17	15.8	n.p.	n.p.	55	15.4
31001	Forest Lake - Oxley	3,223	4.4	337	34.8	25	158.2	893	27.7

(continued)



**Table A4 (continued): Queensland, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
31002	Ipswich Hinterland	2,240	3.6	226	33.6	16	144.5	664	29.6
31003	Ipswich Inner	5,002	4.8	902	60.1	47	190.0	1,694	33.9
31004	Springfield - Redbank	3,255	4.0	264	27.0	20	126.1	1,210	37.2
31101	Beaudesert	821	5.9	109	44.3	7	174.1	396	48.2
31102	Beenleigh	1,546	3.6	170	36.6	12	157.0	363	23.5
31103	Browns Plains	2,827	3.5	272	32.1	14	100.6	848	30.0
31104	Jimboomba	1,049	2.6	68	21.6	n.p.	n.p.	312	29.8
31105	Loganlea - Carbrook	1,766	2.9	258	48.7	12	137.6	582	32.9
31106	Springwood - Kingston	3,255	3.9	421	43.1	27	167.5	1,182	36.3
31201	Bowen Basin - North	2,063	5.4	168	27.1	10	97.7	484	23.4
31202	Mackay	6,757	5.4	533	26.3	47	141.1	1,664	24.6
31203	Whitsunday	646	3.1	49	25.3	n.p.	n.p.	177	27.4
31301	Bribie - Beachmere	860	2.6	88	34.1	n.p.	n.p.	303	35.3
31302	Caboolture	2,975	4.5	437	49.0	13	88.8	1,488	50.0
31303	Caboolture Hinterland	507	3.8	44	28.9	6	241.5	87	17.2
31304	Narangba - Burpengary	1,968	3.1	253	42.8	17	174.2	679	34.5
31305	Redcliffe	1,680	2.8	243	48.2	11	132.1	546	32.5
31401	Hills District	965	1.1	58	20.0	n.p.	n.p.	199	20.6
31402	North Lakes	1,376	2.1	157	38.0	n.p.	n.p.	350	25.4
31403	Strathpine	1,179	3.1	141	39.9	6	102.8	388	32.9
31501	Far North	18,318	55.6	3,213	58.5	185	202.4	2,900	15.8
31502	Outback - North	9,377	26.5	2,411	85.7	177	379.2	2,359	25.2
31503	Outback - South	2,815	13.8	620	73.4	40	285.8	768	27.3
31601	Buderim	749	1.5	55	24.5	n.p.	n.p.	71	9.5
31602	Caloundra	1,435	1.8	157	36.5	11	156.2	187	13.0
31603	Maroochy	947	1.7	89	31.3	7	149.2	99	10.5
31604	Nambour - Pomona	1,419	2.3	170	39.9	12	170.8	274	19.3
31605	Noosa	452	1.1	27	19.9	n.p.	n.p.	42	9.3
31606	Sunshine Coast Hinterland	969	2.0	78	26.8	5	104.0	138	14.2
31701	Toowoomba	6,251	4.1	818	43.6	46	149.3	2,002	32.0
31801	Charters Towers - Ayr - Ingham	5,699	12.8	1,327	77.6	70	247.5	1,428	25.1
31802	Townsville	14,725	7.6	1,908	43.2	141	194.4	7,780	52.8
31901	Bundaberg	3,561	4.0	616	57.7	20	113.3	836	23.5
31902	Burnett	4,112	8.2	1,284	104.1	52	254.6	1,044	25.4
31903	Gympie - Cooloolo	1,665	3.4	196	39.2	7	85.0	300	18.0
31904	Hervey Bay	2,315	4.1	276	39.7	17	148.9	818	35.3
31905	Maryborough	2,118	4.7	310	48.8	21	200.5	519	24.5
<b>Total</b>	<b>Queensland</b>	<b>205,535</b>	<b>4.3</b>	<b>30,561</b>	<b>49.6</b>	<b>1,809</b>	<b>178.2</b>	<b>62,262</b>	<b>30.3</b>

**Table A5: Western Australia, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
50101	Augusta - Margaret River - Busselton	904	1.8	45	16.6	5	113.2	51	5.6
50102	Bunbury	3,351	3.1	459	45.7	32	194.4	1,062	31.7
50103	Manjimup	566	2.4	59	34.8	n.p.	n.p.	104	18.3
50201	Mandurah	2,365	2.4	248	35.0	19	163.6	425	18.0
50301	Cottesloe - Claremont	345	0.5	28	27.1	n.p.	n.p.	37	10.7
50302	Perth City	715	0.7	157	73.1	18	508.0	235	32.8
50401	Bayswater - Bassendean	1,642	1.9	262	53.2	25	307.4	336	20.5
50402	Mundaring	1,596	3.6	198	41.4	19	238.5	307	19.3
50403	Swan	4,207	3.3	465	36.8	24	116.1	927	22.0
50501	Joondalup	1,098	0.6	41	12.5	11	200.8	115	10.4
50502	Stirling	3,129	1.5	425	45.3	29	186.8	776	24.8
50503	Wanneroo	3,339	1.8	192	19.2	25	152.4	565	16.9
50601	Armadale	2,520	3.2	257	34.0	26	209.4	633	25.1
50602	Belmont - Victoria Park	2,070	2.7	378	60.9	36	351.2	592	28.6
50603	Canning	1,356	1.3	164	40.3	13	193.4	380	28.1
50604	Gosnells	3,635	2.9	355	32.6	40	222.2	969	26.7
50605	Kalamunda	1,240	2.0	102	27.4	11	179.3	187	15.1
50606	Serpentine - Jarrahdale	398	1.7	13	10.9	n.p.	n.p.	35	8.8
50607	South Perth	603	1.3	147	81.3	7	233.3	145	24.1
50701	Cockburn	2,220	2.1	283	42.5	24	219.2	277	12.5
50702	Fremantle	652	1.7	155	79.3	8	247.4	119	18.3
50703	Kwinana	1,675	4.5	168	33.4	14	169.7	389	23.2
50704	Melville	746	0.7	103	46.0	7	188.4	94	12.6
50705	Rockingham	2,393	1.9	171	23.8	16	135.5	252	10.5
50801	Esperance	917	5.4	116	42.2	16	362.3	169	18.4
50802	Gascoyne	1,787	17.9	399	74.4	35	393.1	517	28.9
50803	Goldfields	6,519	14.7	1,708	87.3	115	355.6	1,911	29.3
50804	Kimberley	17,775	45.6	6,408	120.2	355	402.0	3,739	21.0
50805	Mid West	6,880	11.8	1,389	67.3	112	326.5	2,180	31.7
50806	Pilbara	10,968	16.1	2,559	77.8	169	312.6	2,530	23.1
50901	Albany	2,743	4.5	376	45.7	28	206.3	516	18.8
50902	Wheat Belt - North	3,114	5.5	503	53.8	49	315.9	545	17.5
50903	Wheat Belt - South	1,276	5.9	268	70.0	35	550.9	244	19.1
<b>Total</b>	<b>Western Australia</b>	<b>94,743</b>	<b>3.6</b>	<b>18,601</b>	<b>65.4</b>	<b>1,332</b>	<b>284.1</b>	<b>21,471</b>	<b>22.7</b>

**Table A6: South Australia, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
40101	Adelaide City	359	1.6	55	51.1	n.p.	n.p.	90	25.1
40102	Adelaide Hills	589	0.8	14	7.9	n.p.	n.p.	26	4.5
40103	Burnside	183	0.4	19	34.5	n.p.	n.p.	6	3.4
40104	Campbelltown (SA)	309	0.6	30	32.3	n.p.	n.p.	20	6.5
40105	Norwood - Payneham - St Peters	242	0.6	22	30.4	n.p.	n.p.	27	11.0
40106	Prospect - Walkerville	247	0.9	39	52.7	6	491.8	23	9.2
40107	Unley	192	0.5	20	34.7	n.p.	n.p.	20	10.5
40201	Gawler - Two Wells	603	1.8	74	40.9	7	236.6	72	12.0
40202	Playford	3,324	3.8	471	47.2	29	177.4	522	15.7
40203	Port Adelaide - East	1,938	2.8	269	46.3	26	273.7	249	12.8
40204	Salisbury	3,273	2.4	305	31.1	15	92.7	539	16.5
40205	Tea Tree Gully	893	0.9	85	31.7	6	135.6	75	8.4
40301	Holdfast Bay	222	0.6	28	42.1	n.p.	n.p.	15	6.8
40302	Marion	1,192	1.3	137	38.3	14	237.9	99	8.3
40303	Mitcham	414	0.6	44	35.4	n.p.	n.p.	30	7.3
40304	Onkaparinga	2,795	1.6	236	28.1	9	65.1	166	5.9
40401	Charles Sturt	1,830	1.7	209	38.1	15	166.5	321	17.5
40402	Port Adelaide - West	2,024	3.4	345	56.8	28	279.7	350	17.3
40403	West Torrens	676	1.1	50	24.7	n.p.	n.p.	54	8.0
40501	Barossa	395	1.1	18	15.2	n.p.	n.p.	32	8.2
40502	Lower North	377	1.7	34	30.0	n.p.	n.p.	17	4.4
40503	Mid North	971	3.5	162	55.6	6	124.5	218	22.5
40504	Yorke Peninsula	792	3.2	134	56.4	10	255.4	143	18.1
40601	Eyre Peninsula and South West	4,249	7.2	907	71.2	40	190.0	1,173	27.6
40602	Outback - North and East	6,969	23.6	2,001	95.7	129	372.3	2,181	31.3
40701	Fleurieu - Kangaroo Island	677	1.4	59	29.0	n.p.	n.p.	41	6.1
40702	Limestone Coast	1,391	2.1	92	22.0	10	144.8	333	24.0
40703	Murray and Mallee	3,099	4.5	499	53.7	18	116.8	480	15.5
<b>Total</b>	<b>South Australia</b>	<b>40,223</b>	<b>2.4</b>	<b>6,358</b>	<b>52.7</b>	<b>386</b>	<b>194.0</b>	<b>7,335</b>	<b>18.2</b>

**Table A7: Tasmania, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
60101	Brighton	1,535	9.4	109	23.7	n.p.	n.p.	212	13.8
60102	Hobart - North East	1,990	3.8	110	18.4	n.p.	n.p.	144	7.2
60103	Hobart - North West	2,908	5.6	149	17.1	n.p.	n.p.	142	4.9
60104	Hobart - South and West	1,272	3.9	35	9.2	n.p.	n.p.	71	5.6
60105	Hobart Inner	831	1.6	62	24.9	n.p.	n.p.	37	4.5
60106	Sorell - Dodges Ferry	759	4.9	33	14.5	n.p.	n.p.	25	3.3
60201	Launceston	3,034	3.7	189	20.8	n.p.	n.p.	369	12.2
60202	Meander Valley - West Tamar	698	3.1	41	19.6	n.p.	n.p.	127	18.2
60203	North East	1,629	4.3	89	18.2	n.p.	n.p.	106	6.5
60301	Central Highlands (Tas.)	642	5.5	37	19.2	n.p.	n.p.	42	6.6
60302	Huon - Bruny Island	1,893	9.8	91	16.0	n.p.	n.p.	218	11.5
60303	South East Coast	375	5.4	15	13.3	n.p.	n.p.	36	9.6
60401	Burnie - Ulverstone	3,806	7.7	129	11.3	n.p.	n.p.	164	4.3
60402	Devonport	2,834	6.2	195	22.9	n.p.	n.p.	230	8.1
60403	West Coast	1,939	10.6	53	9.1	n.p.	n.p.	95	4.9
<b>Total</b>	<b>Tasmania</b>	<b>26,142</b>	<b>5.1</b>	<b>1,337</b>	<b>17.0</b>	<b>n.p.</b>	<b>n.p.</b>	<b>2,017</b>	<b>7.7</b>

**Table A8: Australian Capital Territory, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
80101	Belconnen	1,417	1.5	126	29.6	n.p.	n.p.	242	17.1
80102	Cotter - Namadgi	49	2.3	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
80103	Fyshwick - Pialligo - Hume	103	7.0	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
80104	Gungahlin	1,201	1.9	61	16.9	n.p.	n.p.	100	8.3
80105	North Canberra	748	1.4	96	42.8	n.p.	n.p.	152	20.3
80106	South Canberra	482	1.8	61	42.1	n.p.	n.p.	193	40.0
80107	Tuggeranong	2,019	2.3	169	27.9	n.p.	n.p.	521	25.8
80108	Weston Creek	328	1.4	40	40.7	n.p.	n.p.	81	24.8
80109	Woden	458	1.3	54	39.3	n.p.	n.p.	129	28.2
<b>Total</b>	<b>Australian Capital Territory</b>	<b>6,804</b>	<b>1.8</b>	<b>619</b>	<b>30.3</b>	<b>n.p.</b>	<b>n.p.</b>	<b>1,447</b>	<b>21.3</b>

**Table A9: Northern Territory, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
70101	Darwin City	1,862	7.0	699	125.1	49	530.1	666	35.8
70102	Darwin Suburbs	6,737	11.4	1,398	69.2	101	299.2	1,751	26.0
70103	Litchfield	1,813	8.2	297	54.6	21	234.0	344	19.0
70104	Palmerston	4,410	12.6	722	54.6	66	307.3	1,246	28.2
70201	Alice Springs	16,994	40.6	7,528	147.7	315	373.4	6,404	37.7
70202	Barkly	4,641	68.0	2,186	157.0	85	368.3	1,377	29.7
70203	Daly - Tiwi - West Arnhem	13,898	73.2	2,122	50.9	229	332.9	2,065	14.9
70204	East Arnhem	10,898	69.4	2,739	83.8	197	363.8	2,203	20.2
70205	Katherine	11,571	53.9	2,759	79.5	238	413.6	3,255	28.1
<b>Total</b>	<b>Northern Territory</b>	<b>72,823</b>	<b>29.4</b>	<b>20,450</b>	<b>93.6</b>	<b>1,301</b>	<b>360.0</b>	<b>19,309</b>	<b>26.5</b>

**Table A10: Other territories, detailed results for Indigenous population, by SA3**

SA3 code	SA3 name	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
		No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
90101	Christmas Island	6	0.3	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
90102	Cocos (Keeling) Islands	5	0.8	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
90103	Jervis Bay	270	66.0	n.p.	n.p.	n.p.	n.p.	n.p.	n.p.
<b>Total</b>	<b>Other territories</b>	<b>280</b>	<b>8.7</b>	<b>n.p.</b>	<b>n.p.</b>	<b>n.p.</b>	<b>n.p.</b>	<b>n.p.</b>	<b>n.p.</b>

**Table A11: Total Indigenous health checks, PPH and PAD, Indigenous population**

	Indigenous ERP (2014–15)		PPH		PAD		Indigenous health checks (MBS Item 715)	
	No.	Per 100 residents	No.	Per 1,000 residents	No.	Per 100,000 residents	No.	Per 100 residents
<b>Australia</b>								
<b>All states and territories</b>	<b>721,318</b>	<b>3.0</b>	<b>108,852</b>	<b>70.4</b>	<b>n.p.</b>	<b>n.p.</b>	<b>169,163</b>	<b>23.5</b>
<b>NSW, Qld, WA, SA and NT</b>	<b>636,450</b>	<b>3.8</b>	<b>101,794</b>	<b>74.4</b>	<b>6,499</b>	<b>206.4</b>	<b>158,072</b>	<b>24.8</b>

*Notes*

1. Areas may not add up to totals, due to rounding.
  2. Totals for Indigenous health checks include persons whose postcode was not allocated to an SA3 (for example, Large Volume Receivers).
- Source: AIHW analysis of MBS data, NHMD data, NMD data, and Prometheus Information Pty Ltd population projections.

## Appendix A3: SA3s cross-classified by crude rates of PPH, PAD and Indigenous health checks

**Table A12: SA3s with high Indigenous PPH rate and/or high PAD rate**

State or territory	High Indigenous health check rate	Medium Indigenous health check rate	Low Indigenous health check rate
NSW	1. Bourke - Cobar - Coonamble 2. Broken Hill and Far West 3. Lower Murray 4. Richmond Valley - Hinterland	1. Inverell - Tenterfield 2. Griffith - Murrumbidgee (West) 3. Kempsey - Nambucca 4. Moree - Narrabri 5. Richmond Valley - Coastal	1. Mount Druitt 2. Sydney Inner City 3. Upper Murray (excluding Albury)
Vic	n.a.	1. Murray River - Swan Hill	1. Dandenong
Qld	1. Brisbane Inner 2. Cairns - North 3. Central Highlands (Qld) 4. Innisfail - Cassowary Coast 5. Ipswich Inner 6. Port Douglas - Daintree 7. Tablelands (East) - Kuranda	1. Bundaberg 2. Burnett 3. Charters Towers - Ayr - Ingham 4. Holland Park - Yeronga 5. Outback - North 6. Outback - South 7. Rocklea - Acacia Ridge 8. Sandgate	1. Caboolture Hinterland 2. Far North
WA	1. Belmont - Victoria Park 2. Gascoyne 3. Goldfields 4. Mid West 5. Perth City	1. Bayswater - Bassendean 2. Esperance 3. Fremantle 4. Kimberley 5. Mundaring 6. Pilbara 7. South Perth 8. Wheat Belt - South	1. Wheat Belt - North
SA	1. Eyre Peninsula and South West 2. Outback - North and East	1. Mid North 2. Yorke Peninsula	1. Marion 2. Murray and Mallee 3. Port Adelaide - East 4. Port Adelaide - West 5. Prospect - Walkerville
Tas	n.a.	n.a.	n.a.
ACT	n.a.	n.a.	n.a.
NT	1. Alice Springs 2. Barkly 3. Darwin City 4. Katherine 5. Palmerston	1. Darwin Suburbs 2. East Arnhem 3. Litchfield	1. Daly - Tiwi - West Arnhem

*Notes*

1. Classifications were determined using cut-off values in Table 3.1.
2. Victoria, Tasmania and the ACT are only classified by rates of PPH and Indigenous health checks.
3. Numbers do not suggest ranking (alphabetical order only).

Source: AIHW analysis of MBS data, NHMD data, NMD data, and Prometheus Information Pty Ltd population projections.

**Table A13: Indigenous population in SA3s with high Indigenous PPH rate and/or high PAD rate**

State/territory	PPH and/or PAD rate	High Indigenous health check rate (no.)	Medium Indigenous health check rate (no.)	Low Indigenous health check rate (no.)
NSW	One or both rates high	16,828	20,062	10,745
	Both rates low/medium	32,084	64,164	79,075
Vic	One or both rates high	—	1,414	742
	Both rates low/medium	7,262	8,407	33,432
Qld	One or both rates high	23,641	29,378	18,825
	Both rates low/medium	86,848	35,362	11,480
WA	One or both rates high	17,971	35,429	3,114
	Both rates low/medium	4,707	18,475	15,048
SA	One or both rates high	11,218	1,763	8,500
	Both rates low/medium	—	1,750	16,994
Tas	One or both rates high	—	—	—
	Both rates low/medium	—	698	25,447
ACT	One or both rates high	—	—	—
	Both rates low/medium	940	3,095	2,618
NT	One or both rates high	39,478	19,448	13,898
	Both rates low/medium	—	—	—

*Notes*

1. Population figures refer to 2014–15 projected estimates.
2. SA3s with 'one or both rates high' include any areas with high rates of either PPH or PAD, or both PPH and PAD.
3. SA3s with 'both rates low/medium' include those with low/medium rates of PPH, and low/medium or unpublished rates of PAD.

Source: AIHW analysis of MBS data, NHMD data, NMD data, and Prometheus Information Pty Ltd population projections.

**Table A14: Percentage in SA3s with high Indigenous PPH rate and/or high PAD rate**

State/territory	PPH and/or PAD rate	High Indigenous health check rate (%)	Medium Indigenous health check rate (%)	Low Indigenous health check rate (%)
NSW	One or both rates high	7.5	9.0	4.8
	Both rates low/medium	14.4	28.8	35.5
Vic	One or both rates high	—	2.8	1.4
	Both rates low/medium	14.2	16.4	65.2
Qld	One or both rates high	11.5	14.3	9.2
	Both rates low/medium	42.3	17.2	5.6
WA	One or both rates high	19.0	37.4	3.3
	Both rates low/medium	5.0	19.5	15.9
SA	One or both rates high	27.9	4.4	21.1
	Both rates low/medium	—	4.4	42.2
Tas	One or both rates high	—	—	—
	Both rates low/medium	—	2.7	97.3
ACT	One or both rates high	—	—	—
	Both rates low/medium	14.1	46.5	39.4
NT	One or both rates high	54.2	26.7	19.1
	Both rates low/medium	—	—	—

Note: Percentages were calculated by dividing values in Table A13 by state/territory totals—excluding SA3s with unpublished PPH or health check rates.

# Appendix B: Data quality statements and methodological notes

## National Hospital Morbidity Database data quality statement

Hospitalisation data have been extracted from the AIHW's National Hospital Morbidity Database (NHMD), which is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals in each state and territory. Information on the characteristics, diagnoses and care of admitted patients in public and private hospitals is provided annually to the AIHW by state and territory health departments.

Statistics on admitted patients are compiled when an admitted patient (that is, a patient who undergoes a hospital's formal admission process) completes an episode of admitted patient care and 'separates' from the hospital. This is because most of the data on the use of hospitals by admitted patients are based on information provided at the end of the patient's episode of care, rather than at the beginning. The length of stay and the procedures carried out are then known and the diagnostic information is more accurate. The principal diagnosis is the diagnosis established, after study, to be chiefly responsible for occasioning the patient's episode of admitted patient care.

Hospital records are for 'separations' and not individuals; as there can be multiple separations for the same individual, hospital separation rates do not usually reflect the number of people who were hospitalised. For example, it is not possible to identify whether 1 patient was admitted 5 times or 5 patients were admitted once.

Diagnoses were recorded using the 9th edition of the *International statistical classification of diseases and related health problems, 10th revision, Australian modification* (ICD-10-AM). It comprises classifications of diseases and external causes of injuries and poisoning based on the World Health Organization's version of ICD-10. The ICD-10-AM classification is hierarchical, with 20 summary disease chapters that are divided into a large number of more specific disease groupings.

From 2010–11 onwards, Indigenous status information within hospital separations data from all jurisdictions were of sufficient quality for statistical reporting purposes (AIHW 2013). An AIHW study found an estimated 88% of Indigenous patients were correctly identified in Australian public hospital admission records in 2011–12. Analyses in this paper includes data for all jurisdictions without adjustment.

The data associated with each record in the NHMD include the Statistical Area Level 2 (SA2) of usual residence of the patient (2011 Australian Statistical Geography Standard).

The complete data quality statement for the NHMD is available online at [www.aihw.gov.au/hospitals/](http://www.aihw.gov.au/hospitals/).

## Potentially preventable hospitalisations methodological notes

Potentially preventable hospitalisations (PPH) include hospital admissions that are potentially preventable by timely provision of appropriate individualised preventive health interventions and early disease management, usually delivered in primary care and community-based care settings.



The 2018 AIHW National Healthcare Agreement definitions were used for PPH, listed in Appendix C (Table C1) and available at <https://meteor.aihw.gov.au/content/index.phtml/itemId/658499>.

Separations for patients without a recorded age, or with a care type of 'newborn' (without qualified days) and records for 'hospital boarders' and 'posthumous organ procurement' have been excluded from the analyses presented in this paper.

## Limitations

Total PPH rates are often used as an indicator of unmet community health needs, but how well the current definition of PPH captures reasons for hospitalisations that reflect a lack of adequate access to primary health care has been questioned by recent research in Australia (Falster et al. 2016). A longitudinal study by Falster et al (2016) found that patients admitted for potentially preventable diagnoses tended to have higher levels of engagement with general practitioners (GPs) than persons not admitted for PPH.

The concept of 'potential preventability' of hospitalisations does not imply that all such hospitalisations could be avoided through intervening primary care, but rather that appropriate primary care intervention and management may prevent hospitalisation in some cases—not forgetting that many health conditions become much more difficult to manage in older age groups (AIHW 2018b). At the population level, prevalence of health conditions, socioeconomic status and environmental health factors might also be linked to variation in PPH rates (AIHW 2018b; Falster et al. 2015).

PPH reporting has recently been reviewed by the Australian Institute of Health and Welfare (AIHW) in conjunction with the Royal Australian College of General Practitioners with the aim of supporting the development of a PPH definition of greater relevance to general practice activities (AIHW 2018b). Some of the key differences in the currently proposed GP-focused PPH indicator include restriction to patients aged 0–74 due to the increased likelihood of comorbidity among patients aged 75 and over, diagnoses for mental health conditions, and removal of diagnoses for dental conditions (AIHW 2018b).

## Population data

The populations used as denominators for PPH rate calculations were estimates of the 2014–15 financial year population, as this aligns with the midpoint of the included 3 financial years of data (2013–14 to 2015–16). These estimates were based on the second-release 2011–16 (the first release covered 2011–2015) population estimates and projections by SA2, sex, 5-year age group and Indigenous status produced by Prometheus Information Pty Ltd.

The projections by Prometheus Information Pty Ltd are part of a set of estimates for 2011 and projections to 2016 that was commissioned by the Department of Health. The second release of these estimates and projections is available from the Public Health Information Development Unit of Torrens University (see <http://phidu.torrens.edu.au/help-and-information/indigenous-estimates>). The estimates and projections are based on the population information available from the Australian Bureau of Statistics' (ABS's) 2011 Census of Population and Housing and on its Estimated Resident Population (ERP) for later years. These were constructed in such a way that they are consistent with the available ABS ERPs and projections at the SA2 and state/territory levels. At the SA2 level, the population projections by age and sex were adjusted to sum to the ABS total SA2 ERP in each SA2.

## Geographical concordances

SA2 information was used to correspond data to Primary Health Network (PHN) and to aggregate to Statistical Area Level 3 (SA3). The correspondence was done using the ABS's 2011 Mesh Block population weighted SA2 to PHN correspondence file. Data have also been aggregated to state and territory level. The small proportion of hospitalisations with no recorded usual address have been excluded at all levels.

## Statistics presented

The rates used for PPH in this report are unadjusted crude rates calculated as the number of PPH separations per 1,000 Indigenous persons per year. To preserve confidentiality, numbers of PPH smaller than 5 have been suppressed. All rates based on fewer than 5 PPH or a population denominator of fewer than 100 people have also been suppressed to preserve confidentiality and to avoid rates that are likely to show a high level of random fluctuation because of the small numbers involved.

Numbers and rates that have been suppressed or not calculated are shown as 'n.p.' (not published) in the tables.

## National Mortality Database data quality statement

Cause of Death Unit Record File data are provided to the AIHW by the registrars of births, deaths and marriages and the National Coronial Information System (managed by the Victorian Department of Justice) and include cause of death coded by the ABS. The data are maintained by the AIHW in the National Mortality Database (NMD).

Data are based on the year of registration of death. Deaths registered in 2012, 2013 and 2014 are based on the final version of cause of death data; deaths registered in 2015 are based on a revised version and deaths registered in 2016 are based on a preliminary version. Both revised and preliminary data are subject to further revision by the ABS.

The Indigenous status of a deceased person is identified through the death registration process. While virtually all deaths in Australia are registered, there is some degree of under-identification of Indigenous people in deaths data. This is because a proportion of Indigenous deceased are not reported as Indigenous by the family, health worker or funeral director during the death registration process. Deaths data presented here have not been adjusted for under-identification and are therefore likely to under-estimate the true level of Indigenous deaths. Registered deaths where Indigenous status was not stated are not included here.

In this report, data on potentially avoidable deaths (PAD) are reported for 5 jurisdictions—New South Wales, Queensland, Western Australia, South Australia and the Northern Territory. Other jurisdictions have a small number of Indigenous deaths, and identification of Indigenous deaths in their death registration systems is relatively poor, making the data less reliable. The AIHW considers the quality of Indigenous identification in deaths data for the 5 jurisdictions included to be adequate from 1998.

Great care should be taken when comparing deaths rates across areas in different remoteness categories. Accurate identification of deaths as Indigenous increases with increasing remoteness, and any differences between remote and non-remote deaths rates may be due to differences in Indigenous identification rather than to 'real' variation across remoteness areas.

The data associated with each record in the NMD include the SA2 of usual residence of the patient (2011 Australian Statistical Geography Standard).

The complete data quality statement for the NMD is available online at <https://www.aihw.gov.au/about-our-data/our-data-collections/national-mortality-database>.

The ABS quality declaration summary for 'Deaths, Australia' is available online at <http://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/3302.0>.

The ABS quality declaration summary for 'Causes of Death, Australia' is available online at <http://www.abs.gov.au/ausstats/abs%40.nsf/mf/3303.0>.

## Potentially avoidable deaths methodological notes

PAD include deaths from conditions that are potentially preventable through individualised care and/or treatable through existing primary or hospital care.

The 2018 AIHW National Healthcare Agreement definition was used for PAD, listed in Appendix D (Table D1) and available at <http://meteor.aihw.gov.au/content/index.phtml/itemId/658503>.

Due to the small number of Indigenous deaths from some conditions each year, deaths data for the most 'recent' period are presented for the 5-year period 2012–2016 to enable reporting of cause of death data by Indigenous status and geographical area.

## Population data

The populations used as denominators for deaths rate calculations were estimates of the 2014 calendar year populations, as this aligns with the midpoint of the included 5 calendar years of data (2012–2016). These estimates were based on the second-release 2011–16 (the first release covered 2011–2015) population estimates and projections by SA2, sex, 5-year age group and Indigenous status produced by Prometheus Information Pty Ltd.

## Geographical concordances

SA2 information was used to correspond data to PHNs and to aggregate to SA3. The correspondence was done using the ABS's 2011 Mesh Block population weighted SA2 to PHN correspondence file. Data have also been aggregated to state and territory level. The small proportion of deaths with no recorded usual address have been excluded at all levels.

## Statistics presented

The rates used for PAD in this report are unadjusted crude rates, calculated as the number of PAD per 100,000 Indigenous people per year.

To preserve confidentiality, numbers of deaths smaller than 5 have been suppressed. All rates based on fewer than 5 deaths or on a population denominator of fewer than 100 people have also been suppressed to preserve confidentiality and avoid rates that are likely to show a high level of random fluctuation because of the small numbers involved.

Numbers and rates that have been suppressed or not calculated are shown as 'n.p.' (not published) in the tables.

## MBS data and Indigenous health checks

The Medicare Program ('Medicare') provides access to medical services for all Australian residents and certain categories of visitors to Australia. The Department of Human Services administers Medicare and the payment of Medicare benefits. The Medicare Benefits Schedule (MBS) is a listing of the Medicare services subsidised by the Australian Government.

The AIHW has access to de-identified unit record level MBS claims data back to 1984, containing information about patients, providers and services.

## **Indigenous health checks (MBS item 715)**

All Aboriginal and Torres Strait Islander people, regardless of age, are eligible for an annual Indigenous-specific health check. This health check, listed as item 715 on the MBS, was designed especially for Indigenous people. It was established because Indigenous people have considerably higher levels of morbidity and deaths than non-Indigenous people, with earlier onset and more severe disease progression for many chronic diseases (AIHW 2017a). The aim of the health checks is to provide Indigenous people with primary health care matched to their needs by supporting early detection, diagnosis and intervention for common and treatable conditions. Item 715 can only be claimed by a GP once per patient in any 9-month period.

Data on the number of health checks in this report are the number of checks performed in 2014–15 (by date of service), not the number of people who received a health check. Subsequently, rates are calculated as the crude number of health checks per 100 Indigenous persons (projected resident population). In 2014–15, there were just under 103 Indigenous health checks for every 100 recipients (DoH 2017). This method of calculation is consistent with ‘usage rates’ reported online, but will be slightly higher than the percentage of Indigenous people receiving Indigenous health checks.

For more information, see the list of Medicare Benefits Schedule—Category 1—Attendances (pp. 80–83) available at <http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/Downloads-201811>.

## **Health checks not billed to the MBS**

The number of health checks billed to Medicare does not give a complete picture of all health services provided to Indigenous people. Situations where care that is equivalent or similar to an MBS health check may be provided but not billed as such include where the care is:

- provided by health-care providers not eligible to bill Medicare (such as, some health services provided by the Australian Royal Flying Doctor Service and by some state- and territory-funded services)
- provided by an MBS billing service but for some reason is not billed; for example, if the patient does not have a valid Medicare number (as items cannot be billed without a Medicare number)
- provided by an MBS billing service but the patient has already received an Indigenous health check in the past 9 months
- billed as another MBS item, such as a standard consultation.

Health checks delivered by providers not eligible to bill Medicare are not recorded by Medicare, and therefore are not shown in this report.

## **Geography**

The data associated with each record in the AIHW de-identified MBS claims data include the postcode of the mailing address of the patient on file at the time of processing. Indigenous health checks were first summed to postcode level, then corresponded to ABS Postal Areas (2016 Australian Statistical Geography Standard). Postal Areas were then corresponded to PHNs and to SA3s (2011 Australian Statistical Geography Standard) using a custom-built Indigenous allocation matrix, based on imputed Mesh Block populations and the ABS’s concordance methodology. MBS records with a ‘Post Office Boxes’ postcode were allocated to

the surrounding Postal Area, while records with 'Large Volume Receiver' and other specialist delivery postcodes were retained only in state and territory totals and in PHNs that make up whole states or territories (Tasmania, Australian Capital Territory and the Northern Territory). This was done on the basis that specialist delivery post boxes may be more likely to be in a different SA3 to that of the resident. The presence of mailing addresses in the data set, and the ABS's approximation of Postal Areas boundaries, means that some residents may have been allocated to the wrong SA3s.

## Modelling PPH rates

Using linear regression and trying a large number of models with different variables, we found that 63% of the variation in 2014–15 crude Indigenous PPH rates could be explained by the 16 independent variables in Table B1. Variables tested were predominantly derived from the 2016 Census results in TableBuilder (ABS web product), concorded from 2016 SA3s to 2011 SA3s, and analysed in SAS Enterprise Guide 7.1.

The variables that made it into the best model included measures of socioeconomic status related to unemployment, housing and education (Table B1). They also included measures related to remoteness, community size, commuter flow, and imprisonment (Table B1). This is in line with earlier work by Ansari et al. (2012) who found that composite measures of socioeconomic disadvantage and remoteness were more strongly associated with rates of PPH than with rates of other hospitalisations in Victorian populations. In the current study, the variables in the best model also included measures related to age structure, which is known to be associated with need for primary health care (for example, see AIHW 2014).

Summarising the influence of the variables by broad category, we found that:

- socioeconomic factors were linked to 62%–66% of the variation in predictions
- geographical factors were linked to 15%–25% of the variation in predictions
- age structure was linked to 10% of the variation in predictions.

It is important to note that strong correlations between many of the variables included and not included in the model make it difficult to determine which individual variables have the strongest associations with PPH rate. For example, it is clear from the model that education is associated with PPH rate, even when the associations with other variables have been taken into account. However, as they are all correlated, the 2 education-related variables included in the model may not be much more important than the other considered education-related variables. Such so called co-linearity issues are not a problem for the validity of the model as a whole or for using it to identify areas with unexpected PPH rates.

No direct measures of access to health services or estimates of need for primary health care were included in the best model. The main available measure of access to primary health care is the access component of the AIHW's index of Access Relative to Need. This measure was used in the analysis but not included in the best model for several reasons:

- First, the access measure was not available for Jervis Bay—one of the SA3s analysed by the model.
- Second, access is a local measure that often shows substantial variation within SA3s. Comparing the SA3-level analysis with earlier SA2-level analysis suggests that the strength of the association between access to GPs and PPH rates, after other variables have been accounted for, is much greater when the geographical level used in the analysis is low. However, the reverse correlation seen between rates of Indigenous imprisonment and rates of PPH may be due to the increased exposure to the health-care system reported by Indigenous prison discharges (AIHW 2015b).

- Third, the geographical factors included in the model are strongly associated with access to health services relative to need—especially at higher geographical levels (AIHW 2014). This can explain why adding measures of access to the model does not significantly improve its explanatory power at the SA3 level.

**Table B1: Variables and coefficients included in the linear model for SA3 PPH rate, ranked by absolute size of the standardised coefficient (adjusted R-Squared is 0.63)**

Variable	Category	Coefficient	Standardised coefficient	Relative influence (%)
Intercept	Not applicable	0.495588	0	—
Working age unemployment rate (%)	Socioeconomic	0.870717	0.237517	19.0
Renting government or community housing (%)	Socioeconomic	0.281208	0.203146	16.3
Volunteer rate (%)	Socioeconomic	−0.397681	−0.090050	7.2
Aged 35 to 44 (%)	Age structure	1.907935	0.087868	7.0
Worker influx score	Arguably geographical	8.852909	0.085133	6.8
Living in Outer regional Australia (%)	Geographical	0.062547	0.081490	6.5
Living in Very remote Australia (%)	Geographical	0.100127	0.068915	5.5
Highest qualification: Certificate III and IV (%)	Socioeconomic	−0.292213	−0.061269	4.9
Highest qualification: No education (%)	Socioeconomic	1.168401	0.054363	4.4
No motor vehicle (%)	Arguably socioeconomic or geographical	0.123826	0.050489	4.0
Living in moderately overcrowded private dwelling (%)	Socioeconomic	0.160818	0.049678	4.0
Home owned outright (%)	Socioeconomic	−0.216522	−0.047350	3.8
Aged 45 to 54 (%)	Age structure	1.076331	0.041478	3.3
Home owned with mortgage (%)	Socioeconomic	−0.064751	−0.033359	2.7
Living in Bounded Locality (%)	Geographical	0.064371	0.031121	2.5
In prison on Census night (%)	Other	−0.211533	−0.023761	1.9

*Notes*

1. Rates were calculated from TableBuilder outputs as percentages, excluding non-responses where applicable.
2. Person-level variables were captured in terms of the number of Indigenous respondents by SA3 of usual residence.
3. Household variables were captured in terms of the number of Indigenous respondents at home on Census night, not the number of households.
4. 'Least absolute shrinkage and selection operator' (LASSO) regression in SAS Enterprise Guide 7.1 was used to model the SA3 PPH rates from the interaction of over 40 variables. The variables were normalised to take account of their different ranges.
5. A total of 16 SA3s were excluded from the regression input where the projected Indigenous population was fewer than 100, or where ≥24% of the Indigenous respondents were in prison on Census night, due to concerns about reliability. All other SA3s were weighted equally.
6. The 'worker influx score' was derived in part to take account of the propensity of some people to give non-residential address information (for example, post office boxes) to hospitals, resulting in high numbers of hospitalisations being attributed to business district populations. The measure can be summarised as the logarithm (base 10) of the number of workers that work in an area divided by the number of workers resident in said area.

# Appendix C: Potentially preventable hospitalisations coding

Table C1: National Healthcare Agreement: selected PPH, 2018

Category	ICD-10-AM codes	ICD-10-AM description	Additional requirements
<b>Vaccine-preventable conditions</b>			
Pneumonia and influenza (vaccine-preventable)	J10	Influenza due to other identified influenza virus	In any diagnosis Exclude people aged under 2 months
	J11	Influenza, virus not identified	In any diagnosis Exclude people aged under 2 months
	J13	Pneumonia due to <i>Streptococcus pneumoniae</i>	In any diagnosis Exclude people aged under 2 months
	J14	Pneumonia due to <i>Haemophilus influenzae</i>	In any diagnosis Exclude people aged under 2 months
Other vaccine-preventable conditions	A08.0	Rotaviral enteritis	In any diagnosis
	A35	Other tetanus	In any diagnosis
	A36	Diphtheria	In any diagnosis
	A37	Whooping cough	In any diagnosis
	A80	Acute poliomyelitis	In any diagnosis
	B01	Varicella [chicken pox]	In any diagnosis
	B05	Measles	In any diagnosis
	B06	Rubella [German measles]	In any diagnosis
	B16.1	Acute hepatitis B with delta-agent (coinfection) without hepatic coma	In any diagnosis
	B16.9	Acute hepatitis B without delta-agent and without hepatic coma	In any diagnosis
	B18.0	Chronic viral hepatitis B with delta-agent	In any diagnosis
	B18.1	Chronic viral hepatitis B without delta-agent	In any diagnosis
	B26	Mumps	In any diagnosis
	G00.0	Haemophilus meningitis	In any diagnosis

(continued)

**Table C1 (continued): National Healthcare Agreement: selected PPH, 2018**

Category	ICD-10-AM codes	ICD-10-AM description	Additional requirements
<b>Chronic conditions</b>			
Asthma	J45	Asthma	As principal diagnosis
			Exclude children aged under 4
	J46	Status asthmaticus	As principal diagnosis
			Exclude children aged under 4
Congestive cardiac failure	I50	Heart failure	As principal diagnosis.
			Exclude cases with the following cardiac procedure codes: Blocks 600–606, 608–650, 653–657, 660–664, 666, 669–682, 684–691, 693, 705–707, 717 and codes 33172–00[715], 33827–01[733], 34800–00[726], 35412–00[11], 38721–01[733], 90217–02[734], 90215–02[732].
	I11.0	Hypertensive heart disease with (congestive) heart failure	As principal diagnosis.
			Exclude cases with the following cardiac procedure codes: Blocks 600–606, 608–650, 653–657, 660–664, 666, 669–682, 684–691, 693, 705–707, 717 and codes 33172–00[715], 33827–01[733], 34800–00[726], 35412–00[11], 38721–01[733], 90217–02[734], 90215–02[732].
Diabetes complications	J81	Pulmonary oedema	As principal diagnosis.
			Exclude cases with the following cardiac procedure codes: Blocks 600–606, 608–650, 653–657, 660–664, 666, 669–682, 684–691, 693, 705–707, 717 and codes 33172–00[715], 33827–01[733], 34800–00[726], 35412–00[11], 38721–01[733], 90217–02[734], 90215–02[732].
	E10.0–E10.9	Type 1 diabetes mellitus	As principal diagnosis.
	E11.0–E11.9	Type 2 diabetes mellitus	As principal diagnosis.
Chronic obstructive pulmonary disease	E13.0–E13.9	Other specified diabetes mellitus	As principal diagnosis.
	E14.0–E14.9	Unspecified diabetes mellitus	As principal diagnosis.
	J20	Acute bronchitis	As principal diagnosis.
			Only with additional diagnoses of J41, J42, J43, J44.
	J41	Simple and mucopurulent chronic bronchitis	As principal diagnosis.
	J42	Unspecified chronic bronchitis	As principal diagnosis.
	J43	Emphysema	As principal diagnosis.

*(continued)*



**Table C1 (continued): National Healthcare Agreement: selected PPH, 2018**

Category	ICD-10-AM codes	ICD-10-AM description	Additional requirements
<b>Chronic conditions (continued)</b>			
Chronic obstructive pulmonary disease (continued)	J44	Other chronic obstructive pulmonary disease	As principal diagnosis.
Bronchiectasis	J47	Bronchiectasis	As principal diagnosis.
	J20	Acute bronchitis	As principal diagnosis. Only with additional diagnosis of J47.
Angina	I20	Angina pectoris	As principal diagnosis. Exclude cases according to the list of procedures excluded from the 'Congestive cardiac failure' category shown earlier.
	I24.0	Coronary thrombosis not resulting in myocardial infarction	As principal diagnosis. Exclude cases according to the list of procedures excluded from the 'Congestive cardiac failure' category shown earlier.
	I24.8	Other forms of acute ischaemic heart disease	As principal diagnosis. Exclude cases according to the list of procedures excluded from the 'Congestive cardiac failure' category shown earlier.
	I24.9	Acute ischaemic heart disease, unspecified	As principal diagnosis. Exclude cases according to the list of procedures excluded from the 'Congestive cardiac failure' category shown earlier.
Iron deficiency anaemia	D50.1	Sideropenic dysphagia	As principal diagnosis.
	D50.8	Other iron deficiency anaemias	As principal diagnosis.
	D50.9	Iron deficiency anaemia, unspecified	As principal diagnosis.
Hypertension	I10	Essential (primary) hypertension	As principal diagnosis. Exclude cases according to the list of procedures excluded from the 'Congestive cardiac failure' category shown earlier.
	I11.9	Hypertensive heart disease without (congestive) heart failure	As principal diagnosis. Exclude cases according to the list of procedures excluded from the 'Congestive cardiac failure' category shown earlier.
Nutritional deficiencies	E40	Kwashiorkor	As principal diagnosis.
	E41	Nutritional marasmus	As principal diagnosis.
	E42	Marasmic kwashiorkor	As principal diagnosis.

(continued)

**Table C1 (continued): National Healthcare Agreement: selected PPH, 2018**

Category	ICD-10-AM codes	ICD-10-AM description	Additional requirements
<b>Chronic conditions (continued)</b>			
Nutritional deficiencies (continued)	E43	Unspecified severe protein-energy malnutrition	As principal diagnosis.
	E55.0	Rickets, active	As principal diagnosis.
Rheumatic heart diseases	I00	Rheumatic fever without mention of heart involvement	As principal diagnosis.
	I01	Rheumatic fever with heart involvement	As principal diagnosis.
	I02	Rheumatic chorea	As principal diagnosis.
	I05	Rheumatic mitral valve diseases	As principal diagnosis.
	I06	Rheumatic aortic valve diseases	As principal diagnosis.
	I07	Rheumatic tricuspid valve diseases	As principal diagnosis.
	I08	Multiple valve diseases	As principal diagnosis.
	I09	Other rheumatic heart diseases	As principal diagnosis.
<b>Acute conditions</b>			
Pneumonia (not vaccine-preventable)	J15.3	Pneumonia due to streptococcus, group B	In any diagnosis. Exclude people aged under 2 months
	J15.4	Pneumonia due to other streptococci	In any diagnosis. Exclude people aged under 2 months
	J15.7	Pneumonia due to <i>Mycoplasma pneumoniae</i>	In any diagnosis. Exclude people aged under 2 months
	J16.0	Chlamydial pneumonia	In any diagnosis. Exclude people aged under 2 months
Urinary tract infections, including pyelonephritis	N10	Acute tubulo-interstitial nephritis	As principal diagnosis.
	N11	Chronic tubulo-interstitial nephritis	As principal diagnosis.
	N12	Tubulo-interstitial nephritis, not specified as acute or chronic	As principal diagnosis.
	N13.6	Pyonephrosis	As principal diagnosis.
	N15.1	Renal and perinephric abscess	As principal diagnosis.
	N15.9	Renal tubulo-interstitial disease, unspecified	As principal diagnosis.
	N28.9	Disorder of kidney and ureter, unspecified	As principal diagnosis.

(continued)

**Table C1 (continued): National Healthcare Agreement: selected PPH, 2018**

Category	ICD-10-AM codes	ICD-10-AM description	Additional requirements
<b>Acute conditions (continued)</b>			
Urinary tract infections, including pyelonephritis (continued)	N39.0	Urinary tract infection, site not specified	As principal diagnosis.
	N39.9	Disorder of urinary system, unspecified	As principal diagnosis.
Perforated/bleeding ulcer	K25.0	Gastric ulcer, acute with haemorrhage	As principal diagnosis.
	K25.1	Gastric ulcer, acute with perforation	As principal diagnosis.
	K25.2	Gastric ulcer, acute with both haemorrhage and perforation	As principal diagnosis.
	K25.4	Gastric ulcer, chronic or unspecified with haemorrhage	As principal diagnosis.
	K25.5	Gastric ulcer, chronic or unspecified with perforation	As principal diagnosis.
	K25.6	Gastric ulcer, chronic or unspecified with both haemorrhage and perforation	As principal diagnosis.
	K26.0	Duodenal ulcer, acute with haemorrhage	As principal diagnosis.
	K26.1	Duodenal ulcer, acute with perforation	As principal diagnosis.
	K26.2	Duodenal ulcer, acute with both haemorrhage and perforation	As principal diagnosis.
	K26.4	Duodenal ulcer, chronic or unspecified with haemorrhage	As principal diagnosis.
	K26.5	Duodenal ulcer, chronic or unspecified with perforation	As principal diagnosis.
	K26.6	Duodenal ulcer, chronic or unspecified with both haemorrhage and perforation	As principal diagnosis.
	K27.0	Peptic ulcer, site unspecified, acute with haemorrhage	As principal diagnosis.
	K27.1	Peptic ulcer, site unspecified, acute with perforation	As principal diagnosis.
	K27.2	Peptic ulcer, site unspecified, acute with both haemorrhage and perforation	As principal diagnosis.
	K27.4	Peptic ulcer, site unspecified, chronic or unspecified with haemorrhage	As principal diagnosis.

*(continued)*

**Table C1 (continued): National Healthcare Agreement: selected PPH, 2018**

Category	ICD-10-AM codes	ICD-10-AM description	Additional requirements
<b>Acute conditions (continued)</b>			
Perforated/bleeding ulcer (continued)	K27.5	Peptic ulcer, site unspecified, chronic or unspecified with perforation	As principal diagnosis.
	K27.6	Peptic ulcer, site unspecified, chronic or unspecified with both haemorrhage and perforation	As principal diagnosis.
	K28.0	Gastrojejunal ulcer, acute with haemorrhage	As principal diagnosis.
	K28.1	Gastrojejunal ulcer, acute with perforation	As principal diagnosis.
	K28.2	Gastrojejunal ulcer, acute with both haemorrhage and perforation	As principal diagnosis.
	K28.4	Gastrojejunal ulcer, chronic or unspecified with haemorrhage	As principal diagnosis.
	K28.5	Gastrojejunal ulcer, chronic or unspecified with perforation	As principal diagnosis.
	K28.6	Gastrojejunal ulcer, chronic or unspecified with both haemorrhage and perforation	As principal diagnosis.
Cellulitis	L02	Cutaneous abscess, furuncle and carbuncle	As principal diagnosis.  Exclude cases with any procedure other than those in blocks 1820 to 2016 or other than procedures 30216–00, 30216–01, 30216–02, 30676–00, 30223–01, 30223–02, 30064–00, 90660–00, 90661–00.
	L03	Cellulitis	As principal diagnosis.  Exclude cases according to the list of procedures excluded from the 'Cutaneous abscess, furuncle and carbuncle' hospitalisation code shown earlier.
	L04	Acute lymphadenitis	As principal diagnosis.  Exclude cases according to the list of procedures excluded from the 'Cutaneous abscess, furuncle and carbuncle' hospitalisation code shown earlier.
	L08	Other local infections of skin and subcutaneous tissue	As principal diagnosis.  Exclude cases according to the list of procedures excluded from the 'Cutaneous abscess, furuncle and carbuncle' hospitalisation code shown earlier.

(continued)

**Table C1 (continued): National Healthcare Agreement: selected PPH, 2018**

Category	ICD-10-AM codes	ICD-10-AM description	Additional requirements
<b>Acute conditions (continued)</b>			
Cellulitis (continued)	L88	Pyoderma gangrenosum	As principal diagnosis.
			Exclude cases according to the list of procedures excluded from the 'Cutaneous abscess, furuncle and carbuncle' hospitalisation code shown earlier.
	L98.0	Pyogenic granuloma	As principal diagnosis.
			Exclude cases according to the list of procedures excluded from the 'Cutaneous abscess, furuncle and carbuncle' hospitalisation code shown earlier.
	L98.3	Eosinophilic cellulitis [Wells]	As principal diagnosis.
			Exclude cases according to the list of procedures excluded from the 'Cutaneous abscess, furuncle and carbuncle' hospitalisation code shown earlier.
Pelvic inflammatory disease	N70	Salpingitis and oophoritis	As principal diagnosis.
	N73	Other female pelvic inflammatory diseases	As principal diagnosis.
	N74	Female pelvic inflammatory disorders in diseases classified elsewhere	As principal diagnosis.
Ear, nose and throat infections	H66	Suppurative and unspecified otitis media	As principal diagnosis.
	J02	Acute pharyngitis	As principal diagnosis.
	J03	Acute tonsillitis	As principal diagnosis.
	J06	Acute upper respiratory infections of multiple and unspecified sites	As principal diagnosis.
	J31.2	Chronic pharyngitis	As principal diagnosis.
			As principal diagnosis.
Dental conditions	K02	Dental caries	As principal diagnosis.
	K03	Other diseases of hard tissues of teeth	As principal diagnosis.
	K04	Diseases of pulp and periapical tissues	As principal diagnosis.
	K05	Gingivitis and periodontal diseases	As principal diagnosis.
	K06	Other disorders of gingiva and edentulous alveolar ridge	As principal diagnosis.
	K08	Other disorders of teeth and supporting structures	As principal diagnosis.
	K09.8	Other cysts of oral region, not elsewhere classified	As principal diagnosis

(continued)

**Table C1 (continued): National Healthcare Agreement: selected PPH, 2018**

Category	ICD-10-AM codes	ICD-10-AM description	Additional requirements
<b>Acute conditions (continued)</b>			
Dental conditions (continued)	K09.9	Cyst of oral region, unspecified	As principal diagnosis
	K12	Stomatitis and related lesions	As principal diagnosis
	K13	Other diseases of lip and oral mucosa	As principal diagnosis
	K14.0	Glossitis	As principal diagnosis
Convulsions and epilepsy	G40	Epilepsy	As principal diagnosis
	G41	Status epilepticus	As principal diagnosis
	R56	Convulsions, not elsewhere classified	As principal diagnosis
Eclampsia	O15	Eclampsia	As principal diagnosis
Gangrene	R02	Gangrene, not elsewhere classified	In any diagnosis
	I70.24	Atherosclerosis of arteries of extremities with gangrene	As principal diagnosis
	E09.52	Impaired glucose regulation with peripheral angiopathy, with gangrene	As principal diagnosis

# Appendix D: Potentially avoidable deaths coding

**Table D1: National Healthcare Agreement: PAD, 2018**

Cause of death groups	ICD-10 codes
<b>Infections</b>	
Selected invasive infections	A38–A41, A46, A48.1, G00, G03, J02.0, J13–J16, J18, L03
Human immunodeficiency virus, acquired immune deficiency syndrome	B20–B24
Viral pneumonia and influenza	J10–J12
<b>Cancer</b>	
Colorectal	C18–C21
Skin	C43, C44
Breast ( <i>females only</i> )	C50
Cervix	C53
Prostate	C61
Kidney	C64
Thyroid	C73
Hodgkin disease	C81
Acute lymphoid leukaemia, acute lymphoblastic leukaemia ( <i>0–44 years only</i> )	C91.0
Diabetes	E10–E14
<b>Diseases of the circulatory system</b>	
Rheumatic and other valvular heart disease	I00–I09, I33–I37
Hypertensive heart and renal disease	I10–I13
Ischaemic heart disease	I20–I25
Cerebrovascular diseases	I60–I69
Heart failure	I50, I51.1, I51.2, I51.4, I51.5
Pulmonary embolism	I26
<b>Diseases of the genitourinary system</b>	
Renal failure	N17–N19
<b>Diseases of the respiratory system</b>	
Chronic obstructive pulmonary disease	J40–J44
Asthma	J45, J46
<b>Diseases of the digestive system</b>	
Peptic ulcer disease	K25–K27

(continued)

**Table D1 (continued): National Healthcare Agreement: PAD, 2018**

<b>Cause of death groups</b>	<b>ICD-10 codes</b>
<b>Maternal and infant causes</b>	
Complications of the perinatal period	P00–P96
<b>Other conditions</b>	
Complications of pregnancy, labour or the puerperium	O00–O99
<b>Selected external causes of morbidity and deaths</b>	
Falls	W00–W19
Fires, burns	X00–X09
Suicide and self-inflicted injuries	X60–X84, Y87.0
Misadventures to patients during surgical and medical care	Y60–Y69
Medical devices associated with adverse incidents in diagnostic and therapeutic use	Y70–Y82
Surgical and other medical procedures as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure	Y83, Y84
<b>Other external causes of morbidity and deaths</b>	
Transport accidents	V01–V99
Exposure to inanimate mechanical forces	W20–W49
Exposure to animate mechanical forces	W50–W64
Accidental drowning and submersion	W65–W74
Other accidental threats to breathing	W75–W84
Exposure to electric current, radiation and extreme ambient air temperature and pressure	W85–W99
Contact with heat and hot substances	X10–X19
Contact with venomous animals and plants	X20–X29
Exposure to forces of nature	X30–X39
Accidental poisoning by and exposure to noxious substances	X40–X49
Overexertion, travel and privation	X50–X57
Accidental exposure to other and unspecified factors	X58, X59
Assault	X85–Y09
Event of undetermined intent	Y10–Y34
Legal interventions and operations of war	Y35, Y36
Drugs, medicaments and biological substances causing adverse effects in therapeutic use	Y40–Y59
Sequelae of external causes of morbidity and deaths	Y85, Y86, Y87.1–Y89



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# Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
APY	Anangu Pitjantjatjara Yankunytjatjara
ASGS	Australian Statistical Geography Standard
ERP	estimated resident population
GP	general practitioner
ICD-10	<i>International statistical classification of diseases and related health problems, 10th revision</i>
ICD-10-AM	<i>International statistical classification of diseases and related health problems, 10th revision, Australian modification</i>
MBS	Medicare Benefits Schedule
NHMD	National Hospital Morbidity Database
NMD	National Mortality Database
PAD	potentially avoidable deaths (avoidable deaths)
PHN	Primary Health Network
PPH	potentially preventable hospitalisations
SA2	Statistical Area Level 2
SA3	Statistical Area Level 3

# Symbols

>	greater than
≥	greater than or equal to
—	nil or rounded to zero
n.a.	not available
n.p.	not publishable because of small numbers, confidentiality or other concerns about the quality of the data

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Focusing on Aboriginal and Torres Strait Islander people, this report shows how rates of potentially preventable hospitalisations, potentially avoidable deaths and Indigenous health checks vary geographically within each Australian state and territory and between Primary Health Networks. Linear regression is used to identify areas that have unexpectedly high or low rates of potentially preventable hospitalisations given their characteristics.

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