Estimating population coverage of Tackling Indigenous Smoking teams, a placed-based health intervention in Australia

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Abstract

Objective: As part of the Tackling Indigenous Smoking (TIS) program, TIS teams provide Aboriginal and Torres Strait Islander-led tobacco control in their geographic area. We aimed to estimate the percentage and number of Aboriginal and Torres Strait Islander peoples living in an area serviced by a TIS team in 2018–19.

Methods: We analysed weighted, representative data from 8,048 Aboriginal and Torres Strait Islander people aged ≥10 years from the 2018–19 National Aboriginal and Torres Strait Islander Health Survey. TIS services mapping data were used to define areas served by TIS teams. Coverage was explored in relation to remoteness, program priority groups and sociodemographic characteristics.

Results: Around three-quarters (76.4%,95%CI:72.9–79.9) of the 2018–19 population aged ≥10 years lived in an area served by TIS teams (n=479,000). Coverage by TIS teams was generally similar across groups, with few exceptions.

Conclusions: The recently announced expansion to national coverage would provide access to locally tailored tobacco control to a further 148,000 Aboriginal and Torres Strait Islander peoples aged ≥10 years, including 46,000 adults who currently smoke.

Implications for public health: Expansion to national TIS team coverage is a welcomed first step on the path to ensuring equitable access to tobacco control.

Key words: Indigenous, tobacco, Aboriginal and Torres Strait Islander, public health

Colonisation embedded the smoking of commercial tobacco among Aboriginal and Torres Strait Islander peoples. Colonisers used the addictive quality of tobacco to exploit Aboriginal and Torres Strait Islander peoples' labour, goods and services, providing tobacco as payment in lieu of wages and in rations up to 1968. This systematic embedding of tobacco furthered colonial economic, social and political goals and disrupted Aboriginal and Torres Strait Islander peoples' culture and connection to Country. In addition to embedding tobacco use, such colonial mechanics increased exposure to the 'drivers' of tobacco use, including economic and educational exclusion which continues to manufacture extensive, but preventable, health harms.[1-4] Despite recent improvements, this results in tobacco use remaining the leading contributor to mortality for Aboriginal and Torres Strait Islander peoples.[5] Tobacco causes more than one-third (37%) of all Aboriginal and Torres Strait Islander deaths, and half of deaths at age 45 years and over.[6]

Tobacco control aims to reduce smoking uptake among non-smokers and to increase cessation among smokers. While Aboriginal and Torres Strait Islander smoking prevalence remained relatively static at around 50% from the first recording in 1994 up to 2004–05, there has been a significant reduction in smoking prevalence among Aboriginal and Torres Strait Islander peoples in recent decades.[7,8] In 2018–19, 40.2% of Aboriginal and Torres Strait Islander adults were smoking daily.[8] This is an absolute decrease in prevalence of 9.8% from 2004–05 which represents almost 50,000 fewer Aboriginal and Torres

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Strait Islander smokers than if the prevalence had remained the same.[8] Aboriginal and Torres Strait Islander young adult (18–24 years) daily smoking prevalence in 2018–19 was 35.6%, reduced by 17.3 percentage points compared to 2002.[9] The majority (70%) of Aboriginal and Torres Strait Islander current smokers want to quit,[10] and the prevalence of quit attempts among smokers is increasing.[11] Therefore, there is great potential for further reductions in smoking prevalence and associated harms by supporting current smokers to quit, alongside efforts to prevent smoking initiation.

There is limited quantitative evidence on the effectiveness of tobacco control programs specific to Aboriginal and Torres Strait Islander peoples.[12] However, features of effective tobacco control programs for Aboriginal and Torres Strait Islander people include: being culturally appropriate; taking a holistic approach to health; addressing the social determinants of health; being multi-faceted; and involving collaboration and coordination with different services and community sectors.[1,12-15]

The Australian Government-funded Tackling Indigenous Smoking (TIS) program is an Aboriginal and Torres Strait Islander-specific large-scale, long-term multi-component approach to tobacco control across Australia. It included a range of national components, such as Quitline services enhancement, Quitskills training to health professionals, a National Best Practice Unit and a National Coordinator. The single largest component of the TIS program was the Regional Tobacco Control Grants (RTCGs), which provided funding for place-based tobacco control. This supported local TIS teams to provide locally tailored and culturally appropriate Aboriginal and Torres Strait Islander-led tobacco control in their geographic area.[16] The current distribution of TIS teams, including the geography they cover, reflects the result of changes to the program over time. For example, the earliest iteration of the program (Tackling Indigenous Smoking and Health Lifestyle teams) was rolled out from July 2010 to June 2013 across 58 regions. From July 2015, the teams were reviewed with 37 teams remaining. In 2020, four remote teams were added to the program.

Previous evaluations have not quantified coverage of the TIS teams. As a place-based intervention, it is valuable to have an understanding of the geographic areas covered (or not covered) by the TIS teams. Acknowledging coverage of an area does not necessarily translate to its entire population reached by team activities, it is useful to identify gaps in coverage, particularly in relation to TIS program priority groups: current smokers, female smokers of reproductive age, young current smokers and those living in remote settings. This paper aims to estimate the percentage and number of Aboriginal and Torres Strait Islander peoples, overall and for priority groups, living in an area serviced by a TIS team in 2018–19.

Methods

Research team

The study was conceptualised with Aboriginal and Torres Strait Islander leadership and engagement. Our team brings Aboriginal lived experience (RL), Indigenous lived experience (RM), experience in Indigenous tobacco research (RL, RM, DT, KT, EC, EB, EMB), epidemiology (EMB, KT, RL, EB), statistical methods (JT), and Geographical Information Systems application (VL). In privileging Aboriginal and Torres Strait Islander peoples' lived experiences and worldviews, this work was informed by the interests and needs of Aboriginal and Torres Strait Islander peoples across Australia.[17] We utilised an integrated knowledge translation approach, sharing information and preliminary findings in an iterative manner with Aboriginal and Torres Strait Islander knowledge users, including Thiitu Tharrmay (an Aboriginal and Torres Strait Islander research reference group) and TIS Jurisdictional Forums (annual forums bringing TIS teams together across all Australian states and territories), and informally through everyday conversations with TIS teams and Aboriginal and Torres Strait Islander peoples working in public health. Input from these relational processes was incorporated into the study design, providing insight into the approach used here, as well as returning preliminary findings to TIS teams in an iterative manner for their input and feedback. This iterative process assisted with the interpretation of findings and assisted to draw and develop conclusions prior to publication.

We acknowledge that coloniality and the ongoing impacts of colonisation bring fundamental limitations to research, including Settler Privilege.[17,18] We highlight awareness of the study methodology and research team members' worldviews, including perspectives and values.[19] This shapes how the research was conducted and how the findings are interpreted and disseminated.[20] In locating ourselves as the research team, we are somewhat fulfilling our respective relational protocols and recognising the theoretical lens we bring to this research; acknowledging our respective accountabilities, responsibilities and Settler Privilege.[17,18] We recognise our connections, biases, worldviews and accountability to Aboriginal and Torres Strait Islander communities,[17] the data and stories that we are humbly attempting to honour, analyse and share with respect.

Data sources

TIS Service Map

The Department of Health Tackling Indigenous Smoking Services map was used to define the boundaries of the geographic areas served by TIS teams in 2019.[21] Based on these data, each Statistical Area Level 1 (SA1, representing geographic areas containing approximately 200 to 800 persons[22]) was coded as a TIS team area (i.e. served by a TIS team) or non-TIS team area (i.e. not served by a TIS team). SA1s were coded as a TIS team area if their centroid was within a TIS team service boundary.

ABS National Aboriginal and Torres Strait Islander Health Survey

The study analysed demographic and smoking behaviour data from 8,048 Aboriginal and Torres Strait Islander people (6,423 adults ≥18 years and 1,625 youth 10–17 years) from the 2018–19 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) conducted by the Australian Bureau of Statistics (ABS). This constitutes the most recent representative survey data for the population. Unit-record data were accessed through the ABS DataLab.[23]

Variables

Defining areas served by TIS

Statistical Area Level 2 (SA2s) represent geographic areas containing an average of 25 SA1s, and approximately 3,000 to 25,000 persons.[22] SA2s are the smallest geographical unit available within the 2018–19 NATSIHS. Therefore, for this analysis we were restricted to defining TIS team areas at the SA2 level which inevitably results in exposure misclassification for individuals living in SA2s where some

encompassed SA1s are TIS and other SA1s within that SA2 are not TIS (Figure 1). The risks associated with aggregating data from one administrative geographic unit (in this case SA1s) to another (SA2s) are a well-established phenomenon in geography known as the Modifiable Areal Unit Problem (MAUP).[24]

We defined TIS team areas using a ≥50% SA2 population cut-off (whereby SA2s with at least half of their population in a TIS SA1 are defined as TIS, and all others are defined as non-TIS), as previous work (results forthcoming) demonstrated this approach produced coverage estimates most similar to those produced using SA1 data (98% specificity and 100% sensitivity), minimising the effect of the MAUP.

Sociodemographic characteristics and priority groups

Coverage was explored by remoteness category (urban, regional, remote), other TIS priority groups, and sociodemographic characteristics (age group: 10–17, 18–24, 25–34, 35–44, 45–54 or ≥55 years; sex: male or female; area-level disadvantage according to Index of Relative Socio-economic Disadvantage 2016 deciles: most disadvantaged, decile 1; middle disadvantage, deciles 2–3; least disadvantaged, deciles 4–10). The sample was limited to people aged 10 years and above as TIS team activities directly targeted this population, and children aged under 10 years were considered unlikely to be directly exposed to TIS team activities.

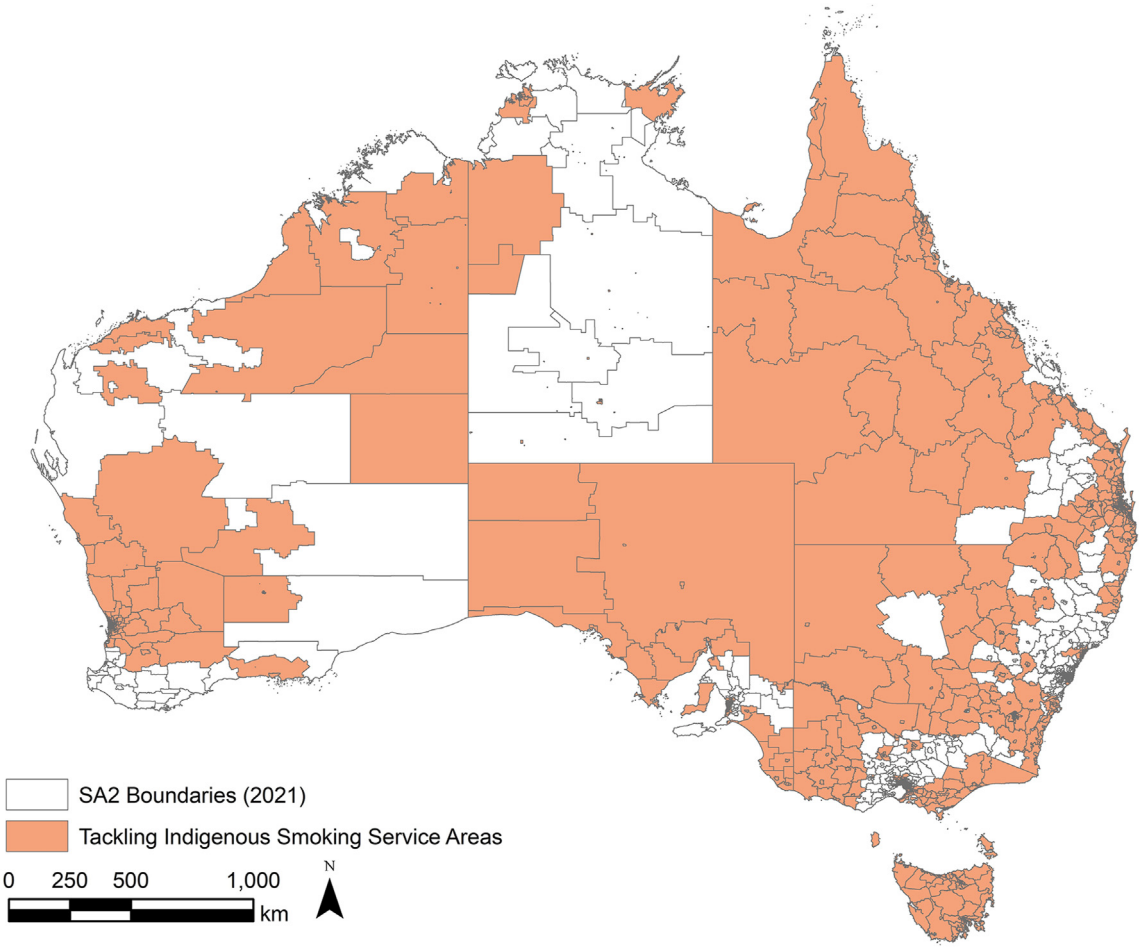
The findings presented here were informed by the relational and iterative processes outlined above. This included input and feedback from TIS teams to examine and present data for the 10–17-year age group and the total population aged 10 years and over. However, given known limitations in youth smoking data collected in the 2018–19 NATSIHS,[25] we have restricted the definition of all key priority groups to those aged 18 years and older. Key priority groups in this analysis included adult current smokers, female current smokers of reproductive age (defined as 18–49 years[26]) and young adult current smokers (current smokers aged 18–24 years).

Analysis

Analyses were conducted using Stata 16. Weighted numbers and percentages and 95% confidence intervals (95%CI) of Aboriginal and Torres Strait Islander people (aged ≥10 years) residing in areas with and without TIS teams were quantified overall and by remoteness category.

Weighted numbers and percentages and 95% CI residing in areas with and without TIS teams were then presented for key priority groups, and by sociodemographic characteristics, overall and within each remoteness category. The Rao-Scott $\chi 2$ test was conducted to assess the statistical significance of overall differences in coverage across remoteness and/or socio-demographic categories.

Figure 1: Map of Australia by Tackling Indigenous Smoking service areas and Statistical Area Level 2 (SA2) boundaries.



These data were used to generate population estimates of TIS team coverage, weighted to a total in-scope population[27] of 625,687 (486,444 adults and 139,243 youth), or approximately 95% of the national Aboriginal and Torres Strait Islander population aged 10 years and over in 2019.[28]

Results

Just over three-quarters (76.4%; 95%CI 72.9,79.9) of the 2018–19 Aboriginal and Torres Strait Islander population aged 10 years and over lived in an area served by a TIS team, corresponding to 479,000 people (Table 1). The proportion of the population living in an area served by a TIS team was 72.3% (67.0,77.6) within urban areas (*n*=171,000), 80.2% (74.1,86.2) within regional areas (*n*=218,000), and 76.0% (68.0,83.9) within remote areas (*n*=89,000).

More than three-quarters (78.4%; 74.2,84.6) of adult current smokers (*n*=165,000), 77.5% (72.3,82.7) of female current smokers of reproductive age (*n*=60,000), and 81.1% (74.3,88.0) of young adult current smokers (*n*=34,000) lived in an area served by a TIS team. The

Table 1: Weighted estimates of the number (n) and percentage and 95% CI (%, 95%CI) of Aboriginal and Torres Strait Islander people in areas served and not served by a TIS team for the total population, key priority groups and by select sociodemographic characteristics, each presented overall and by geography.

	TIS Team				No TIS Team			
	Overall	By geographical context			Overall	By geographical context		
		Urban	Regional	Remote		Urban	Regional	Remote
Total population (≥10 years)								
n	479,000	171,000	218,000	89,000	148,000	65,000	54,000	28,000
%	76.4 (72.9, 79.9)	72.3 (67.0, 77.6)	80.2 (74.1, 86.2)	76.0 (68.0, 83.9)	23.6 (20.1, 27.1)	27.7 (22.4, 33.0)	19.8 (13.8, 25.9)	24.0 (16.1, 32.0)
Current adult smokers (>=18 years)[a]								
n	165,000	41,000	81,000	44,000	46,000	18,000	16,000	12,000
%	78.4 (74.2, 82.6)	69.4 (61.5, 77.4)	83.9 (77.5, 90.2)	78.5 (70.1, 86.8)	21.6 (17.4, 25.8)	30.6 (22.6, 38.5)	16.2 (9.8, 22.5)	21.5 (13.2, 29.9)
Female smokers of reproductive age (18–49 years)[a]								
n	60,000	14,000	28,000	17,000	17,000	7000	6000	4000
%	77.5 (72.3, 82.7)	66.6 (54.9, 78.3)	82.1 (74.1, 90.1)	81.2 (73.3, 89.1)	22.5 (17.3, 27.8)	33.5 (21.8, 45.1)	17.9 (9.9, 25.9)	18.8 (10.9, 26.8)
Young adult smokers (18–24 years)								
n	34,000	9000	16,000	10,000	8000	2000	4000	2000
%	81.1 (74.3, 88.0)	80.7 (66.5, 94.9)	80.6 (69.7, 91.5)	82.4 (71.7, 93.2)	18.9 (12.0, 25.7)	19.3 (5.1, 33.5)	19.4 (8.5, 30.3)	17.6 (6.9, 28.3)
Sociodemographic characteristics								
Age								
10–17 years, n	105,000	38,000	49,000	18,000	35,000	13,000	16,000	6000
%	75.1 (69.9, 80.3)	74.4 (66.3, 82.5)	75.7 (66.7, 84.6)	75.0 (65.1, 84.9)	24.9 (19.7, 30.1)	25.6 (17.6, 33.7)	24.3 (15.4, 33.3)	25.0 (15.2, 34.9)
18–24 years, n	83,000	34,000	34,000	14,000	23,000	8000	11,000	4000
%	78.2 (72.6, 83.8)	80.4 (71.5, 89.3)	75.7 (65.7, 85.7)	79.1 (69.0, 89.1)	21.9 (16.2, 27.5)	19.6 (10.7, 28.5)	24.3 (14.3, 34.3)	20.9 (10.9, 31.0)
25–34 years, n[a]	89,000	32,000	40,000	18,000	29,000	16,000	7000	6000
%	75.7 (71.1, 80.2)	66.9 (58.9, 74.8)	85.6 (78.4, 92.8)	73.8 (64.5, 83.1)	24.4 (19.8, 28.9)	33.1 (25.2, 41.1)	14.4 (7.2, 21.6)	26.2 (16.9, 35.6)
35–44 years, n	64,000	22,000	28,000	14,000	20,000	9000	6000	4000
%	76.2 (70.6, 81.8)	69.9 (59.9, 79.9)	81.8 (73.3, 90.3)	76.1 (64.9, 87.2)	23.8 (18.3, 29.4)	30.1 (20.1, 40.2)	18.2 (9.7, 26.7)	24.0 (12.8, 35.1)
45–54 years, n	62,000	21,000	29,000	13,000	19,000	9000	7000	4000
%	76.4 (70.6, 82.2)	70.1 (58.8, 81.4)	81.1 (71.7, 90.5)	77.7 (68.4, 87.1)	23.6 (17.8, 29.4)	29.9 (18.6, 41.2)	18.9 (9.5, 28.3)	22.3 (12.9, 31.6)
≥55 years, n[a]	76,000	24,000	38,000	13,000	22,000	10,000	7000	4000
%	77.6 (73.2, 82.0)	70.8 (62.3, 79.3)	83.5 (77.3, 89.8)	75.5 (66.1, 84.9)	22.4 (18.0, 26.9)	29.2 (20.7, 37.7)	16.5 (10.2, 22.7)	24.5 (15.1, 34.0)
Sex								
Male, n	231,000	84,000	105,000	43,000	73,000	32,000	27,000	14,000
%	76.0 (71.9, 80.1)	72.7 (66.3, 79.0)	79.3 (72.2, 86.4)	75.0 (66.2, 83.8)	24.0 (19.9, 28.1)	27.3 (21.0, 33.7)	20.7 (13.6, 27.8)	25.0 (16.2, 33.8)
Female, n	247,000	87,000	113,000	47,000	74,000	34,000	26,000	14,000
%	76.8 (73.2, 80.5)	72.0 (66.1, 77.8)	81.0 (74.8, 87.2)	76.9 (69.3, 84.5)	23.2 (19.5, 26.8)	28.1 (22.2, 33.9)	19.0 (12.8, 25.2)	23.1 (15.5, 30.7)
Area-level disadvantage[b]								
Most disadvantaged (decile 1), n[a]	174,000	25,000	90,000	59,000	56,000	19,000	14,000	23,000
%	75.7 (69.0, 82.4)	57.1 (41.0, 73.2)	86.5 (76.8, 96.2)	72.1 (61.4, 82.7)	24.3 (17.6, 31.0)	42.9 (26.9, 59.0)	13.5 (3.8, 23.2)	27.9 (17.3, 38.6)
Middle (deciles 2–3), n	142,000	48,000	80,000	14,000	31,000	10,000	18,000	3000
%	82.0 (75.5, 88.4)	82.1 (72.5, 91.7)	81.4 (71.9, 90.9)	84.6 (66.8, 100.0)	18.1 (11.6, 24.5)	17.9 (8.3, 27.5)	18.6 (9.1, 28.1)	15.4 (0.0, 33.2)
Most advantaged (deciles 4–10), n	162,000	98,000	48,000	16,000	60,000	36,000	22,000	3000
%	72.8 (65.7, 80.0)	73.1 (64.6, 81.5)	69.1 (52.8, 85.5)	85.5 (70.0, 100.0)	27.2 (20.0, 34.3)	26.9 (18.5, 35.4)	30.9 (14.6, 47.3)	14.5 (0.0, 30.1)

Absolute numbers are presented rounded to the nearest 1000
Data are presented using a 50% cut-off defining TIS-exposure: SA2s defined as TIS-exposed if ≥50% of SA2 population living in TIS-exposed SA1.
[a]Indicates a significant difference in coverage across remoteness (urban, regional and remote areas), with the *p*- value for the Rao-Scott $\chi 2$ test <0.05.
[b]Indicates a significant difference in coverage across area-level disadvantage categories within urban areas, with the *p*- value for the Rao-Scott $\chi 2$ test <0.05 (no significant differences were identified within regional areas, remote areas or overall).

percentage of adult current smokers and female current smokers of reproductive age who lived in an area served by a TIS team differed significantly by remoteness (*p*-value for difference=0.02). Within urban areas, 69.4% (61.5,77.4) of adult current smokers lived in an area served by a TIS team, compared to 83.9% (77.5,90.2) within regional areas and 78.5% (70.1,86.6) within remote areas. Two-thirds (66.6%, 54.9,78.3) of female current smokers of reproductive age within urban areas lived in an area served by a TIS team, compared to 82.1% (74.1,90.1) of those within regional areas, and 81.2% (73.3,89.1) within remote areas (*p*-value for difference=0.04). TIS team coverage of young adult current smokers was similar across remoteness categories.

Overall, the percentage of people who lived in an area served by a TIS team was generally similar across sociodemographic groups. Across age groups, coverage ranged from 75.1% (69.9,80.3) in people aged 10–17 years, to 78.2% (72.6,83.8) in people aged 18–24 years. There were significant differences in coverage by remoteness in people aged 25–34 years (urban: 66.9%, 58.9,74.8; regional: 85.6%, 78.4,92.8; remote: 73.8%, 64.5,83.1; *p*-value for difference=0.004) and ≥55 years (urban: 70.8%, 62.3,79.3; regional: 83.5%, 77.3,89.8; remote: 75.5%, 66.1,84.9; *p*-value for difference=0.04). Across categories of area-level disadvantage, coverage ranged from 72.8% (65.7,80.0; least disadvantaged) to 82.0% (75.5,88.4; middle disadvantaged). TIS team coverage for people living in the most disadvantaged areas differed significantly by remoteness (*p*-value for difference=0.007); within urban areas coverage was 57.1% (41.0,73.2), compared to 86.5% (76.8,96.2) and 72.1% (61.4,82.7) within regional and remote areas, respectively. Within urban areas, TIS team coverage also differed significantly across categories of area-level disadvantage (*p*-value for difference=0.04), at 57.1% (41.0,73.2) for people living in the most disadvantaged areas, compared to 82.1% (72.5,91.7) and 73.1% (64.6,81.5) for people living in areas with middle and lowest disadvantage, respectively. No significant differences in coverage by area-level disadvantage were identified in regional areas, remote areas or across remoteness.

Discussion

Approximately three-quarters (76.4%) of the Aboriginal and Torres Strait Islander population aged 10 years and over, or 479,000 people, were estimated to have lived in an area served by a TIS team in 2018–19. The TIS program achieved similar coverage of TIS teams broadly across remote, regional, and urban areas. Among adults who currently smoke, including young people (18–24 years) and women of reproductive age specifically, more than two-thirds of people lived in an area served by a TIS team, overall and within each level of remoteness.

While the majority of Aboriginal and Torres Strait Islander people lived in an area served by a TIS team in 2018–19, one in four, or approximately 148,000 people, did not. Further, our analysis shows that coverage of some priority groups in 2018–19 differed significantly by level of remoteness, including current adult smokers, female smokers of reproductive age, and people residing in areas with the greatest area-level disadvantage, where coverage was lowest in urban areas. As almost 40% of the Aboriginal and Torres Strait Islander population live in urban areas, it is critically important that TIS teams cover these areas. If large-scale tobacco control programs like the TIS program are inequitably covering areas where TIS priority groups reside, this risks reinforcing and perpetuating existing tobacco-related disparities.

It is important to highlight that the use of geographic data to define TIS team service area borders did not capture the diversity in activities implemented, frequency of activities, or reach of activities (i.e. how many people within TIS service areas are actually being exposed to activities) occurring across Australia as part of the flexibly-funded TIS teams. Nor did it account for the potential 'diffusion' of tobacco control activities to areas outside of team service borders, due to the nature of certain activities implemented (e.g. communication and social media-based activities), the sharing of resources among family, friends and social networks in other areas, and the mobility of Aboriginal and Torres Strait Islander peoples sharing knowledge and information. Acknowledging the importance of these factors over coverage alone, a TIS Program Intensity Tool (a semi-quantitative survey) has been developed and administered to TIS teams nationally to better understand and quantify TIS team reach and intensity in future research.

The Australian Government Department of Health recently announced its intention to distribute funding to expand the TIS team service boundaries to achieve national TIS team coverage. This was part of a $187.8 million commitment to reduce smoking in Aboriginal and Torres Straits Islander communities.[29] This is a welcomed and necessary step on the path to achieving equitable tobacco control for all Aboriginal and Torres Strait Islander people and could address the gaps in coverage described above. Importantly and as mentioned above, national coverage will not inherently mean the national reach of the program to all people in covered areas, and this is unlikely to occur without adequate and sustained funding. To implement this announced commitment effectively and ensure the national reach of the TIS teams, resourcing and support to teams should be provided based on the principle of 'proportionate universalism', whereby population tobacco control is accompanied by additional resourcing for priority populations and settings, commensurate to need.[30,31] Specifically, areas with higher current smoking prevalence and less current exposure to tobacco control activities would warrant additional resourcing. Increased resourcing may also be required in large, remote areas, with increased travel costs, less existing infrastructure and the need to provide resources and services in multiple languages. Alongside tobacco control resourcing, policy is required to directly address smoking determinants at a systems level, targeting socio-economic factors such as the systematic exclusion of Aboriginal and Torres Strait Islander peoples from the economy and education systems.[1] The TIS Program Intensity tool is expected to prove a valuable resource in exploring the true reach and intensity of activities, providing particularly helpful insights once TIS team service boundaries are expanded.

Strengths and limitations

This study used an existing nationally representative dataset and applied evidence-based methods to quantify TIS team coverage. Precision regarding TIS team areas was limited by access to only SA2 data within the survey, but this limitation was minimised by aggregating from the smallest geographic unit available (SA1s) and performing a range of diagnostic tests to determine the most accurate method of defining TIS team coverage at the SA2 level.

Geographic areas covered by the TIS teams have changed over time since the program (then known as the Regional Tackling Smoking and

Health Lifestyle program) was first established in 2010. Coverage estimates here are based on the serviced regions in 2019 but do not capture TIS team coverage in years prior to 2019 or reflect changes to TIS team coverage that have occurred since 2019. To address this limitation in future research, the TIS Program Intensity Tool described earlier, which can be distributed to teams on an annual basis, will also help to capture changes in service over time Figure 1.

Conclusion

The TIS program, of which place-based TIS teams are a key component, is the only comprehensive, large-scale tobacco control program for Aboriginal and Torres Strait Islander peoples. We estimate that around three-quarters of the population aged 10 years and over were living in an area served by a TIS team in 2018–19. The announced expansion of the TIS teams' service to national coverage will provide coverage to a further 148,000 Aboriginal and Torres Strait Islander peoples aged 10 years and over, including 46,000 adult current smokers, and is a necessary and welcomed step on the path to achieving equitable tobacco control. Importantly, national coverage is only a first step, and focus should also be given to ensuring the adequate reach of the TIS teams through equitable resourcing, to accelerate reductions in tobacco use.

Ethical statement

This study was conducted under The Australian National University HREC protocols 2019/654 and 2017/013; details of additional ethics approvals, including Indigenous-specific approvals, are available upon request

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Conflict of interest

The authors declare that they have no competing interests.

References

1. Colonna E, Maddox R, Cohen R, Marmor A, Doery K, Thurber KA, et al. Review of tobacco use among Aboriginal and Torres Strait Islander peoples. *Australian Indigenous HealthBulletin* 2020;**20**(2).
2. Brady M. Health inequalities: Historical and cultural roots of tobacco use among Aboriginal and Torres Strait Islander people. *Aust N Z J Public Health* 2002;**26**(2):120–4.
3. Ivers RG. Tobacco addiction and the process of colonisation [letter]. *Aust N Z J Public Health* 2002;**26**(3):280–1.
4. Maddox R, Waa A, Lee K, Nez Henderson P, Blais G, Reading J, et al. Commercial tobacco and indigenous peoples: A stock take on framework convention on tobacco control progress. *Tob Control* 2019;**28**(5):574.
5. Al-Yaman F. The Australian Burden of Disease Study: Impact and causes of illness and death in Aboriginal and Torres Strait Islander people. 2011 *Public Health Res Pract* 2017;**27**(4):e2741732.
6. Thurber K, Banks E, Joshy G, Soga K, Marmor A, Benton G, et al. Tobacco smoking and mortality among Aboriginal and Torres Strait Islander adults in Australia. *Int J Epidemiol* 2021;**50**(3):942–54.
7. Lovett R, Thurber KA, Wright A, Maddox R, Banks E. Deadly progress: Changes in Australian Aboriginal and Torres Strait Islander adult daily smoking, 2004-2015. *Public Health Res Pract* 2017;**27**(5):275174.
8. Maddox R, Thurber KA, Calma T, Banks E, Lovett R. Deadly news: The downward trend continues in Aboriginal and Torres Strait Islander smoking 2004–19. *Aust N Z J Public Health* 2020;**44**(6):449–50.
9. Thurber K, Walker J, Maddox R, Marmor A, Heris C, Banks E, et al. *A Review of Evidence on the Prevalence of and Trends in Cigarette and E-cigarette use by Aboriginal and Torres Strait Islander Youth and Adults*. Canberra: (AUST): The Australian National University; 2020.
10. Thomas DP, Davey ME, Briggs VL, Borland R. Talking about the smokes: Summary and key findings. *Med J Aust* 2015;**202**(10):S3–4.
11. Australian Bureau of Statistics. *Aboriginal and Torres Strait Islander Peoples: Smoking Trends, Australia, 1994 to 2014-15*. Canberra: (AUST): ABS; 2017.
12. Chamberlain C, Perlen S, Brennan S, Rychetnik L, Thomas D, Maddox R, et al. Evidence for a comprehensive approach to Aboriginal tobacco control to maintain the decline in smoking: An overview of reviews among Indigenous peoples. *Syst Rev* 2017;**6**(1):135.
13. Carson K, Jayasinghe H, Smith B, Newchurch J, Brinn M, Veale A, et al. Smoking cessation and tobacco prevention in Indigenous populations. *Evidence Base* 2014;(3). https://doi.org/10.4225/50/558111F5AEF58.
14. Minichiello A, Lefkowitz ARF, Firestone M, Smylie JK, Schwartz R. Effective strategies to reduce commercial tobacco use in Indigenous communities globally: A systematic review. *BMC Public Health* 2016;**16**:21.
15. Power J, Grealy C, Rintoul D. Tobacco interventions for Indigenous Australians: A review of current evidence. *Health Promot J Austr* 2009;**20**(3):186–94.
16. National Best Practice Unit Tackling Indigenous Smoking (NBPU TIS). *Tackling Indigenous Smoking*. Mt Lawley (AUST): Edith Cowan University Australian Indigenous HealthInfoNet; 2019.
17. Walter M, Andersen C. *Indigenous Statistics: A Quantitative Research Methodology*. Abingdon (UK): Routledge; 2016.
18. Watego C. *Another Day in the Colony*. Brisbane: (AUST): University of Queensland Press; 2021.
19. Moreton-Robinson A. Relationality: A Key Presupposition of an Indigenous Social Research Paradigm. In: O'Brien JM, Andersen C, editors. *Sources and Methods in Indigenous Studies (Routledge Guides to Using Historical Sources)*. Abingdon (UK): Routledge; 2017. p. 69–77.
20. Nilson C. A journey toward cultural competence: The role of researcher reflexivity in indigenous research. *J Transcult Nurs* 2016;**28**(2):119–27.
21. Australian Government Department of Health. *Tackling Indigenous Smoking Service Areas 23 February 2021*. *Canberra (AUST)*. Government of Australia; 2021.
22. Australian Bureau of Statistics. *1270.0.55.001 - Australian Statistical Geography Standard (ASGS): Volume 1 - Main Structure and Greater Capital City Statistical Areas*. July 2016. Canberra: (AUST): ABS; 2016.
23. Australian Bureau of Statistics. *2018-19 Microdata and TableBuilder: National Aboriginal and Torres Strait Islander Health, Australia*. Canberra: (AUST): ABS; 2021.
24. Openshaw S. *The Modifiable Areal Unit Problem*. Norfolk (UK): Geo Books; 1984.
25. Barrett EM, Maddox R, Thandrayen J, Banks E, Lovett R, Heris C, et al. Clearing the Air: Understimation of Youth Smoking Prevalence Associated with Proxy-reporting or Parent Presence at Interview, Compared to Youth Self-report. *BMC Med Res Methodol* 2022;**22**(108). https://doi.org/10.1186/s12874-022-01594-w.
26. World Health Organization. *Global Reference List of 100 Core Health Indicators*. Geneva (CHE): WHO; 2015.
27. Australian Bureau of Statistics. *National Aboriginal and Torres Strait Islander Health Survey Methodology*. Canberra: (AUST): ABS; 2019.
28. Australian Bureau of Statistics. *Estimates and Projections of the Aboriginal and Torres Strait Islander Population for 2006 to 2031*. Canberra: (AUST): ABS; 2019.
29. Australian Government Department of Health. *$188 Million to Extend Indigenous Anti-smoking Program*. Canberra: (AUST): Government of Australia; 2022.
30. Marmot M, Allen J, Goldblatt P, Boyce T, McNeish D, Grady M, et al. *Fair Society. Healthy Lives: Strategic Review of Health Inequalities in England Post 2010. The Marmot Review*. London (UK): Marmot Review; 2010.
31. Carey G, Crammond B. Systems change for the social determinants of health. *BMC public Health* 2015;**15**:662.