



## Team members influence retention in a First Peoples' community-based weight-loss program

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### ABSTRACT

The aim of this study was to evaluate program retention factors in a repeated team-based weight-loss and healthy lifestyle program for Aboriginal and Torres Strait Islander Peoples. Data comprised 3107 participants in 10 Aboriginal Knockout Health Challenge contests. Multiple variable and bivariate analyses compared age, gender, self-reported behaviors (physical activity and fruit and vegetable consumption) and objectively measured weight between completers and non-completers. First-time participants (n = 3107) who completed were more likely to be female, be older, weigh less and have more completing members in their team; only the number of team members completing was significant among participants (n = 1245) who took part in a second contest participation. Multivariate results were similar, with a participant's odds of completing on their first and second participation occasion increasing by 1.16 and 1.18, respectively, with every teammate completed. Given that the strongest effect centered on a social factor, this highlights the importance of having community-driven design and the benefits of a group-based approach to engage and maintain First Peoples' engagement in preventive health programs. Further, by identifying a change in factors associated with retention in successive weight-loss attempts, this study improves understanding of retention in weight-loss programs more generally.

### 1. Introduction

Though notable improvements in health indicators have been made in recent years, Aboriginal and Torres Strait Islander Peoples (henceforth "Aboriginal Australians") have a 1.6 higher mortality rate than non-Indigenous Australians predominantly due to non-communicable diseases (Australian Institute of Health and Welfare, 2015). Tailored health promotion programs can improve health habits and reduce the risk of non-communicable diseases. For example, the Aboriginal Knockout Health Challenge (the KHC), an on-going, culturally-tailored, state-wide healthy lifestyle and weight reduction program for Aboriginal Australians in New South Wales (NSW), has significantly reduced participant average weight and increased fruit and vegetable consumption and moderate and vigorous physical activity (PA) (Grunseit et al., 2019).

Weight-loss programs in general can be effective in improving participant physical (Ma et al., 2017) and mental (Fabricatore et al., 2011) health, but participant retention in weight-loss programs is often suboptimal. Setting and variability in retention definitions, strategies and measurement contribute to rate variation, with attrition in community-based programs ranging 23–67% (Moroshko et al., 2011). Poor retention is a problem because longer time spent in weight-loss programs is associated with better weight outcomes (Jiandani et al., 2016); poor retention may distort study findings, likely biasing toward program effectiveness, and require better retention strategies (Rae et al., 2013). Retention in weight-loss programs is generally associated with older age (Leahey et al., 2010, Jiandani et al., 2016, Jiang et al., 2016, Babatunde et al., 2017, Burgess et al., 2017, Leung et al., 2017, Stoutenberg et al., 2017, Alexander et al., 2018, Tomioka et al., 2019), though some studies have found no such association (Moroshko et al., 2011,

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Latner and Cio, 2014). Retention rates have been found to be higher among females (Jiang et al., 2016), but also among males (Burgess et al., 2017) or not associated with gender (Moroshko et al., 2011, Stoutenberg et al., 2017). Other common factors associated with retention are initial weight or BMI and initial weight-loss success. Lower starting weight correlated with completion of weight-loss programs in two recent reviews (Burgess et al., 2017, Leung et al., 2017), in a 16-week state-wide internet-based program (Leahey et al., 2010) and in a 12-week program targeting church-going African Americans (Babatunde et al., 2017), but no relationship was found in a 16-week team competition set in community recreation centers (Stoutenberg et al., 2017) or in short (3 month) or long-term (12 month) retention in a phone and internet-based intervention (Alexander et al., 2018). Programs targeting Aboriginal Australians have demonstrated acceptable retention (30–74%), with the higher rates when programs are community-based (Canuto et al., 2012, Grunseit et al., 2019), but there have been no analyses of factors contributing to this. Further, few studies have examined health habits as predictors of retention in weight-loss programs. PA behavior has more often been found to be unrelated to retention (Moroshko et al., 2011) than associated with it (Leung et al., 2017). Fruit and vegetable consumption appear uncorrelated with retention (Moroshko et al., 2011) while measures of poor eating habits (e.g., skipping meals) have some predictive value for attrition (Leung et al., 2017).

There is evidence that effective community programs targeting lifestyle change may be more acceptable among Aboriginal Australians than hospital or clinic-based programs due to their accessibility and social capital capacity (Hunt et al., 2008, Browne-Yung et al., 2013). Moreover, Aboriginal Australians may feel marginalized in clinical settings (Mbuzi et al., 2017). To our knowledge only two studies have evaluated individual-level demographics associated with attrition in community lifestyle programs for Indigenous peoples. In a diabetes prevention program for Native American/Native Alaskans, age and gender predicted attrition in both program (4–6 month) and maintenance (12 months or longer) phases (Jiang et al., 2016). Age and fitness level predicted attrition at 12 months from a culturally tailored community-setting fitness class for older Hawaiian adults (Tomioka et al., 2019). In addition to targeting different Indigenous populations, these programs have different objectives from and are longer in duration than the KHC. Therefore, improving our understanding of factors associated with retention in a program which has demonstrated significant mean weight-loss among participants is warranted. We examined the association of individual attributes with retention in the KHC and also included one team level variable to capture the context of the analyzed program.

## 2. Methods

### 2.1. Program

The KHC has been described in detail elsewhere (Passmore et al., 2017). Briefly, the KHC is a state-wide community-based team weight-loss competition open to Aboriginal Australians aged 16 years or older, with no weight or BMI criteria for participation. Since 2014 the competition has comprised two 10–12-week contests per year, with participation increasing over the years (Grunseit et al., 2019). Participants join either or both contests to form teams of 20 or more persons and engage in team-determined activities promoting healthy lifestyle behaviors and weight-loss. The KHC provides support to teams through social media, learning resources and start-up funds for sporting or other equipment or lifestyle assistance (e.g., hire of person trainer or dietitian). Teams successful at weight-loss may be awarded prize money and this is directed to improving local environmental and socio-economic supports for healthy living. The team-level award may incentivize retention as a minimum of 20 participants/team must provide pre/post data.

### 2.2. Data

Participants complete enrolment forms with their name, date of birth and gender; and report their fruit and vegetable intake (servings of each on a typical day) and PA (frequency in last seven days of 20 min or more vigorous PA, 30 min or more of walking, and 30 min or more of moderate PA) using validated questions (Dal Grande et al., 2012); and weight (to nearest 0.1 kg) as measured by a health professional. The enrolment form also gathers participant consent to allow data use from forms for research purposes. Participants submit their form to a team manager to join that team and at the conclusion of the contest participants submit the same data to their team manager. Team managers forward the forms to a central database at contest start and end.

Probabilistic record matching by participant name, gender and date of birth was used by an independent data linkage agency (The Centre for Health Record Linkage – <http://www.cherel.org.au/>; 0.05% false positive rate) in merging data for 12 contests (2012–2018). Ethics approval for the secondary analysis was provided by the Aboriginal Health and Medical Research Council (Project 1125/15) and the University of Sydney (2019/425).

### 2.3. Sample

Analysis was limited to 2014–2018 ( $n = 10$  contests) to assess self-reported behaviors as predictors. Analysis was limited to adults as children's retention may differ from adults due to their low numbers in the program (Smith et al., 2014) and be dependent on that of their parent/guardian availability (Lucas et al., 2014); further, participation by 16–17-year-olds had only been allowed since 2017. Because non-completers have 1.86-fold more previous weight-loss attempts than completers (Teixeira et al., 2004) suggesting repeat participants may differ from first-time participants, we analyzed the first participation occasion for each participant as well as the second for those who participated in a subsequent contest.

### 2.4. Outcome and measures

The outcome variable of this study was contest completion, defined as participants belonging to a team with at least 20 members at the start of the competition and who supplied a starting and finishing weight. Non-completers were those belonging to a team of at least 20 members, providing a starting weight, and not submitting a weight at the end of the competition.

Age was re-coded into quartiles: 18–<29 years, 30–<39 years, 39–<49 years and 49 years or older. Dietary intake and PA behaviors were analyzed as categorical. For the dietary variables, the thresholds for meeting recommendations were at least two servings of fruit and five servings of vegetables (National Health and Medical Research Council, 2013). PA was operationalized as a four level variable indicating minimal (0 vigorous sessions/week and 2 or fewer walking or moderate activity sessions/week), low (1–2 vigorous sessions/week and 2 or fewer walking or moderate activity sessions/week; or 0 vigorous sessions/week and 3–4 walking or moderate activity sessions/week), adequate (three or more vigorous sessions/week; or five or more walking or moderate sessions/week; or 1–2 vigorous sessions/week and 3–4 walking or moderate sessions/week) or high (3 or more vigorous sessions/week and 3 or more sessions/week walking or moderate activity) (Smith et al., 2005). A team level variable was derived denoting the total number of completers in a team by summing the people within a team who met the above definition of completers.

For the second participation, a variable indicating whether the person had completed the competition on their first occasion was derived.

### 2.5. Data analysis

An analysis of those missing any of the demographic (age, gender)

and behavioral (PA, fruit and vegetable consumption) data was undertaken by examining the patterns of missing data descriptively, and by comparing those with and without missing data on the behavioral variables across the demographic and outcome variables using chi-square tests. We also conducted Little's test to determine whether the data were missing completely at random (Li, 2013).

The intraclass correlation (ICC) for the outcome variable (competition completion) was calculated for first and second occasions of participation to determine the clustering effect of team.

Baseline characteristics of completers and non-completers were compared for first and second participation occasion using mixed effects logistic models, adjusting for the clustering of individuals within teams. The team level variable (total number of completers in team) was also tested, and for the second participation occasion only, the variable indicating whether the person completed on their first participation occasion was also tested. To maintain comparability between the multiple variable and bivariate analyses, only those participants included in the multiple variable analyses were included in the bivariate analyses. Adjusted effects were tested using multivariate mixed effects logistic regression models with all demographic, baseline behavioral variables and total number of completers in the team included for both participation occasions, with the addition of the variable indicating whether the person completed on their first participation occasion for the model examining completion on the second participation occasion. A threshold of 0.05 was used for statistical significance and all analyses were conducted using Stata 16.1 (College Station, TX, USA).

### 3. Results

#### 3.1. Missing data analysis

There were 3513 participants who were aged 18 years or older and had participated in the KHC from 2014 onwards. Of those, 88% (n = 3107) had completed data for all variables included in the analysis. For the 406 with at least one missing variable, the most common pattern was to be missing the number of fruit servings at baseline (n = 252, 7.2%) either alone or in combination with missing data on other variables. All other variables had <5% data missing (range 0.1%–4.0%). There were no differences in age, gender or whether the person completed the Challenge for those missing data on fruit servings compared with those who had data. We conducted Little's test and the result indicated that the data across all variables was missing completely at random (Li, 2013). The results showed the same non-systematic pattern for the second participation occasion (highest amount of missing data was for fruit servings: missing for 75 of a total of 1367 participants, 6%).

**Table 1**

Descriptive statistics and bivariate comparison (adjusted for clustering within teams) for competition completers and non-completers on the first (n = 3107) and second participation occasion (n = 1245).

	First participation occasion (n = 3107)			Second participation occasion (n = 1245)		
	Non-completer (n = 1330)	Completer (n = 1777)	p-value	Non-completer (n = 524)	Completer (n = 721)	p-value
% Female	72.0% (957)	75.1% (1334)	0.047	78.2% (410)	77.5% (559)	0.382
Age in years			0.003			0.239
<29	32.0% (426)	27.1% (481)		24.2% (127)	22.2% (160)	
29-<39	24.2% (322)	24.8% (440)		27.1% (142)	28.9% (208)	
30-<49	23.5% (313)	24.8% (440)		28.8% (151)	25.2% (182)	
49+	20.2% (269)	23.4% (416)		19.9% (104)	23.7% (171)	
Mean kg weight at start (SD)	96.6 (25.0)	95.6 (23.1)	0.011	96.7 (24.0)	95.6 (21.9)	0.113
PA at start			0.068			0.242
minimal	31.9% (424)	29.0% (515)		25.8% (135)	25.2% (182)	
low	18.7% (249)	18.7% (333)		16.6% (87)	14.2% (102)	
adequate	23.5% (313)	25.6% (455)		27.5% (144)	26.5% (191)	
high	25.9% (344)	26.7% (474)		30.2% (158)	34.1% (246)	
% meeting fruit recs at start	43.2% (574)	46.1% (819)	0.068	49.3% (259)	54.1% (390)	0.597
% meeting veg recs at start	8.5% (113)	7.5% (134)	0.399	8.6% (45)	10.3% (74)	0.984
Total completers in team*	16.6	19.6	<0.001	15.9	19.3	<0.001

Abbreviations: PA, physical activity; recs, daily serving recommendations; SD, standard deviation; veg, vegetable. \* Team level variable.

Therefore, we used complete cases only as these would produce unbiased estimates (Hughes et al., 2019).

#### 3.2. Bivariate analyses

There were 3107 participants with no missing data for their first occasion of participation in the KHC and 1245 who had no missing data for their second participation occasion. The ICC for the null model was 0.45 (95%CI: 0.38; 0.52) for the first participation occasion and 0.61 (0.51; 0.69) for the second participation occasion indicating a very strong clustering effect for team.

Bivariate comparisons (adjusted for the within teams clustering) of those who completed the challenge compared to those who did not are shown in Table 1. On the first participation occasion, completers were more likely to be female, be older, weigh less and have more completing members in their team compared with participants who did not complete the competition. On the second participation, only the number of completing team members differed between completers and non-completers. None of the baseline behavioral variables (i.e., PA, meeting fruit and vegetable recommendations) differed between completers and non-completers either at the first or second participation occasion.

#### 3.3. Multiple variable analyses

The results for the multiple variable analyses predicting completion for the first and second participation occasion are shown in Table 2. Once adjusted for clustering within teams and for all other variables, female participants had 1.18 times the odds of completing compared with their male counterparts. Age was significantly associated with completion, showing higher the odds of completion with greater age. For example, those aged 49 years or over had nearly twice the odds of those age under 29 years to complete the competition. The effect for total PA was significant overall, but only those with adequate or high levels of activity showed greater likelihood of completion than those with minimal levels. For every person in a team who completed, the odds of an individual in that team completing rose by a factor of 1.16.

For the second participation occasion, only weight at the start of the competition and the number of completers in the team showed statistically significant associations with completion. Those with higher weight at baseline had lower odds of completing, and as with the first participation occasion, the odds of a person completing increased with the total number of team members completing. Completing the previous competition was marginally associated with higher odds of completion (p = 0.080).

**Table 2**  
Adjusted odds ratios for completion for participants on their first and second participation occasion.

Variable (reference category)	First participation occasion (n = 3107)			Second participation occasion (n = 1245)		
	AOR	95%CI	p-value	AOR	95%CI	p-value
Female (Male)	1.18	0.96; 1.46	<0.001	0.76	0.50; 1.14	0.181
Age in years (<29 years)			<0.001			0.720
29-<39	1.30	1.03; 1.64	0.028	1.21	0.79; 1.85	0.392
30-<49	1.34	1.06; 1.7	0.014	1.13	0.73; 1.75	0.579
49 + years	1.84	1.42; 2.37	<0.001	1.30	0.81; 2.09	0.275
Mean kg weight at start	1.00	0.99; 1.00	0.077	0.99	0.99; 1.00	0.034
PA (minimal)			0.016			0.263
low	1.15	0.89; 1.47	0.288	1.04	0.64; 1.71	0.866
adequate	1.33	1.06; 1.69	0.016	1.05	0.69; 1.61	0.811
high	1.43	1.13; 1.82	0.003	1.46	0.96; 2.23	0.079
meets fruit recs (does not meet recs)	1.12	0.94; 1.35	0.204	1.12	0.81; 1.54	0.488
meets veg recs (does not meet recs)	0.77	0.56; 1.06	0.113	0.99	0.56; 1.75	0.975
Completed previously (did not complete)	NA	NA	NA	1.37	0.96; 1.96	0.080
Total completers in team*	1.16	1.13; 1.18	<0.001	1.18	1.14; 1.23	<0.001

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; PA, physical activity; recs, daily serving recommendations; veg, vegetable. \* Team level variable.

#### 4. Discussion

This study examined the association of individual-level attributes and team retention with individual retention in a repeating, state-wide weight reduction program for Aboriginal Australians, the KHC. We found age and gender were related to retention for initial participation, with females and older participants more likely to complete their first participation. However, age and gender were not related to subsequent competition completion. Of the behavior measures, only adequate and high PA, compared to minimal PA, increased the odds of first participation retention. For both first and second participation occasions, the odds of contest completion increased significantly with each fellow team member completing. Together these results show certain demographic subpopulations may be at greater risk of program drop-out and show the reinforcing effect of retention within a team.

Consistent with the majority of findings from the literature (Leahey et al., 2010, Jiandani et al., 2016, Jiang et al., 2016, Babatunde et al., 2017, Burgess et al., 2017, Leung et al., 2017, Stoutenberg et al., 2017, Alexander et al., 2018, Tomioka et al., 2019), older (over 49 years of age) participants were more likely to complete their first the KHC participation than younger (under 29 years) participants. Obesity and chronic disease rates among Aboriginal Australians increase with age (Australian Institute of Health and Welfare, 2015), with 80% of those 55 or more years old overweight or obese. The retention of older participants therefore suggests the KHC could be well-designed for this demographic, however a better understanding of age-differences in motivators to both join and complete the KHC could help to retain younger participants and have long-term impact on obesity rates. For example, younger participants may join for the physical challenge while the social factor appeals to older participants, as found elsewhere (Spink

et al., 2014). Age-related positive role-modelling and negative peer pressure have been observed to influence health behaviors among Aboriginal Australians (Waterworth et al., 2015); these influencers could play roles in both the KHC enrolment and retention decisions.

The weak relationship of starting weight with retention in our results is unsurprising given the conflicting evidence in the literature. In community setting programs, starting BMI was associated with retention at 12 months in a healthy lifestyle trial (Babatunde et al., 2017) and at 16 weeks in a pedometer-based online competition (Leahey et al., 2010) but was not associated with retention in a 16-week team-based program (Stoutenberg et al., 2017). Previous research found no difference in average participant behaviors or starting weight in KHC contests 2–6 [2], suggesting that the type of person attracted to the program remains consistent. Qualitative investigation around participant motivators and program satisfaction could be beneficial to further explore the role of starting weight in retention in the KHC.

While findings on associations between gender and retention in weight-loss interventions have been inconsistent (Moroshko et al., 2011, Jiang et al., 2016, Burgess et al., 2017, Leung et al., 2017, Stoutenberg et al., 2017), a larger proportion of women completed their first KHC competition. High retention rates (84.2–91.2%) have been demonstrated previously in interventions with positive health outcomes which targeted Aboriginal Australian men (Egger et al., 1999, Mendham et al., 2015). Recently another sport-based healthy lifestyle program for males has been trialed in Australia, capitalizing on bonding through shared team appreciation to deliver effective healthy lifestyle programs involving PA (Kwasnicka et al., 2020). The program had high retention (86% at 12 weeks) and participants lost on average 3.41% body weight (Kwasnicka et al., 2020). Although no participants in the football-based program were Aboriginal Australians (Kwasnicka et al., 2020), Aboriginal Australian men also benefit from peer support and camaraderie through sports participation (Thorpe et al., 2014). Despite having an organizational partner in the state rugby league, which is traditionally popular in the Aboriginal community, the KHC retention rates for male KHC participants were suboptimal. How sporting organizations can be used to optimize uptake, participation and retention in KHC warrants further exploration as sports-based men's behavior change programs have been found to attract participants not meeting PA recommendations and improve their health behaviors (Zwolinsky et al., 2013). Qualitative research exploring a range of factors influencing the KHC uptake, participation and retention among men and women could inform further modifications. In particular, exploring the use of mixed gender vs single gender programs could be insightful given the high retention rates observed in single-sex interventions and gender differences in sport and PA attitudes and beliefs (Dahlberg et al., 2018).

The strongest indicator of retention was the effect of teammate completion, in that this indicator was predictive in both first and second participation occasions. The increased odds of the KHC contest completion with each completing teammate suggests that there is some sort of reinforcing effect within a team which is related to retention. The observed very high ICC values provide further support of this relationship. KHC participants have previously identified a high level of community connectedness through program participation (Passmore et al., 2017). Social support and cohesion, inclusion of family members and group-structured formats have all been identified as factors promoting participation in health interventions among Aboriginal Australians (Hunt et al., 2008, Canuto et al., 2013, Sushames et al., 2017). While other factors attributed to retention in lifestyle interventions, including being embedded in and supported by the community, creating social opportunities, and building capacity (Ball et al., 2017), are also incorporated in the KHC design, the emphasis on cultural values of community and connectedness through the team format (Browne-Yung et al., 2013) may be the mechanism through which teammate completion is influencing the retention rate. It is unclear the extent to which team member social ties existed prior to the KHC participation. In other research, where teams formed prior to enrolment in a weight-loss

program, weight-loss was found to be influenced by one's peers (Leahey et al., 2012). Pre-established groups of Aboriginal men have also reported improved experience with healthcare services when attending consults as a group (Stevens et al., 2016). This could suggest prior social ties might facilitate successful outcomes. However, feelings of social cohesion can also develop through the process of participation in group-oriented programs where individuals may not be previously acquainted (Canuto et al., 2013, Borek et al., 2019), particularly where there is homogeneity in a group (Farrance et al., 2016). Moreover, the impact of social cohesion may be intertwined with group leader characteristics (Izumi et al., 2015). Staffing factors have been shown to affect participation in community settings (Jiang et al., 2016). Team managers play a role in fostering KHC participation and their role and the potential interaction between leadership and social ties on participation could be further explored. Group-based approaches in Aboriginal Australian communities have been successful for improving health indicators (Stevens et al., 2016, Grunseit et al., 2019) and are a desirable format for physical activities (Hunt et al., 2008). Together with the present findings on retention, this suggests group-based approaches may be an effective way to address Aboriginal Australians' health.

#### 4.1. Limitations

A limitation of this work is that true completion rates may be higher than measured here as participants may take part in program activities without providing start and final weights. Regardless, given the paucity of intervention and implementation evidence in Aboriginal Australian communities our work is a significant contribution to evidence of effective programs addressing health gaps in the community. The work also augments understanding of retention in community-based weight-loss programs more generally. Qualitative research is needed to understand the mechanism underlying the role of teammate completion in participant retention. Finally, in natural experiments such as this, some participation characteristics and measures, such as attendance rate, and program processes (e.g., recruitment and follow-up) are not captured, nor is there an appropriate comparison group. Nonetheless, the findings are program-relevant for real world public health evidence and practice, particularly given the dearth of evaluations of programs targeting Aboriginal Australians, with study strengths including objective weight assessment and large participation numbers compared to other Aboriginal Australian community interventions.

#### 4.2. Conclusion

The association between teammate retention with an individual's retention in a weight reduction program for Aboriginal Australians suggests peer support and group cohesion are important underlying attributes. Emphasizing approaches using community and social ties to capitalize on their value in Aboriginal Australian cultures may be effective at improving health indicators in Aboriginal Australians. The implications of this work suggest that despite program co-creation with Aboriginal Australian communities, maintaining Indigenous participation in preventive health programs requires continued consultation and engagement. Further research could identify strategies to maximize younger and male participants' retention and explore how factors interact with participation to ensure high levels of retention for both first and repeat participants.

#### *CRedit* authorship contribution statement

**Erika Bohn-Goldbaum:** Conceptualization, Project administration, Validation, Visualization, Writing – original draft, Writing – review & editing. **Aaron Cashmore:** Conceptualization, Data curation, Funding acquisition, Investigation, Supervision, Writing – review & editing. **Adrian Bauman:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing. **Anna Sullivan:** Investigation, Resources, Writing – review & editing. **Lose (Rose) Fonua:**

Conceptualization, Investigation, Writing – review & editing. **Andrew Milat:** Conceptualization, Funding acquisition, Investigation, Supervision, Writing – review & editing. **Kate Reid:** Conceptualization, Funding acquisition, Investigation, Supervision, Writing – review & editing. **Anne Grunseit:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

#### Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The NSW Ministry of Health engaged author Bauman's consultancy firm to conduct the study, with author Bohn-Goldbaum engaged as sub-contractor. Authors Cashmore, Milat, Reid and Sullivan have a non-financial competing interest in that they work for the organization that operates the program. Additionally, author Fonua's former employment in the same organization overlapped with this study.

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#### Disclosures

The NSW Ministry of Health engaged author Bauman's consultancy firm to conduct the study, with author Bohn-Goldbaum engaged as sub-contractor. Authors Cashmore, Milat and Sullivan have a non-financial competing interest in that they work for the organization that operates the program. Additionally, authors Reid's and Fonua's former employment in the same organization overlapped with this study.

#### Data availability

The datasets generated and/or analyzed during the current study are not publicly available due to the conditions of ethics approval. Data are available from the authors upon reasonable request and with permission of the NSW Ministry of Health.

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