

MONITORING UPDATE

**An examination of the demographic characteristics and dietary
intake of people who meet the physical activity guidelines:
NSW Population Health Survey data 2007**

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FOREWORD

PANORG's *Monitoring Updates* focus on summarising new information relating to indicators identified and described in the PANORG publication '*A Framework for Monitoring Overweight and Obesity*'. *Monitoring Updates* not only cover more recent data on variables described in that report, but also extend the information by reporting on additional indicators, as data sources and evidence for their utility emerges.

Topics for the *Monitoring Updates* are determined on the basis of policy relevance. The principal audience for *Monitoring Updates* comprises policymakers, public health and health promotion professionals in NSW and Australia. This includes professionals working in government agencies, Area Health Services and non-government and community organisations who have an interest in overweight and obesity prevention and promotion of healthy nutrition and physical activity.

EXECUTIVE SUMMARY

Physical activity and healthy diet play an important role in the prevention of obesity and a wide range of chronic conditions. A better understanding of the relationship between these two health behaviours in the NSW population would be particularly useful in guiding future interventions to reduce the risk of chronic disease and prevent population weight gain.

The purpose of this report is to examine the association between physical activity and dietary intake using self reported data from the 2007 NSW Population Health Survey. This report first investigates whether being physically active is associated with healthy dietary behaviours, and then describes the sociodemographic profile of physically active people who do not engage in healthy eating behaviours.

In the NSW Population Health Survey, physical activity is determined using the *Active Australia Survey*, and meeting the physical activity guidelines is defined as doing 150 minutes or more of total physical activity over five separate occasions in the previous week. Nutrition data are collected using short dietary questions. Four dietary intake variables were included for this analysis based on their relevance to chronic disease and weight gain: vegetable intake, fruit intake, soft drink consumption and takeaway food consumption. Responses to these variables were dichotomised into 'healthier'/'unhealthier' categories.

Overall, results showed that older people, especially men, tend to do less physical activity compared to younger people, and that obese women were less likely to meet physical activity guidelines compared to healthy weight women. Those who reported a higher intake of fruits and vegetables and/or a lower consumption of soft drinks were more likely to meet the physical activity guidelines. No significant association was found between physical activity and consumption of takeaway food.

Findings also indicate that among those meeting the physical activity guidelines, men were more likely to report a lower intake of vegetables and a higher consumption of soft drinks and takeaway foods compared to women. Among active people, young people were at a higher risk of unhealthy eating than older age groups.

This exploratory analysis of selected data from the adult component of the NSW Population Health Survey in 2007 provides evidence of a significant association between physical activity and intake of fruit, vegetables and soft drinks, among NSW adults. This study strongly supports the hypothesis that physical activity and dietary habits are correlated behaviours, which is consistent with other findings previously described in the literature.

The gender and age differences in the association of these health behaviours, suggest the value of targeting specific population groups for future interventions. For instance, interventions to promote improved diets among young active men are warranted. In addition, interventions targeting less active groups, such as women aged 45-64 years old and older adults, need to promote both physical activity and dietary intake to improve health outcomes.

INTRODUCTION

Participation in regular physical activity and eating a healthy diet are among the most important influences on health. Together, physical activity and healthy diet play an important role in the prevention of obesity and a wide range of chronic conditions (1). Therefore, interventions to promote physical activity and healthy diet are often the focus of obesity prevention initiatives. A better understanding of the relationship between physical activity and nutrition factors would be particularly useful in guiding integrated efforts to reduce risk of chronic disease and prevent population weight gain.

There is little published research, particularly for population groups in NSW and Australia, about the relationship between physical activity and nutritional behaviours (2). Evidence from international cross-sectional and longitudinal studies show that physical activity and dietary habits are correlated behaviours; for example, those who are more physically active tend to consume higher amounts of fruits, vegetables and nutrients such as fibre, calcium and folate, and smaller amounts of less nutritious foods such as fat and cholesterol (3, 4, 5).

Age is of particular interest, given the findings of the *Weight of Time study* that young adults (who are also likely to be parents of young children) are gaining weight at a faster rate than previous generations (6). Socioeconomic factors have also been identified as having a clear effect on health behaviours. For instance, US studies have identified the “clustering” of unhealthy lifestyle habits, particularly in single individuals with lower levels of education and from non-white racial backgrounds (3). On the other hand, healthier behaviours have been associated with higher levels of education and income (7). Similarly, local surveys indicate that there are socio-economic gradients in the rates of overweight and obesity in adult populations in NSW and Australia overall (8).

The purpose of this report is to examine the association between physical activity and dietary intake using data from the 2007 NSW Adult Population Health Survey. This report will, first, investigate whether being physically active is associated with healthy dietary behaviours, and then will describe the sociodemographic profile of physically active people who do not engage in healthy eating behaviours.

This study sought to address the following research questions:

1. Is there an association between a higher intake of fruits and vegetables, and a lower consumption of soft drinks and takeaway foods, among respondents meeting the physical activity guidelines, compared to those that do not meet the physical activity guidelines? What are the demographic characteristics of physically active respondents who engage in healthy dietary behaviours?
2. What are the demographic characteristics of respondents who meet the physical activity guidelines, but do not engage in healthy dietary behaviours?

METHODS

New South Wales Population Health Survey

The New South Wales (NSW) Population Health Survey is an ongoing telephone survey of state residents, conducted by the NSW Department of Health, to monitor population health and report on performance indicators. It provides detailed information on the health of the people of NSW, supporting the planning, implementation, and evaluation of state-wide health services and programs (8).

Data are collected between February and December each year via computer assisted telephone interviewing (CATI) which utilises random digit dialling of people living in NSW households who have private telephones. If the selected household respondent is a child under the age of 16 years, a parent or carer provides the information. The target sample is approximately 12,000 each year (including 4,000 children aged 0-15 years). The NSW Health Survey Program conducts a primary analysis of these data within the NSW Department of Health. This further analysis examined the adult component (respondents aged 16 years and over) of the NSW Population Health Survey (8).

Measures

Demographic characteristics

Age, sex, socioeconomic status and weight status were considered for this analysis. Age classification was limited to four age groups (16-24, 25-44, 45-64, and 65+ years old) in order to increase cell power, due to low sample size in some age groups.

The Socio-Economic Indexes for Areas (SEIFA) were used to describe the socioeconomic aspects of the sample. SEIFA index values are grouped into 5 quintiles, with quintile 1 being the least disadvantaged and quintile 5 being the most disadvantaged. For this analysis, SEIFA quintiles were grouped into two categories where 'advantaged' corresponds to quintiles 1 and 2, and 'disadvantaged' corresponds to quintiles 3, 4, and 5.

The WHO classification of Body Mass Index (BMI) was used to define the weight status of respondents: underweight=BMI <18.5 kg/m², healthy weight= BMI 18.5-24.9 kg/m², overweight=BMI 25-29.9 kg/m², and obese=BMI ≥30 kg/m² (9). Five cases of BMI were excluded as values were misreported.

Physical activity

Physical activity was determined using the *Active Australia Survey* (10). This questionnaire comprises six questions that measure the frequency and duration of walking and of moderate and vigorous-intensity physical activity, in the past seven days. Meeting the physical activity guidelines was defined as doing 150 minutes or more of total physical activity over five separate occasions in the previous week (10), and is referred to as '**sufficient physical activity**' in this report.

Dietary intake

Nutrition data were collected using short dietary questions for reporting of key indicators for food intake (11). Four dietary intake variables were included for this analysis based on their relevance to chronic disease and weight gain: vegetable intake, fruit intake, soft drink¹ consumption and takeaway food consumption. Responses to these variables were dichotomised into 'healthier'/'unhealthier' categories. Thresholds for vegetable and fruit intake were based on *The Australian Guide to Healthy Eating* (AGHE) (12), however the threshold for vegetable intake was modified as only a small percentage of the population meet the 'five serves or more' of vegetables each day. Cut-points for soft drink and takeaway food consumption were based on discussions with public health nutrition experts, as dietary guidelines for these foods are not available.

¹ 'Soft drink' includes soft drink, cordials and sports drinks

‘Healthier’ dietary intake variables comprised:

1. consumption of three serves or more of vegetables per day,
2. consumption of two serves or more of fruit per day,
3. consumption of two cups or less of soft drinks, cordials or sports drinks per week,
4. consumption of takeaway food less than two times per week.

Statistical Analysis

The adult component of the 2007 NSW Population Health Survey was accessed through the NSW Department of Health’s Health Outcomes Information Statistical Toolkit (HOIST) data warehouse system, with permission of the Chief Health Officer.

The NSW Health Survey Program conducts a primary analysis of these data, and weights the survey sample to adjust for differences in the probabilities of selection among subjects. These differences were due to the varying number of people living in each household, the number of residential telephone connections for the household, and the varying sampling fraction in each health area. Post-stratification weights were used to reduce the effect of differing non-response rates among males and females and different age groups on the survey estimates. These weights were adjusted for differences between the age and sex structure of the survey sample and the Australian Bureau of Statistics 2007 mid-year population estimates (excluding residents of institutions) for each area health service. Further information on the weighting process is provided elsewhere (13).

The weighted data from NSW Health were analysed using SAS for Windows version 9.1 (SAS Institute Inc, Carey, North Carolina). The analyses were based on the dichotomised variables, described above, for meeting or failing to meet defined thresholds.

Question 1

Bivariate associations between ‘sufficient’ physical activity (outcome variable) and dietary intake variables (independent predictors) were assessed using odds ratios (OR) and 95% confidence intervals. The significance of each association was tested using the chi-squared test of independence. Multivariate logistic analyses were performed adjusting for age, sex, BMI and SEIFA. Adjusted odds ratios (AOR) and 95% confidence intervals were calculated. Associations between variables were assessed using the SURVEYLOGISITC procedure, which adjusts for the complex nature of the survey.

Question 2

Only those respondents reporting ‘sufficient’ physical activity were included in this analysis. Bivariate associations between dietary intake variables (outcome variables) and demographic characteristics (independent predictors) were assessed using odds ratios (OR) and 95% confidence intervals. Multiple logistic regression models were constructed adjusting for age, sex, BMI and SEIFA. Adjusted odds ratios (AOR) and 95% confidence intervals were calculated. Associations between variables were assessed using the SURVEYLOGISITC procedure, which adjusts for the complex nature of the survey.

RESULTS

Characteristics of respondents

In 2007, the total sample of people aged 16 years and over was 13,178 with a response rate of 63.6%. Table 1 shows the demographic characteristics of the sample, and the percentage of respondents meeting the threshold level for each variable. The age range of respondents was 16 to 103 years, with a median of 43 years. A large proportion of the sample were 25–44 years old (38%), 31% were 45–64 years old, 16.4% were 65 years and over and 14.6% were 16–24 years old. The sample was equally distributed across gender (49.1% men).

The median self-reported BMI was 25.3 kg/m²; 45% of respondents were in the healthy weight range (BMI 18.5–24.9 kg/m²), 33% were overweight (BMI 25–29.9 kg/m²), 18% were obese (BMI ≥30 kg/m²), and only 2.9% were underweight (BMI <18.5 kg/m²). Approximately 60% of this sample (59%) were classified as ‘disadvantaged’ (SEIFA quintile 3, 4, 5).

In regards to physical activity, 55% of respondents reported being ‘sufficiently active’. In relation to the ‘healthier’ thresholds for dietary intake, 40% of respondents reported eating three or more serves of vegetables per day, 54.4% reported eating two or more serves of fruit per day, 61% reported consuming two cups or less of soft drinks per week, and 89.5% reported consuming takeaway food less than twice a week.

Table 1 Characteristics of respondents

Variable	Threshold	Sample Size (unweighted n)	Weighted percentage (95% CI)
Demographics			
Age	16- 24 years	1026	14.6 (13.7, 15.6)
	25 – 44 years	2836	38.0 (36.7, 39.2)
	45 – 64 years	5194	31.0 (30.0, 32.0)
	65+	4122	16.4 (15.8, 17.0)
Sex	Male	5111	49.1 (47.9, 50.3)
	Female	8067	50.9 (49.7, 52.1)
BMI	Underweight	200	2.9 (2.4, 3.4)
	Healthy weight	3129	45.4 (43.8, 47.0)
	Overweight	2481	33.7 (32.2, 35.2)
	Obese	1449	18.0 (16.8, 19.2)
SEIFA	Advantaged	4354	41.0 (39.8, 42.2)
	Disadvantaged	8666	59.0 (57.8, 60.2)
Physical activity			
	150 minutes or more over 5 occasions/week	2616	54.8 (52.9, 56.7)
	Less than 150 minutes/week	2500	45.2 (43.3, 47.1)
Dietary intake			
Vegetable intake	3 or more serves /day	3453	40.3 (38.7, 41.8)
	Less than 3 serves /day	3847	59.7 (58.2, 61.3)
Fruit intake	2 or more serves/day	4202	54.3 (52.7, 41.8)
	Less than 2 serves/day	3130	45.6 (44.0, 47.2)
Soft drink consumption	2 cups or less/week	5044	61.1 (59.4, 62.7)
	More than 2 cups/week	2292	38.9 (37.3, 40.5)
Takeaway food consumption	Less than 2 times/week	6804	89.5 (88.3, 90.7)
	2 times or more/week	432	10.4 (9.3, 11.6)

Question 1: Is there an association between a higher intake of fruits and vegetables, and a lower consumption of soft drinks and takeaway food, among respondents meeting the physical activity guidelines compared to those that do not meet the physical activity guidelines? What are the demographic characteristics of physically active respondents who engage in healthy dietary behaviours?

Demographic characteristics and dietary intake of those meeting physical activity guidelines

Table 2 shows the results of the unadjusted analysis. Those who reported ‘sufficient’ levels of physical activity were more likely to be men, less than 25 years old, be overweight, and from a higher socioeconomic status (‘advantaged’ = SEIFA quintile 1, 2).

In addition, people exceeding the threshold level of vegetable and fruit intake were more likely to meet the ‘sufficient’ level of physical activity compared to those who reported a lower intake of vegetables and fruit (p=0.005 and p=0.004, respectively). Consumption of soft drinks or takeaway food was not significantly associated with reporting ‘sufficient’ physical activity.

Table 2 Demographic characteristics and dietary intake of those meeting physical activity guidelines

Variable	‘Sufficient’ physical activity		Unadjusted analysis
	YES (n=2616) % (95% CI)	NO (n=2500) % (95% CI)	P value
Demographics			
Age	16- 24 years	10.4 (9.0, 11.7)	0.005*
	25 – 44 years	20.6 (18.9, 22.4)	
	45 – 64 years	16.4 (15.2, 17.7)	
	65+	7.4 (6.7, 8.0)	
Sex	Male	30.8 (28.9, 32.7)	<0.0001*
	Female	24.0 (22.4, 25.5)	
SEIFA	Disadvantaged	24.8 (23.1, 26.6)	<0.0001*
	Advantaged	30.2 (28.4, 32.0)	
BMI	Underweight	1.26 (0.67, 1.85)	0.55
	Healthy weight	26.0 (23.67, 28.38)	
	Overweight	21.3 (19.10, 23.49)	
	Obese	7.2 (6.70, 8.70)	
Dietary intake			
3 or more serves of vegetables /day		23.6 (21.4, 25.7)	0.005*
Less than 3 serves of vegetables /day		31.4 (28.86, 33.86)	
2 or more serves of fruit /day		32.1 (29.6, 34.5)	0.004*
Less than 2 serves of fruit /day		22.7 (20.52, 24.98)	
2 cups or less of soft drinks /week		35.3 (32.9, 37.8)	0.96
More than 2 cups of soft drinks /week		19.5 (17.36, 21.67)	
Less than 2 times of takeaway food /week		49.5 (47.0, 52.1)	0.90
2 times or more of takeaway food /week		5.2 (3.10, 5.74)	

Multiple logistic regression models were used to further examine the relationship between reporting healthy dietary intake and ‘sufficient’ physical activity, controlling for age, sex, BMI and SEIFA. The results are presented as adjusted odds ratios and corresponding 95% confidence intervals, separately for men and women, in Table 3.

After adjusting for age, sex, SEIFA and BMI, the results indicate:

- **‘Healthier’ vegetable intake:** Men eating three or more serves of vegetables per day were twice as likely to be ‘sufficiently’ active compared to men who did not meet the guidelines for vegetable serves per day ($p < 0.001$). Similarly, women with a healthier vegetable intake were more likely to be ‘sufficiently’ active than women who did not meet this vegetable threshold ($p = 0.01$).
- **‘Healthier’ fruit intake:** Men and women eating two or more serves of fruit per day were more likely to meet physical activity recommendations compared to those eating less fruit. However, this association was only statistically significant for women ($p < 0.001$).
- **‘Healthier’ soft drink intake:** Men consuming lower amounts of soft drinks per week were more likely to achieve ‘sufficient’ physical activity levels compared to those consuming more than two cups of soft drinks per week ($p = 0.04$).
- **Age:** As age increases, people (especially men) are less likely to achieve ‘sufficient’ physical activity levels compared to younger people. This association was significant for both genders in all age groups, except for women aged 25-44 years old.
- **BMI:** Obese women are less likely to be ‘sufficiently’ active compared to healthy weight women ($p = 0.04$). Underweight men are less likely to be ‘sufficiently’ active compared to healthy weight men ($p = 0.02$). Overweight people tended to be more active than those with a healthy weight, but this association was not statistically significant.

Relationships between ‘sufficient’ physical activity and SEIFA, and ‘sufficient’ physical activity and takeaway food consumption, were not statistically significant.

Table 3 Demographic characteristics and dietary intake of those meeting physical activity guidelines by sex, adjusted for age, SEIFA and BMI

Variable	‘Sufficient’ physical activity (n=2616)						
	MEN			WOMEN			
	AOR	95% CI	P value	AOR	95% CI	P value	
Demographics							
Age	16- 24 years	1.00	Reference group	1.00	Reference group		
	25 – 44 years	0.38	0.18, 0.80	0.01*	0.69	0.41, 1.14	0.14
	45 – 64 years	0.20	0.09, 0.41	<0.0001*	0.58	0.35, 0.97	0.04*
	65+	0.16	0.08, 0.35	<0.0001*	0.34	0.20, 0.56	<0.0001*
SEIFA	Disadvantaged	1.41	0.98, 2.03	0.06	1.10	0.82, 1.46	0.53
	Advantaged	1.00	Reference group		1.00	Reference group	
BMI	Underweight	0.15	0.03, 0.79	0.02*	1.87	0.72, 4.86	0.20
	Healthy weight	1.00	Reference group		1.00	Reference group	
	Overweight	1.48	0.96, 2.29	0.08	1.30	0.88, 1.94	0.19
	Obese	0.58	0.29, 1.14	0.11	0.60	0.37, 0.98	0.04*
Dietary intake							
3 or more serves of vegetables /day		2.02	1.43, 2.88	<0.001*	1.47	1.11, 1.95	0.01*
	Less than 3 serves of vegetables /day	1.00	Reference group		1.00	Reference group	
2 or more serves of fruit /day		1.32	0.92, 1.89	0.14	1.67	1.26, 2.21	<0.001*
	Less than 2 serves of fruit /day	1.00	Reference group		1.00	Reference group	
2 cups or less of soft drinks /week		1.53	1.02, 2.27	0.04*	1.12	0.81, 1.54	0.50
	More than 2 cups of soft drinks /week	1.00	Reference group		1.00	Reference group	
Less than 2 times of takeaway food /week		1.19	0.61, 2.31	0.60	1.32	0.69, 2.53	0.40
	2 times or more of takeaway food /week	1.00	Reference group		1.00	Reference group	

Overall, the results showed that adults who have a higher intake of fruits and vegetables and a lower consumption of soft drinks are more likely to meet the physical activity guidelines. Additionally, younger women with a healthy weight were more likely to engage in both ‘sufficient’ physical activity and a ‘healthier’ diet.

Question 2: What are the demographic characteristics of respondents who report meeting the physical activity guidelines but do not engage in healthy dietary behaviours?

Characteristics of those ‘sufficiently’ active who do not meet healthy eating thresholds

Additional analyses were conducted to describe the demographic characteristics of those ‘sufficiently’ active who reported an ‘unhealthier’ diet. For this analysis, only those who met the physical activity guidelines were included (n=2616).

Table 4 shows the proportion of respondents that did not meet the defined thresholds for dietary intake. Unadjusted results show that ‘sufficiently’ active people who reported a lower intake of vegetables and fruits and a higher consumption of soft drink and takeaway food were more likely to be men. Active people reporting a lower intake of vegetables and fruits were more likely to be from a higher socioeconomic status (‘advantaged’= SEIFA quintiles 1 and 2). Those consuming a higher amount of soft drinks per week were more likely to be 25-44 years old, whilst those consuming more takeaway food were more likely to be 16-24 years old. Underweight people reporting meeting the physical activity guidelines were less likely to report a lower intake of vegetables and less likely to have a higher consumption of soft drinks and takeaway food.

Table 4 Demographic characteristics of those reporting ‘sufficient’ physical activity and ‘unhealthier’ dietary intake

‘Sufficient’ physical activity (n=2616)		Dietary intake			
		Less than 3 serves of vegetables /day % (95% CI)	Less than 2 serves of fruit /day % (95% CI)	More than 2 cups of soft drinks /week % (95% CI)	2 times or more of takeaway food /week % (95% CI)
Demographic characteristics					
Age	16- 24 years	12.4 (9.74, 15.05)*	8.1 (5.94, 10.19)*	11.2 (8.72, 13.67)*	4.6 (3.03, 6.19)*
	25 – 44 years	23.7 (20.29, 27.11)	18.2 (15.11, 21.24)	15.4 (20.47, 27.24)*	3.8 (2.09, 5.57)*
	45 – 64 years	14.1 (11.81, 16.31)*	9.9 (8.05, 11.77)*	6.5 (4.99, 8.07)*	1.0 (0.33, 1.62)
	65+	7.0 (5.69, 8.23)*	5.4 (4.23, 6.48)	2.4 (1.69, 3.18)*	0.1 (0.00, 0.24)*
Sex	Male	36.8 (33.15, 40.36)*	26.9 (23.57, 30.27)*	23.0 (19.80, 26.25)*	7.0 (4.83, 9.08)*
	Female	20.4 (17.58, 23.13)*	14.6 (12.33, 16.86)*	12.6 (10.32, 14.78)*	2.6 (1.46, 3.70)*
SEIFA	Disadvantaged	25.5 (22.17, 28.80)	18.0 (15.11, 20.97)	14.1 (11.43, 16.87)	5.4 (3.38, 7.30)
	Advantaged	31.1 (27.75, 34.48)*	23.2 (20.24, 26.20)*	21.3 (18.3, 24.23)*	4.4 (2.88, 5.87)*
BMI	Underweight	1.3 (0.35, 2.17)*	1.4 (0.35, 2.39)	0.9 (0.00, 1.79)*	0.0 (0.00, 0.15)*
	Healthy weight	27.2 (22.42, 31.94)	19.8 (15.58, 24.08)	18.3 (14.10, 22.49)	4.6 (2.32, 6.82)
	Overweight	23.1 (18.51, 27.62)	15.7 (11.82, 19.62)	14.9 (10.99, 18.86)	2.4 (0.71, 4.16)
	Obese	7.4 (4.85, 9.96)	4.4 (2.49, 6.40)	4.1 (2.30, 5.85)	0.7 (0.00, 1.50)

* indicates a statistically significant difference at p<0.05

Multiple logistic regression models were used to examine the relationship between reporting ‘sufficient’ physical activity and ‘unhealthy’ dietary intake, controlling for age, sex, BMI and SEIFA. The results are presented in adjusted odds ratios and corresponding 95% confidence intervals separately for each dietary variable in Table 5.

After adjusting for age, sex, SEIFA and BMI, the results indicate:

- **Age:** As age increases, the likelihood of a lower intake of vegetables and a higher consumption of soft drinks and takeaway food decreases, among those people reporting meeting the physical activity guidelines. These associations were significant for all age groups, except for those 25-44 years old reporting a lower intake of vegetables. There was no significant association between age and reporting a lower fruit intake for those meeting the physical activity guidelines.
- **Sex:** Active men are approximately twice as likely to consume a lower intake of vegetables and fruits and a higher amount of soft drinks and takeaway food compared to active women.
- **SEIFA:** Active people from a lower socioeconomic status ('disadvantaged') were less likely to report high soft drink consumption compared to those from a higher socioeconomic status ('advantaged'). Although those adults who are more socioeconomically disadvantaged were more likely to consume more takeaway food, this association was not significant.
- **BMI:** Active people who were underweight were over three times as likely to have a lower fruit intake compared to those people with a healthy weight.

Table 5 Demographic characteristics of those reporting 'sufficient' physical activity and 'unhealthier' dietary intakes by sex, adjusted for age, SEIFA and BMI

Demographic characteristics	Dietary intake				
	Less than 3 serves of vegetables /day AOR % (95% CI)	Less than 2 serves of fruit /day AOR % (95% CI)	More than 2 cups of soft drinks /week AOR % (95% CI)	2 times or more of takeaway food /week AOR % (95% CI)	
Age	16- 24 years	Reference group	Reference group	Reference group	Reference group
	25 – 44 years	0.66 (0.40, 1.09)	1.10 (0.69, 1.77)	0.42 (0.26, 0.69)*	0.31 (0.16, 0.59)*
	45 – 64 years	0.41 (0.25, 0.66)*	0.68 (0.43, 1.07)	0.17 (0.07, 0.27)*	0.10 (0.05, 0.24)*
	65+	0.41 (0.25, 0.67)*	0.77 (0.49, 1.23)	0.11 (0.07, 0.20)*	0.0 (0.00, 0.08)*
Sex	Male	2.38 (1.76, 3.22)*	1.99 (1.48, 2.69)*	1.94 (1.39, 2.72)*	2.50 (1.39, 4.51)*
	Female	Reference group	Reference group	Reference group	Reference group
SEIFA	Disadvantaged	1.04 (0.77, 1.42)	0.89 (0.66, 1.21)	0.71 (0.51, 1.00)*	1.68 (0.94, 3.01)
	Advantaged	Reference group	Reference group	Reference group	Reference group
BMI	Underweight	1.42 (0.38, 5.27)	3.52 (1.08, 11.52)*	1.36 (0.43, 4.35)	0.14 (0.01, 1.52)
	Healthy weight	Reference group	Reference group	Reference group	Reference group
	Overweight	1.19 (0.80, 1.77)	0.92 (0.62, 1.36)	1.28 (0.82, 1.99)	0.60 (0.26, 1.37)
	Obese	1.65 (0.93, 2.95)	0.97 (0.53, 1.76)	1.25 (0.67, 2.34)	0.81 (0.25, 2.60)

* indicates a statistically significant difference at $p < 0.05$

Overall, the results showed that among those meeting the physical activity guidelines, men were more likely to report a low intake of vegetables and a high consumption of soft drink and takeaway foods compared to women. Among active people, young people were at a higher risk of unhealthy eating than adults in the older age groups.

DISCUSSION

Results from this secondary analysis of the 2007 NSW Population Health Survey found that there is a statistically significant association between physical activity and intake of fruit, vegetables and soft drinks. Men and women eating three or more serves of vegetables per day were more likely to be 'sufficiently' active compared to those who did not meet the guidelines for vegetable serves per day. Women eating two or more serves of fruit per day were more likely to meet physical activity recommendations compared to those eating less fruit. Men consuming lower amounts of soft drink per week were more likely to achieve 'sufficient' physical activity levels compared to men consuming more than two cups of soft drink per week. However, active adults with a lower socioeconomic status were less likely to report high soft drink consumption compared to those with a higher socioeconomic status.

While younger women with a healthy weight were more likely to engage in both physical activity and a 'healthier' diet, older adults and obese women were less likely to meet the physical activity guidelines. Among those meeting the physical activity guidelines, young people (especially men) have a higher risk of low vegetable intake and high consumption of soft drink and takeaway food.

These results are consistent with other findings described in the literature. For instance, Gillman et al (2001) showed that increased amounts of physical activity were associated with larger intakes of fruits and vegetables, dietary fibre, calcium, folate, and vitamins A, C and E; as well as associated with smaller intakes of red and processed meats, animal fat, saturated fat, trans fat, and dietary cholesterol. Eaton et al (1995) reported similar results, where moderately and very active respondents consumed significantly more fruit and vegetables. Interestingly, our study findings did not find the relationship between physical activity and socioeconomic status to be statistically significant.

Limitations of this report include the cross-sectional nature of the data, which make conclusions on causality or the temporal order of these associations indeterminable. Also, data were based on self-reported information, which may be limited by recall bias or social desirability bias. In addition, cut-points for dietary intake do not give an accurate indication of absolute intake, particularly thresholds for soft drink and takeaway food which are based on expert judgement. The validity of the short questions on fruit and vegetable intake for adults has been shown to be reasonably good when compared to 24-hour recalls but the validity of short questions relating to takeaway food and soft drinks is not determined (11).

CONCLUSION AND IMPLICATIONS

This exploratory analysis of NSW Population Health Survey provides evidence of a significant positive association between physical activity and intake of fruit, vegetables and soft drinks for NSW adults. People who meet the healthy eating guidelines for vegetables and fruit intake and who consume a low amount of soft drinks, are more likely to meet the physical activity recommendations.

The gender and age differences in the association of these health behaviours suggest the value of targeting specific population groups for future interventions. For instance, interventions to promote improved diets among young, active men are warranted. In addition, interventions targeting less active groups such as women aged 45-64 years old, and older adults, need to promote both physical activity and healthy dietary intake for optimal health outcomes.

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