

MONITORING UPDATE

**A further analysis of the weight status and dietary characteristics of
people reporting food insecurity in NSW:**

NSW Population Health Survey data 2007 and 2008

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FOREWORD

PANORG's *Monitoring Updates* focus on summarizing 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 and health promotion professionals in NSW and Australia. This includes professionals working in government agencies, Area Health Services and non-government and community organizations who have an interest in overweight and obesity prevention and promotion of healthy nutrition and physical activity.

EXECUTIVE SUMMARY

Food security refers to the ability to acquire appropriate and nutritious food on a regular and reliable basis. The NSW Population Health Survey uses a single item indicator of individual and household level food insecurity which measures financial access to food by asking the question *“In the last 12 months, were there any times that you ran out of food and couldn’t afford to buy more?”*

The purpose of this study was to explore the relationship between food insecurity and dietary habits in the NSW population, using data from the 2007 and 2008 NSW Population Health Surveys. Dietary habits of interest comprised the frequency of consumption of energy dense nutrient poor (EDNP) foods and drinks, as well as intake of fruit and vegetables.

This study explores self reported data from the 2007 and 2008 New South Wales Population Health Surveys. Six dietary intake variables were included for this analysis based on their relevance to chronic disease and weight gain: vegetable intake, fruit intake, soft drink, hot chip, salty snacks and takeaway food consumption. Responses on these variables were dichotomised into ‘healthier’/‘unhealthier’ categories.

It is estimated that in the two year period 2007-2008, 4.8% of all adults experienced food insecurity in the previous 12 months.

People reporting food insecurity had a significantly higher prevalence of obesity than people not reporting food insecurity. No association was found between reporting food insecurity and being overweight, healthy weight or underweight.

The prevalence of food insecurity was higher for women than for men in all age groups. The highest prevalence of food insecurity was found for women in the 25-44 year age group. Dietary behaviours associated with health risk were more prevalent in women reporting food insecurity than in men.

Overall a significant association was found between being food insecure and lower consumption of fruit < 2 serves per day, and vegetables < 3 serves per day. Food insecurity was also associated with consumption of take away food ≥ 2 times per week and soft drink > 2 cups per week. However, this association was not found for the other EDNP foods examined (hot chips and salty snacks).

This exploratory study strongly suggests that obesity is more prevalent among people who report being food insecure in NSW. It also supports the hypothesis that higher consumption of EDNP foods can be associated with both food insecurity and obesity when they occur concurrently. Further research should be undertaken into mediators of the relationship between food insecurity, EDNP foods and obesity, such as the cost and marketing of EDNP foods as well as the impact of local food environments.

INTRODUCTION

Food security refers to the ability to acquire appropriate and nutritious food on a regular and reliable basis.[1] Food security is a manifestation of food availability and people's ability to access it. These factors are in turn influenced by a range of individual and community level factors,[2] reflecting the fact that food security is a multidimensional concept, as described in a recent Discussion Paper published by PANORG. [3] Lack of availability and/or access to food can be experienced at a national, household, community or individual levels.

While there are available survey measures which reflect the multidimensional nature of food security,[4] the NSW Population Health Survey uses a single item indicator of individual and household level food insecurity which measures financial access to food by asking the question "*In the last 12 months, were there any times that you ran out of food and couldn't afford to buy more?*".[5]

Some studies have found that food insecurity may be positively associated with overweight and obesity in western cultures, [6-7] and that this association is stronger for women than for men. [7-8] Further, it has been proposed that this relationship may be mediated by consumption of low cost, energy dense nutrient poor (EDNP) foods,[9] and that the higher obesity rates found in lower income groups may be related to both energy density and the relatively low cost of EDNP foods.[10]

AIM

The purpose of this study was to explore the relationship between food insecurity and dietary habits in the NSW population, using data from the 2007 and 2008 NSW Population Health Surveys. Dietary habits of interest comprised the frequency of consumption of EDNP foods and drinks, as well as intake of fruit and vegetables. The study also aims to identify any age and sex differences by further exploration of the data.

METHODS

Survey methods

The NSW Department of Health conducts an annual Population Health Survey, between February and December each year. Data is collected computer assisted telephone interviewing (CATI) which utilises random digit dialling of people living in NSW households who have private telephones. The main aims of the survey are to provide detailed information on the health of the people of New South Wales, and to support the planning, implementation, and evaluation of state-wide health services and programs.[11] This analysis examines the adult component (respondents aged 16 years and over) of the NSW Population Health Survey.

Measures

The 2007 and 2008 New South Wales Population Health Surveys comprised approximately 13,000 and 10,000 adults aged 16 years and over respectively. Each of these surveys conducted at least 1,485 interviews in each of the 8 area health services.

The prevalence of food insecurity was estimated to be 4.4% in 2007 and 5.1% in 2008. The Australian National Nutrition Survey (1995) similarly reported that 5.2% of adults (aged over 19 years) had experienced food insecurity in the previous 12 months.[12] Given the low prevalence rate, there were a small number of respondents reporting food insecurity in each of the survey years; with 339 in 2007 and 437 in 2008. Data for this analysis was obtained by aggregating the 2007 and 2008 surveys. In addition to the low prevalence rate, survey questions were randomly allocated to respondents in both 2007 and 2008, so that not every respondent was asked both the individual dietary intake question and the food insecurity question, further reducing the overall sample size available for the bivariate analysis.

Food insecurity

Food security status was determined by a single item indicator; '*have you run out of food in the past twelve months and been unable to afford to buy more?*'. [5]

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) was 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.

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, obese=BMI >=30 kg/m² .[13]

Dietary intake

Nutrition data was derived from short dietary questions which can be used to report on key indicators for food intake.[14] Six dietary intake variables were included for this analysis based on their relevance to chronic disease and weight gain: vegetable intake, fruit intake, soft drink, hot chip, salty snacks and takeaway food consumption. Responses on these variables were dichotomised into 'healthier'/'unhealthier' categories. Thresholds for vegetable and fruit intake were based on *The Australian Guide to Healthy Eating* (AGHE),[15] however, the threshold for vegetable intake was modified, as only a small percentage of the population meet the five serves or more of vegetables a day. Cut-points for soft drink and takeaway consumption were based on discussions with public health nutrition experts, as guidelines are not applicable.

Less healthy dietary behaviours were defined as:

- Consumption of less than three serves of vegetables per day
- Consumption of less than two serves of fruit per day
- Consumption of takeaway food two or more times per week
- Consumption of hot chips less two or more times per week
- Consumption of sugar sweetened drinks (soft drinks, cordials or sports drinks) more than two cups per week
- Consumption of salty snacks less than three or more times a week

Statistical analysis

NSW population health data was accessed through the New South Wales Health Department's Health Outcomes Information statistical Toolkit (HOIST) data warehouse system, with the permission of the Chief Health Officer, NSW Health. Data were analysed using SAS for Windows version 9.1 (SAS Institute Inc, Carey, North Carolina).

For analysis, the NSW Health Survey Program 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 and 2008 mid-year population estimates (excluding residents of institutions) for each area health service. Further information on the weighting process is provided elsewhere.[16]

Analyses were based on the variables noted above and dichotomised as either meeting or failing to meet the defined thresholds. Bivariate associations between food insecurity and unhealthy dietary intake variables were assessed using odds ratios and 95% confidence intervals. The significance of each association was tested using the chi-squared test of independence and was accepted at $p < 0.05$. The data were further explored using gender and age categories.

RESULTS

Table 1 shows the demographic characteristics of the sample and the percentage of respondents meeting the threshold level for each variable for the aggregated 2007 and 2008 data.

Table 1: Characteristics of respondents

Variable	Threshold	Sample Size (unweighted n)	Weighted percentage (95% CI)
Demographics			
Age	16- 24 years	1804	14.8 (14.1-15.57)
	25 – 44 years	4938	37.5 (36.5-38.4)
	45 – 64 years	9284	31.3 (30.5-32.0)
	65+	7448	16.4 (15.9-16.9)
Sex	Men	9227	49.1 (48.2-50.1)
	Women	14247	50.9 (49.9-51.8)
Weight status	Underweight	306	2.0 (1.7-2.4)
	Healthy weight	6674	45.6 (44.4-46.7)
	Overweight	5320	34.0 (33.0-35.1)
	Obese	3189	18.4(17.5- 19.2)
SEIFA	Quintile 1 (Least Disadvantaged)	3528	20.3 (19.5-21.0)
	Quintile 2	4206	21.2 (20.4-21.9)
	Quintile 3	5344	20.0 (19.3-20.7)
	Quintile 4	5578	18.6 (17.9-19.2)
	Quintile 5 (Most disadvantaged)	4560	20.0 (19.2-20.7)
Food security status	Food insecure	15903	4.8 (4.4-5.3)
Dietary intake			
Vegetable intake	Less than 3 serves /day	15719	58.3 (57.2-59.4)
Fruit intake	Less than 2 serves/day	15804	44.3 (43.2-45.4)
Hot chip consumption	2 times or more/week	15479	18.8 (17.8-19.8)
Soft drink consumption	More than 2 cups/week	15662	38.1 (36.9-39.1)
Takeaway food consumption	2 times or more/week	15585	10.7 (9.8-11.5)
Salty snack consumption	3 or more times/week	15476	9.4 (8.7-10.1)

It is estimated that in the two year period 2007-2008, 4.8% of all adults experienced food insecurity in the previous 12 months. A significantly higher proportion of women reported food insecurity (5.8%) than men (3.8%), $P < 0.0001$. There was a significant difference in the proportion of people reporting food security between rural settings and urban settings, with 4.5% of those in urban areas reporting food insecurity compared with 5.7% in rural areas ($p = 0.007$). When stratified by sex, this association was significant for women (4.5%) $p = 0.03$, but not men (5.9%). The proportion of people reporting food insecurity also increased with increasing disadvantage, from 1.9% in the least disadvantaged group to 5.6% in the most disadvantaged groups.

Food security status by age and sex

The prevalence of food insecurity was higher for women than for men in all age groups (Table 2). The highest prevalence of food insecurity was found for women in the 25-44 year age group (Table 2).

Table 2: Food security status by age and sex

Age group	Sex	Food insecure	
		YES (n=776) % (95% CI)	NO (n=15127) % (95% CI)
	16-24 years	Men	4.4 (2.4-6.3)
Women		6.7 (4.2-9.2)	93.3 (90.8-95.8)
25-44 years	Men	4.3 (3.1-5.6)	95.7 (94.4-96.9)
	Women	7.6 (6.2-8.9)	92.4 (91.1-93.8)
45-64 years	Men	4.2 (3.2-5.2)	95.8 (94.8-96.8)
	Women	5.4 (4.5-6.3)	94.6 (93.7-95.5)
65 + years	Men	1.1 (0.6-1.7)	98.9 (98.3-99.4)
	Women	2.1 (1.5-2.7)	97.9 (97.3-98.5)

In some age groups there was a significant difference in the number of women reporting food insecurity compared with men. Specifically, women in the 25 to 44 year age group and the over 65 year age group were around two times more likely to report food insecurity than men in the same age groups (25-44 Years: $p = 0.0014$; OR: 1.8 1.25 2.58; Over 65 Years: $p = 0.0269$, OR: 1.9; 95%CI:1.06, 3.37).

Weight status of persons reporting food insecurity

People reporting food insecurity had a significantly higher prevalence of obesity than people not reporting food insecurity ($p < 0.0001$), see Table 3. No association was found between reporting food insecurity and being overweight, healthy weight or underweight.

Table 3: Associations between food insecurity and weight status and dietary behaviours

Variable		Food insecure		Unadjusted analysis	
		YES (n=776) % (95% CI)	NO (n=15127) % (95% CI)	OR (95% CI)	P value
Weight status					
BMI	Underweight	1.3 (0.50-2.14)	1.5 (1.2-1.8)	0.87 (0.45-1.67)	>0.05
	Healthy weight	29.4 (24.5-34.3)	31.3 (30.2-32.4)	0.91 (0.72-1.16)	>0.05
	Overweight	19.6 (15.5-23.7)	23.9 (23.0-24.9)	0.77 (0.60-1.01)	>0.05
	Obese	20.9 (17.2-24.8)	12.7 (12.0-13.4)	1.83 (1.44-2.32)	<0.0001
Dietary intake					
	Vegetables less than 3 serves /day	67.5 (62.0-73.0)	56.9 (55.6-58.3)	1.57 (1.22-2.03)	0.0005
	Fruit less than 2 serves /day	57.6 (51.9-63.4)	42.9 (41.5-44.2)	1.81 (1.42-2.31)	<0.0001
	Hot chips 2 or more times/week	21.7 (17.0-26.5)	18.4 (17.2-19.6)	1.23 (0.92-1.65)	>0.05
	Soft drinks more than 2 cups /week	44.8 (38.9-50.6)	37.0 (35.6-38.4)	1.38 (1.08-1.76)	0.009
	Takeaway food 2 or more times/week	15.6 (10.8-20.4)	10.2 (9.1-11.2)	1.64 (1.12-2.40)	0.01
	Salty snacks 3 or more times/week	10.7 (6.8-14.6)	9.0 (8.2-9.9)	1.22 (0.80-1.85)	>0.05

Dietary characteristics of persons reporting food insecurity

A significant association was found between being food insecure and lower consumption of fruit < 2 serves per day, ($p < 0.0001$) and vegetables < 3 serves per day ($p = 0.0005$).

Food insecurity was also associated with consumption of take away food ≥ 2 times per week ($p = 0.01$) and soft drink > 2 cups per week ($p = 0.009$), see Table 2. However, this association was not found for the other EDNP foods examined (hot chips and salty snacks).

Dietary characteristics of persons who reporting food insecurity by sex and age group

Significant associations were found between food insecurity and the frequency of consumption of some EDNP foods (take away food: $p = 0.02$ and soft drinks: $p = 0.001$) for women but not for men (see Table 4). Lower intakes of fruit and vegetables were also significantly associated with food insecurity for women but not men (Table 4), $p < 0.0001$ for both.

Table 4: Associations between food insecurity and dietary behaviours by sex

Variable	Sex	Food insecure		Unadjusted analysis	
		YES (n=776) % (95% CI)	NO (n=15127) % (95% CI)	OR (95% CI)	P value
Dietary intake					
Vegetables	Men	72.8 (63.9-81.8)	65.6 (63.6-67.6)	1.40 (0.89-2.22)	>0.05
less than 3 serves /day	Women	63.9 (57.0-70.7)	48.6 (47.9-50.3)	1.87 (1.38-2.54)	<0.0001
Fruit less than	Men	54.7 (44.6-64.9)	48.5 (46.4-50.7)	1.28 (0.84-1.95)	>0.05
2 serves /day	Women	59.6 (52.9-66.2)	37.4 (35.7-39.0)	2.47 (1.86-3.28)	<0.0001
Hot chips	Men	28.7 (19.8-37.5)	24.1 (22.1-26.1)	1.27 (0.81-1.98)	>0.05
2 or more times/week	Women	17.2 (11.9-22.5)	12.9 (11.6-14.2)	1.40 (0.95-2.06)	>0.05
Soft drinks	Men	50.3 (40.2-60.5)	44.1 (41.9-46.3)	1.28 (0.85-1.94)	>0.05
more than 2 cups/week	Women	41.2 (34.2-48.1)	30.1 (28.5-31.7)	1.62 (1.21-2.18)	0.001
Takeaway food	Men	20.0 (11.7-28.2)	13.9 (12.2-15.7)	1.59 (0.93-2.72)	>0.05
2 or more times/week	Women	12.8 (7.0-18.7)	6.5 (5.5-7.5)	1.76 (1.08-2.88)	0.02
Salty snacks	Men	14.0 (6.5-21.4)	11.3 (9.9-12.8)	1.27 (0.67-2.41)	>0.05
3 or more times/week	Women	8.6 (4.5-12.7)	6.8 (5.9-7.7)	1.30 (0.75-2.23)	>0.05

When stratified further by age group as well as sex, there was a significant association between food insecurity and fruit intake < two serves per day for women in the 16-24 ($p=0.02$), 25-44 ($p<0.0001$) and 45-64 ($p<0.003$) year age groups. Food insecurity was also significantly associated with low fruit intake in men in the over 65 year age group ($p=0.003$).

Frequent consumption of EDNP foods was associated with food insecurity for men over 65 years (hot chips: $p<0.0001$) and men 45-64 years (soft drinks: $p=0.01$) and for women 45-64 years (soft drinks: $p<0.0001$) and women over 65 years (salty snacks: $p=0.03$).

DISCUSSION

This exploratory analysis of the 2007 and 2008 NSW Population Health Survey data found that people who experience some food insecurity are more likely to be obese, when food insecurity is defined as an episode of inability to access food for financial reasons. This is consistent with other findings which have previously been described in the literature. [7-8, 17-18] In fact, the paradox of hunger and obesity has been discussed in the literature since 1995, when W. Dietz published a case study entitled “ Does Hunger Cause Obesity?”.[19]

Identifying persons experiencing food insecurity based on a single item question, which asks about financial access to food, is likely to under-report the true prevalence of food insecurity. An additional set of questions would be required in order to allow further investigation of the experience of food insecurity issues across the NSW population. This is not recommended for routine surveillance purposes, however, a specific study that uses a module of short questions, based on a validated tool such as the United States Department of Agriculture ‘Guide to Measuring Household Food Insecurity’ [4], could be considered.

The experience of food insecurity can differ in nature and extent, for example, it can be episodic or chronic and may occur through factors other than lack of money .[4] Even when this financial indicator of food security is used, local studies suggest that the true prevalence of food insecurity may be higher in some population sub groups.[20-22]

This study has revealed a significant association between being food insecure and the frequency of consumption of some EDNP foods such as take away food and soft drinks, and hot chips and salty snacks in some age and gender groups. It has been suggested that EDNP foods may be a mediating variable in this relationship due to their low cost. [10] It is acknowledged that food preferences for EDNP foods may also influence food choice in people who experience food insecurity. [23] Associations with other EDNP foods may become apparent with a larger sample size and the use of a more sensitive measure of food insecurity.

The associations were found to be stronger for women than men for most dietary behaviours, and in most age groups. This is consistent with other findings, [7-8] and may be attributable to inequities in food access and availability, along with other factors such as household income and employment status, which also potentially impact on food security status.[3]

Limitations of this report include the use of cross-sectional data, which make conclusions on causality or the temporal order of these associations indeterminable. Data were based on self-reported information, which may be limited by recall bias or social desirability bias. In addition, the use of cut-points for dietary intake do not give an accurate indication of absolute intake, in particular, thresholds for soft drink, hot chips, salty snacks and takeaway food are based on historical discussions and not on dietary guidelines. 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 data on short questions relating to take away food and soft drinks are still limited.[14]

The ability of the single-item survey question to predict the true prevalence of food insecurity is a further limitation of this study. As discussed above, more comprehensive measures are available to describe the nature and extent of food insecurity. [4] Another limitation is the randomisation of questions regarding food insecurity and nutrition, as this reduced the sample size for analysis.

Conclusion and implications

This exploratory study strongly suggests that obesity is more prevalent among people who report being food insecure, in NSW. It also supports the hypothesis that higher consumption of EDNP foods can be associated with both food insecurity and obesity when they occur concurrently. Further research should be undertaken into mediators of the relationship between food insecurity, EDNP foods and obesity, such as the cost and marketing of EDNP foods as well as the impact of local food environments.

Gender differences, specifically the higher prevalence of food insecurity in women overall, and the more prevalent dietary behaviours associated with health risk in women; suggest that interventions should target specific population groups. For example, interventions designed to address food access and availability should include specific strategies targeting women in the 25 to 44 year age group, particularly those in the most disadvantaged areas and rural locations.

There is limited data available to explore the nature of food insecurity in NSW. Data which describes the nature and extent of the experience of food insecurity in more detail is required at both a population and community level to inform programs which aim to address food insecurity through either food availability, food access or both.

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