

# Frequency of eating occasions reported by young New Zealand Polynesian and European women

TAUA AMOSA\*  
 ELAINE RUSH\*  
 LINDSAY PLANK\*\*

## Abstract

The frequency of eating occasions reported by young New Zealand Polynesian and European women was examined. The timing and content of meals and snacks were analysed from 80 self-reported seven-day food diaries from a previous study of 80 young women (39 New Zealand Polynesian and 41 European) aged between 18 and 27 years. Nineteen Polynesian and 20 European women had a body mass index (BMI) greater than 30 kg.m<sup>-2</sup> and were classified as obese.

Breakfast was eaten more often by the European women than the Polynesian (median 4 versus 3 times.week<sup>-1</sup>, P=0.012). Eleven (28%) of the Polynesian women skipped breakfast every day of the study week compared to only three (7%) of the Europeans (P=0.019). Dinner was eaten more frequently by the European women (P=0.020) who also ate significantly more meals during the week than the Polynesian (P=0.039). Non-obese Europeans ate breakfast more frequently than their obese counterparts (P=0.002) while no significant difference was observed between non-obese and obese Polynesians. The obese European and Polynesian groups reported similar patterns of breakfast consumption which differed significantly from the non-obese Europeans (P = 0.008). The young women in this study did not eat

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breakfast every day with the young Polynesian women eating fewer meals than the Europeans. There was an association between ethnic origin, body size and eating patterns in the women. These findings in comparison with previous studies in other countries indicate that the frequency of eating breakfast may be declining with time.

## Introduction

The prevalence of obesity and overweight are increasing within the western world<sup>1</sup>. Weight gain is a major risk factor in cardiovascular diseases, diabetes, and hypertension<sup>2</sup>. Obesity is commonly defined as body mass index (BMI) greater than 30 kg.m<sup>-2</sup> and overweight as a BMI of greater than 25 kg.m<sup>-2</sup>.

The Ministry of Health in New Zealand has recognised weight gain as a major public health problem. In the 1997 National Nutrition Survey, New Zealand Food: New Zealand People<sup>3</sup> New Zealanders of Polynesian and Maori origin had at least twice the prevalence of obesity than that of Europeans (Polynesian males 26.2%, females 47.2%, Maori males 27.0%, females 27.9% vs European males 12.6%, and females 16.7%). Polynesian women (47.2%) were more likely to be classified as obese than European women (16.7%). In this survey, for Polynesian and Maori people obesity was defined as a BMI of greater than or equal to 32 kg.m<sup>-2</sup> and, for all other New Zealanders, greater than or equal to 30 kg.m<sup>-2</sup>.

Epidemiological, clinical and experimental analyses have been reported to show possible relationships between eating frequency, energy intake and body weight<sup>4,5,6</sup>. It has also been suggested that decreased meal frequency may contribute to obesity and that increasing meal frequency but maintaining the same caloric intake may have a role in the prevention of heart disease<sup>5</sup>.

Breakfast has been considered the most important meal of the day as it is said to improve mental and physical performance, and breakfast skippers are more likely to overeat later in the day<sup>7</sup>. The consumption of breakfast has also been reported to improve mental

\*Department of Applied Science, Auckland University of Technology. \*\*Department of Surgery, University of Auckland. Contact: Dr Elaine Rush, Department of Applied Science, Auckland University of Technology, Private Bag 92006, Auckland 1020, New Zealand. Fax: 09 307 9973. Email: elaine.rush@aut.ac.nz

**Table 1. Body Mass Index (BMI) of the volunteers. N=80**

Ethnicity	Obesity	Number	BMI (kg.m <sup>-2</sup> )
Polynesian	Obese	19	36.5 ± 6.3
	Non-Obese	20	25.5 ± 2.9
	All Polynesian	39	30.7 ± 7.5
European	Obese	20	36.2 ± 5.0
	Non-obese	21	22.4 ± 2.4
	All European	41	29.1 ± 8.0

performance in children<sup>8,9,10,11</sup>. A study on the role of breakfast in the treatment of obesity by Schlundt<sup>12</sup> reported that eating breakfast helped reduce the intake of dietary fat and minimize impulsive snacking. However it is a meal that many people miss, and has been reported as missed more often in obese children<sup>13,14</sup> and adults<sup>15</sup>.

The aim of this research was to examine the frequency of eating in young Polynesian and European women as measured by 7-day diet diaries and to compare meal frequency in those classified as obese with their non-obese counterparts.

## Method

Dietary intake data was collected from 80 seven day food diaries. These self-reported, household-measures diaries were from a study<sup>16</sup> of differences in metabolism and body composition between Polynesian and European women. The volunteers were carefully instructed on how to fill in the diary. The diary was reviewed with them at the end of the seven day collection period, following guidelines reviewed by Mackerras<sup>17</sup>.

## Subjects

Eighty two healthy female volunteers aged 18 - 27 years were selected for the Rush study on the basis of their body mass index (BMI). Forty identified themselves

as Polynesian (22 Samoan, 12 Maori, 3 Tongan, 2 Niuean and 1 Cook Islander) and 42 European. Half of each ethnic group had a BMI of 30 kg.m<sup>-2</sup> or more and these women were defined as obese<sup>18</sup> (Table 1). Two volunteers, one European and one Polynesian did not return their food diaries despite repeated reminders and have been excluded from this analysis.

## Diet history

The requirements of the seven-day diet diary were explained to the volunteers and the recording of food intake started at the time of explanation and continued until a second visit seven days later. At the second visit the seven-day food diary measurements were reviewed with the volunteers to clarify any points. A third visit a week later was used to discuss the printed analysis of the macronutrients in the diet. Each volunteer was given a copy of the analysis of their diet.

## Extraction of data from diaries

Data concerning the timing and content of food and drinks were extracted from the food diaries for each of the seven days. A spreadsheet was devised in which each day was divided into nine periods with periods 1-8 equally divided into 2 hours each, from 6.00am (inclusive) - 10.00pm (exclusive) and period 9 running from 10.00pm (inclusive) - 6.00am (exclusive), (Table 2). Data were

**Table 2. Definition of time periods**

Period No.	Time
Period 1	Between 0600 (inclusive) and 0800 (exclusive)
Period 2	Between 0800 (inclusive) and 1000 (exclusive)
Period 3	Between 1000 (inclusive) and 1200 (exclusive)
Period 4	Between 1200 (inclusive) and 1400 (exclusive)
Period 5	Between 1400 (inclusive) and 1600 (exclusive)
Period 6	Between 1600 (inclusive) and 1800 (exclusive)
Period 7	Between 1800 (inclusive) and 2000 (exclusive)
Period 8	Between 2000 (inclusive) and 2200 (exclusive)
Period 9	Between 2200 (inclusive) and 0600 (exclusive)

**Table 3. Definitions of eating occasions**

<b>Meal</b>	A 'meal' is one of the main eating occasions of the day occurring in the Morning: Breakfast Midday: Lunch Evening: Dinner <sup>19,20,21</sup>
<b>Breakfast</b>	A meal eaten between 0600 – 1000 consisting of a breakfast food (eg. Cereal, toast, bread, bacon, egg, fruit, etc.) <sup>21,22</sup>
<b>Lunch</b>	A meal eaten between 1100 – 1500 consisting of 2 or more foods .
<b>Dinner</b>	A meal eaten between 1600 – 2200 consisting of 2 or more foods <sup>19</sup> .
<b>Snack</b>	Any food eaten outside habitual meal times, plus any food eaten during these periods but consisting mainly of snack foods (eg. Chips, chocolate, biscuit, fruit health bars etc.) <sup>6</sup>
<b>Eating Period</b>	Any food eaten at anytime
<b>Drink</b>	One measure of consumable liquid, therefore if four glasses of water were consumed at 1030 this was recorded as 4.
<b>Irregular Meal</b>	Food eaten outside habitual meal times but obviously a 'meal' was recorded according to content and time consumed (e.g., porridge eaten at 10.30am was recorded as a breakfast but was noted that it was eaten outside the defined time).

recorded in the spreadsheet according to which period the food was consumed.

Eating episodes were categorised as 'breakfast', 'lunch', 'dinner' or 'snack'. A collection of definitions from meal pattern studies were modified and put together to obtain definitions for this study<sup>19,20,21,22,4</sup>. Criteria were based on the time of food consumption and the type of food. The irregular meals were obvious meals eaten outside the defined times and these were recorded as snacks. These criteria are summarised in Table 3.

### Data analysis

Data were tallied over the 7 days for each subject and the results are presented as medians and ranges due to the non-normally distributed nature of the data. Rates of

meal consumption were compared between groups by the Mann-Whitney test. Contingency table analysis was performed by Fishers exact test or chi-square. Analyses were carried out using SAS Release 6.12 (SAS Institute Inc., Cary, NC). The 5% level was chosen for statistical significance.

### Results

Table 4 summarises the median frequencies for the consumption of meals and snacks over the seven-day study period for the 41 European and 39 Polynesian women. Breakfast was eaten more often by the European women than the Polynesian (4 versus 3 times.week<sup>-1</sup>,  $P=0.012$ ). Eleven (28%) of the Polynesian women skipped breakfast every day of the week compared to only three (7%) of the Europeans ( $P=0.019$ ). Breakfast was eaten

**Table 4. Frequency of meals and snacks eaten by European and Polynesian young women over a 7-day period. Results are median (range).**

Meals and Snacks	European (n=41)	Polynesian (n=39)
Breakfast	4 (0 – 7)	3 (0 – 6)*
Irregular Breakfast	1 (0 – 5)	1 (0 – 5)
<i>Total Breakfast</i>	<i>6 (0 – 7)</i>	<i>4 (0 – 6)*</i>
Lunch	5 (1 – 7)	5 (2 – 7)
Irregular Lunch	0 (0 – 2)	0 (0 – 3)
<i>Total Lunch</i>	<i>5 (2 – 7)</i>	<i>6 (2 – 7)</i>
Dinner	6 (3 – 7)	6 (2 – 7)*
Irregular Dinner	0 (0 – 2)	0 (0 – 2)
<i>Total Dinner</i>	<i>7 (4 – 7)</i>	<i>6 (3 – 7)</i>
<b>Total Meals</b>	<b>15 (7 – 20)</b>	<b>12 (7 – 18)*</b>
<b>Total Snacks</b>	<b>15 (5 – 26)</b>	<b>17 (4 – 40)</b>
<b>Total Eating Periods</b>	<b>30 (13 – 40)</b>	<b>30 (17 – 58)</b>

\*  $P<0.05$

**Table 5. Breakfast consumption by European and Polynesian women**

		Number of women skipping breakfast per week		
		0 - 2 times	3 - 5 times	6 - 7 times
European	Non-obese (n=21)	14	7	0
	Obese (n=20)	5	6	9
Polynesian	Non-obese (n=20)	6	5	9
	Obese (n=19)	4	7	8

every day by five (12%) of the Europeans but none of the Polynesians ( $P=0.055$ ).

Dinner was the most popular meal. While both groups ate dinner a median five times per week, this meal was eaten more frequently by the Europeans ( $P=0.020$ ) with 17 of the 41 subjects having dinner every day of the week compared to 6 of the 39 Polynesians. Among the 41 Europeans, 35 had dinner five times or more per week, compared with 25 who had 5 or more lunches. Similarly, among the 39 Polynesians, 31 had dinner five times or more per week, compared with 25 who had 5 or more lunches. Lunch consumption was similar for the two ethnic groups ( $P=0.51$ ).

The European women ate significantly more meals during the week than the Polynesian (median 2.14 vs 1.71 meals.d<sup>-1</sup>,  $P=0.039$ ). The Polynesian women reported that they ate more snacks (median 2.43 per d) than the Europeans (2.14 per d) but this difference did not reach statistical significance ( $P=0.29$ ). The total number of eating periods was similar for the two groups ( $P=0.81$ ).

The consumption of lunches between both ethnic groups and obesity groups were similar.

Frequency of breakfast consumption is shown in Fig.1 for the European and Polynesian women categorized into non-obese and obese groups. Non-obese Europeans ate breakfast more frequently than their obese counterparts ( $P=0.002$ ) while no significant difference was observed between non-obese and obese Polynesians. The obese

European and Polynesian groups reported similar patterns of breakfast consumption which differed significantly from the non-obese Europeans ( $P = 0.008$ , Table 5).

Lunch and dinner consumption was similar between non-obese and obese subgroups for both ethnic groups (Table 6).

## Discussion

The expected/recommended frequency of eating breakfast is seven times a week<sup>23</sup>. This was not observed in the women in this study. None of the Polynesian and only five (12%) of the European women in this study ate breakfast every day. Of the 39 Polynesian women in the study, 11 (28%) skipped breakfast everyday and 17 (44%) skipped breakfast at least 6 times per week. Of the 41 European women, three (7%) skipped breakfast every day of the study period and 9 (22%) skipped breakfast at least 6 times per week. Similarly, 11 of the Europeans had breakfast 6 or 7 times.week<sup>-1</sup> while only three Polynesians did. The frequency of breakfast consumption was significantly higher in the European women.

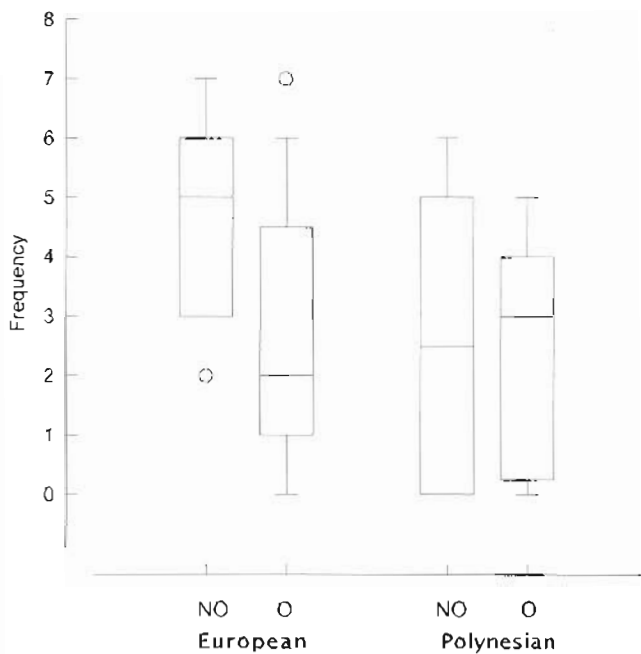
In comparison to a similar study conducted in 1974 by Jakobovitis<sup>24</sup> of 195 American college women, only 4% missed breakfast 6 - 7 times per week<sup>1</sup>. Forty-seven percent of these college women had breakfast every day. These results suggest a change in eating times and living styles between 1974 -1996. Culture could also be an influencing factor as different groups have different eating styles. A recent study of the eating habits of French

**Table 6. Frequency of meal consumption for non-obese and obese European and Polynesian women over 7 days. Results are median (range)**

	European		Polynesian	
	Non-obese n=21	Obese n=20	Non-obese n=20	Obese n=19
Breakfast	5.0 (2 - 7)	2.0 (0 - 7) <sup>‡</sup>	2.5 (0 - 6)	3.0 (0 - 5)
Lunch	5.0 (1 - 7)	4.5 (2 - 7)	5.0 (3 - 7)	5.0 (2 - 7)
Dinner	6.0 (3 - 7)	6.5 (3 - 7)	6.0 (2 - 7)	6.0 (3 - 7)
Snacks	15.0 (5 - 26)	13.0 (5 - 26)	19.0 (5 - 40)	16.0 (4 - 39)
Total meals	16.0 (7 - 20)	13.5 (7 - 20)	12.0 (8 - 18)	2.0 (7 - 18)
Total eating Periods	31.0 (20 - 40)	29.0 (13 - 39)	31.0 (17 - 58)	28.0 (17 - 53)

\*  $P<0.05$  for comparison between non-obese and obese subgroups.

**Figure 1. Box-plot of the frequency of breakfast consumption over seven days in non-obese (NO) and obese (O) European and Polynesian young women**



students reported that 84% of 365 women studied ate breakfast everyday<sup>25</sup>.

High rates of skipping breakfast have been reported in published studies based on 24-h recall or records and where classification of an eating period as a meal or snack was defined by the subject. A recent survey of 299 male and female New Zealand adolescents reported that 29% skipped breakfast<sup>7</sup>. In a study of breakfast consumption in 504 young white and black American adults, 37% reported skipping breakfast and no significant ethnic or gender differences were observed<sup>26</sup>. A study of 225 adolescents in Tennessee showed that 32% of the boys and 39% of the girls skipped breakfast<sup>19</sup>.

The women in our study ate lunch and dinner more often than breakfast with 36 (88%) of the Europeans and 31 of the Polynesians (79%) having dinner five times or more per week. Similar frequencies of eating dinner have been reported in other studies<sup>19,24,14</sup>. This behaviour could be due to the convenience in time – it is easier to eat later in the day where most people have generally ended a days activity.

The European and Polynesian subjects in this study ate a median 2.14 (average: 2.07) and 1.71 (average: 1.83) meals per day, respectively. These rates are low compared to other studies. A research project looking at the eating frequency of European University Students reported that women consumed 2.7 meals per day<sup>26</sup>, which is in agreement with Gatenby's<sup>27</sup> study which reports 2.7

meals per day. A study<sup>14</sup> of teenage food and eating practices reported on average 2.51 meals per day.

A total of 4.29 (median) eating periods (meals and snacks) per day was observed in the current study for both Europeans (average: 4.32) and Polynesians (average 4.42). This was similar to the 4.4 eating periods per day reported by University students in 21 European countries<sup>26</sup>. But these observations are lower than the 6.5 eating periods per day reported by the British Nutrition Foundation<sup>27</sup> and 5.31 eating periods per day in Huenemann's study<sup>14</sup>.

An important element affecting the comparison of these findings is the difference in meal definitions, as there is no universal definition of what constitutes a meal or a snack. Therefore in most cases other reports can not be directly compared to this study. Most studies are self-defined and as stated by Gatenby<sup>27</sup> self-reports of meals can reveal strong individual biases, and may be ambiguous and inconsistent. An effect of living style could also be an influencing factor on these observations as life in the western world today has become very demanding and busy and eating occasions occur only when convenient. Breakfast is the most likely meal to be missed.

The significant differences seen in Polynesians eating fewer breakfasts and fewer meals than Europeans supports the finding that decreased meal frequency may contribute to obesity and thus be a possible factor in the prevalence of obesity in Polynesians. When we categorized our subjects into obese and non-obese we observed that, among the Europeans, the obese subjects ate breakfast less frequently than the non-obese. Both the obese and non-obese Polynesians reported similar rates of breakfast consumption, although these were significantly lower than for the non-obese Europeans. Energy intake was not accounted for in this study but research has reported that breakfast skippers are more likely to overeat later in the day<sup>7</sup>. This was observed in a study<sup>13</sup> of obesity and food intake in children, where the obese and fat children reported that they ate less at breakfast and more at dinner than their leaner peers. Therefore with the Polynesian women eating fewer meals, possibly more than required might be eaten within the fewer meals. However this is a question that would need further investigation.

Other studies have shown that among Caucasians, those classified as non-obese report that they eat breakfast more often than their obese counterparts<sup>14,15</sup>. This was in agreement with our study. Again this highlights the association between decreased meal frequency and obes-

ity.

The current study was based on what each individual reported as opposed to what may have actually been eaten. Due to the burden of recording this may prompt subjects to alter their diets, or their dietary reporting, either to simplify recording and/or because of their perception of what is acceptable dietary behaviour<sup>29</sup>. As well as variability within an individual's eating habits there is also variability within each group. In addition the number of women was a relatively small non-random sample of 80 volunteer women and therefore may not be representative of the larger population. Thus caution must be exercised in extrapolating the frequencies of meal consumption reported here to the wider New Zealand Polynesian and European populations.

Other influencing factors which were not accounted for in this study include socioeconomic status, where people may not have breakfast due to the unavailability of food. Culture and religion also play a major role. For example breakfast is considered important in English speaking countries but is reduced to 'bare essentials' in Italy<sup>30</sup>.

## Conclusions

We have found that young women, both Polynesian and European, are not eating breakfast seven days a week; the former consuming breakfast about 3 times per week and the latter about 4 times per week on average. New Zealand Polynesian women ate fewer meals overall. Independent of ethnicity obese women ate less breakfasts than non-obese women. The non-obese European women ate breakfast more often than their obese counterparts and more often than the obese and non-obese Polynesians.

Suggestions for future studies include sampling a greater age range as eating patterns differ between age groups. Both male and female need to be accounted for, and whether the frequency of breakfast and eating make a difference to obesity, energy expenditure, physical activity, mental performance and moods. After all of what use is it to find that breakfast consumption is low and that eating patterns differ between ethnic groups, and be unable to state why breakfast needs to be eaten, or why we should eat so many times per day. Another important factor to be defined in future studies is the constituents of a meal? For example is eating fried fish and chips at breakfast time to be considered a breakfast?

However, this study has contributed to the body of information about the wide range of eating patterns amongst human beings and has indicated where further investigation may be directed.

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Some breakfast food manufacturers hit upon the simple notion of emptying out leavings of carthorse nosebags, adding a few other things like unconsumed portions of chicken layer's mash and sweepings of racing stables, then packing the mixture in little bags and selling them through health food shops.

**Frank Muir (1920 - ) in Upon My Word**