

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

A Pilot Nutrition Survey of the Adult Niuean Population in Niue.

A thesis presented in partial fulfilment of the requirements for
the degree of Master of Science in Nutritional Science at
Massey University, Albany,
New Zealand

Gaylene Mitikulena Tasmania

2003

Abstract

A pilot nutrition survey was conducted on 50 randomly selected adult Niueans aged between 18 and 60 years, living in Niue. The survey consisted of three visits per person, each encompassing a 24-hour dietary recall, body measurements and questionnaires. The body measurements included weight, height, waist and hip circumference, elbow breadth and body-fat using Bioelectrical Impedance Analysis. Other measurements taken were of blood pressure and blood glucose.

By comparison, the Niuean population have a higher percentage energy contribution from fat and protein but a lower contribution from total carbohydrates than the NZ population. These differences in energy contributions may attribute to some extent to the prevalence of overweight and obesity in the Niuean population. Some nutrient intakes were inadequate and are of some concern particularly calcium, iron, and vitamin A. Forty-four percent and forty percent of the subjects had calcium and iron intakes below two-thirds of the RDI respectively.

Alcohol consumption was much more common among the men than the women. Based on the reported volumes consumed 83% of the men who drank alcohol, drank to intoxicating levels well above the legal limit, during a drinking session.

The average weight of the Niuean men was 92 kg; some 13 kg heavier than the average in 1987 and 23 kg heavier than the average in 1953. Likewise with the women whose average weight was 87 kg; 10 kg heavier than the average in 1987 and 25 kg heavier than the average in 1953.

The prevalence of obesity and overweight in the Niuean population studied is very high, in both the men and the women. The prevalence of obesity was observed to be 1 in 2 men, an increase of at least five times the rate it was 22 years ago. Prevalence of obesity among the women over the same period has also increased to be 2 in 3 women.

Acknowledgements

Above all things, I give thanks to my Lord Jesus Christ who gave me the strength and the courage to see this project through.

To my loving family; my husband John William Togiafiatau Tasmania and my daughter Beatrice Filimanogi Onelini Tasmania. Thank you for your continuous support, encouragement, patience and sacrifice that have carried me through the most challenging times of this thesis.

To my supervisor Patsy Watson, thank you for your leadership and commitment. Your knowledge, support and encouragement have been invaluable.

Fakaaue Lahi Mahaki to all the study participants in Niue. This research would not have been possible without you. Thank you for letting me into your lives and I hope that you have learnt from me as much as I have from you.

To the Director and Deputy Director of the Department of Agriculture, Forestry and Fisheries; Sauni Tongatule and Ernest Nemaia, and all the staff of the Department, again I say Fakaaue Lahi Mahaki. Thank you for all the resources and the support provided to me during my stay in Niue. Special thanks also to the Director of Health and the Government of Niue for all the assistance provided.

I would also like to thank the Health Research Council of New Zealand for granting me a Pacific Masters Scholarship and thus providing the necessary funds for this study.

Finally, I extend my most sincere gratitude to all my family and friends who have helped me along this journey.

Fakaaue Lahi Mahaki and Kia Monuina.

Table of Contents

ABSTRACT.....	II
ACKNOWLEDGEMENTS.....	III
TABLE OF CONTENTS.....	IV
LIST OF TABLES.....	VI
LIST OF FIGURES.....	VIII
LIST OF APPENDICES.....	IX
LIST OF ABBREVIATIONS.....	X
1. INTRODUCTION.....	1
2. LITERATURE REVIEW.....	2
2.1 Niue: The land and its people	2
2.2 Niueans and other Polynesians in New Zealand.....	7
2.3 Obesity in the Pacific.....	8
2.4 Diabetes in the Pacific.....	9
2.5 Hypertension in the Pacific.....	10
2.6 Smoking and alcohol consumption in the Pacific.....	11
2.7 Pacific Island diets.....	12
2.8 Cumulative risk: cardiovascular disease (CVD).....	15
2.9 Gout and osteoarthritis.....	26
2.10 Inferences from the literature.....	28
3. AIMS OF THE STUDY.....	29
4. METHODOLOGY.....	30
4.1 Pre-survey preparation.....	30
4.2 Promotion of survey.....	30
4.3 Selection of study subjects.....	31
4.4 Data collection programme.....	31
4.5 Data collection procedures.....	33
4.6 Data feedback.....	38
4.7 Data input and checking.....	39
4.8 Data analysis.....	40

5. RESULTS.....	41
5.1 Demographic characteristics.....	41
5.2 Lifestyle characteristics.....	44
5.3 Anthropometric characteristics.....	53
5.4 Blood measurements.....	61
5.5 General dietary characteristics.....	62
5.6 Dietary intake.....	74
6. DISCUSSION.....	79
6.1 Demographic characteristics.....	79
6.2 Lifestyle characteristics.....	79
6.3 Food production characteristics.....	85
6.4 Anthropometric characteristics.....	87
6.5 Blood measurements.....	97
6.6 Dietary Assessment.....	99
6.7 Limitations and errors associated with the pilot survey and its scale up to a national survey.....	128
7. CONCLUSIONS.....	131
8. RECOMMENDATIONS.....	137
8.1 Improvement of the wellbeing of adult Niueans.....	137
8.2 Recommendations for further study.....	139
REFERENCES.....	141
APPENDICES.....	152

List of Tables

Table 2.01	Consumption of beer in Niue (litres per capita).....	7
Table 2.02	Main risk factors associated with CVD.....	17
Table 5.01	Age distribution of subjects by gender.....	41
Table 5.02	Number of subjects living with other household members.....	42
Table 5.03	Percentage of household members undertaking paid work.....	42
Table 5.04	Highest education level attained by the study subjects.....	43
Table 5.05	Subjects' involvement in laundry duties.....	44
Table 5.06	Subjects' involvement in bush duties.....	45
Table 5.01	Percentage of subjects undertaking regular physical activities.....	46
Table 5.08	Percentage of subjects who reported some changes in activity levels.	46
Table 5.09	Hours of sedentary activity per day.....	47
Table 5.10	General activity levels.....	47
Table 5.11	Usual alcohol consumption among subjects who drank.....	49
Table 5.12	Estimated blood alcohol concentrations for the men who drink.....	50
Table 5.13	Subjects' health perception and frequency of medical check-up.....	51
Table 5.14	Subjects' reported health problems.....	52
Table 5.15	Percentage of subjects on medication & subsequent lifestyle changes.....	52
Table 5.16	Percentage of subjects with at least one relative suffering from an NCD.....	53
Table 5.17	Women's anthropometric measurements by age group.....	54
Table 5.18	Men's anthropometric measurements by age group.....	55
Table 5.19	Total anthropometric measurements of all study subjects by gender.....	56
Table 5.20	The percentage of overweight and obese subjects according to BMI.....	57
Table 5.21	Subjects' actual weight (kg) in excess of their desirable weight as set out in the Metropolitan Weight/Height Tables, by age group and gender.....	58
Table 5.22	Percentage of subjects classified by small, medium or large frames according to elbow breadth and height.....	59
Table 5.23	Percentage of subjects classified 'at risk' according to waist circumference.....	60
Table 5.24	Subjects with a WHR in excess of 0.9 for men and 0.8 for women.....	60
Table 5.25	Bioelectrical impedance analysis.....	61
Table 5.26	Blood pressure measurements.....	63
Table 5.27	Random blood glucose levels.....	63
Table 5.28	Weekly consumption of local vs imported vegetables.....	68
Table 5.29	Total weekly vegetable consumption.....	68
Table 5.30	Daily consumption of local vs imported carbohydrate foods.....	69
Table 5.31	Total daily consumption of carbohydrate foods.....	69
Table 5.32	Weekly consumption of local vs imported protein foods.....	70
Table 5.33	Total weekly consumption of protein foods.....	70
Table 5.34	Total daily fluid consumption among subjects.	73
Table 5.35	Mean dietary energy sources.....	75

Table 5.36	Mean dietary carbohydrate sources.....	75
Table 5.37	Mean dietary lipid sources.....	77
Table 5.38	Mineral content of the diet.....	77
Table 5.39	Vitamin content of the diet.....	78
Table 6.01	Percentage of total activities ≥ 3.5 MET per day.....	81
Table 6.02	Comparison of the mean weight of Niuean adults observed in some studies.....	88
Table 6.03	Comparison of body size according to the BMI classifications used in the 1987 National Nutrition and Dietary Survey (SPC, 1992) and the 1980 Non-communicable Disease Survey (SPC, 1984) in Niue.....	89
Table 6.04	Comparison of body size according to the BMI classification for Pacific Island populations; findings from different studies.....	90
Table 6.05	Comparison of BIA measurements between subjects of the pilot survey (Niueans) and Swinburn's study on Samoans (mean \pm SD).....	95
Table 6.06	Comparison of body composition between the Niuean and Samoan subjects using Swinburn's equation.....	96
Table 6.07	Body composition of subjects as determined by the BIA instrument and Swinburn's regression equation for Samoans (mean \pm SD).....	97
Table 6.08	Percentage of subjects classified by blood pressure levels.....	99
Table 6.09	Significant differences in mean nutrient intake between Sunday & week-day diets ($P < 0.05$).....	107
Table 6.10	Comparison of percent energy contribution of the macronutrients from different populations.....	111
Table 6.11	Protein intake compared to RDI.....	112
Table 6.12	CHO intake compared to the Nutrition Task Force recommendation.....	113
Table 6.13	Percentage of subjects whose total energy contribution from fat exceed the recommended guidelines.....	115
Table 6.14	Energy contribution of fatty acids.....	116
Table 6.15	Percentage of subjects with mineral intakes less than 2/3rds RDI, the RDI, LRNI and RNI.....	118
Table 6.16	Percentage of subjects with vitamin intakes less than 2/3rds RDI, the RDI, LRNI and RNI.....	123

List of Figures

Figure 2.01	Relationship of BMI and relative risk of mortality.....	18
Figure 5.01	Income level of study subjects.....	43
Figure 5.02	Smoking among all subjects.....	48
Figure 5.03	Frequency of alcohol consumption among subjects who drank.....	49
Figure 5.04	Frequency of grocery shopping.....	65
Figure 5.05	Reported factors affecting food choice.....	66
Figure 5.06	Meal-time where most food was eaten.....	66
Figure 5.07	Subjects' fruit consumption per week.....	67
Figure 5.08	Weekly consumption of milk and milk products among all subjects.....	71
Figure 5.09	Consumption of confectionery products among subjects per week.....	72
Figure 5.10	Frequency of consumption of take-away foods per week.....	73
Figure 5.11	Frequency of consumption of fish and chips per week.....	74
Figure 6.01	Swinburn's equation for estimating fat mass (kg) using bioelectrical impedance in Pacific Island populations.....	95
Figure 6.02	Calculation of mean daily nutrient intake.....	109

List of Appendices

Appendix A	Map of Niue.....	152
Appendix B	Letter of Approval from the Human Ethics Committee.....	154
Appendix C	Study Subjects from each Village.....	156
Appendix D	Letters of Introduction.....	158
Appendix E	Information Sheets.....	161
Appendix F	Data Collection Sheets.....	171
Appendix G	Consent Forms.....	219
Appendix H	Feedback Information	222
Appendix I	Foods Added to the Food Composition Database.....	229
Appendix J	Dietary Intake of the General New Zealand Population.....	232
Appendix K	Dietary Intake of the Pacific Island Population of New Zealand...	234

List of Abbreviations

BAC	Blood Alcohol Concentration
BIA	Bioelectrical Impedance Analysis
BMI	Body Mass Index
CHO	Carbohydrates
CVD	Cardiovascular Disease
DAFF	Department of Agriculture, Forestry and Fisheries
DALY	Disability Adjusted Life Years
EPDSU	Economic Planning, Development and Statistics Unit
HDL	High Density Lipoprotein
IGT	Impaired Glucose Tolerance
LDL	Low Density Lipoprotein
LRNI	Lower Reference Nutrient Intake
UAC	Upper Arm Circumference
MUFA	Monounsaturated Fatty Acids
NZFCDB	New Zealand Food Composition Database
NCD	Non-Communicable Diseases
OA	Osteoarthritis
PIFCDB	Pacific Island Food Composition Database
PUFA	Polyunsaturated Fatty Acids
RDI	Recommended Dietary Intake
RNI	Reference Nutrient Intake
SFA	Saturated Fatty Acids
SPC	South Pacific Commission
SD	Standard Deviation
SEM	Standard Error of the Mean
WHO	World Health Organisation