

NCD Risk Factors STEPS Report

**Ministry of Health
Republic of the Marshall Islands
2002**



RMI

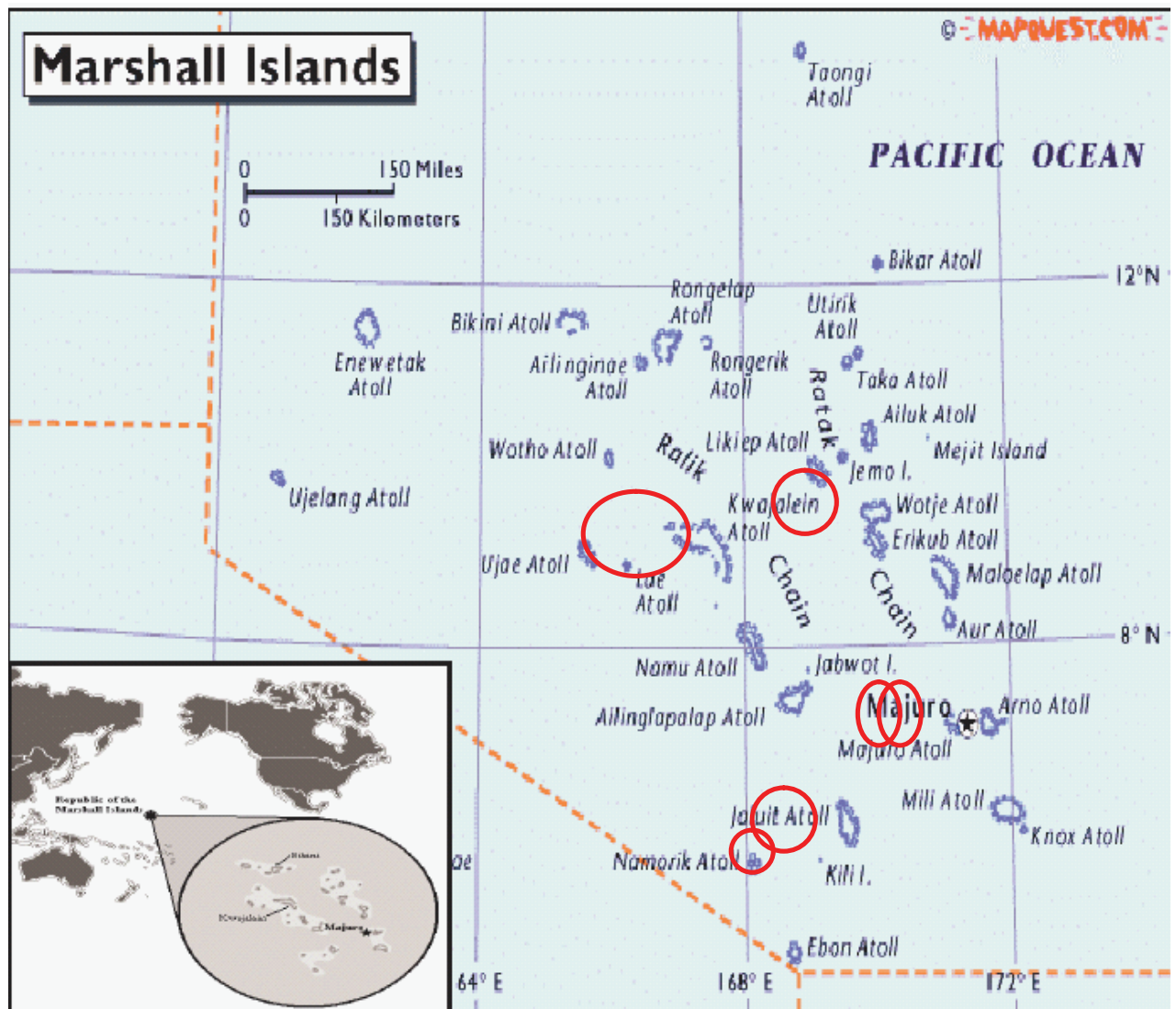


**World Health
Organization**

Western Pacific Region

REPUBLIC OF THE MARSHALL ISLANDS
NCD Risk Factors STEPS Report 2002

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Survey sites:

- Majuro atoll
- Kwajalein atoll
- Wotje atoll
- Jaluit atoll
- Arno atoll
- Kili island

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STEPS project committee, World Health Organization, Fiji School of Medicine, Menzies Center, AusAID and community of RMI at large.

STEPS project committee:

Ms. Justina R. Langidrik - Secretary of Health- MOH
Ms. Julia M. Alfred (STEPS Project Manager - MOH)
Dr. Kennar Briand (Director of Public Health- MOH)
Mr. Arata Nathan (Director of Outer Islands Health Care System)
Dr. Robyn McIntyre (Physician- 177 Health Care Program)
Mr. Duncan Banda (Statistician- UNV)
Ms. Florina Nathan (Supervisor of PH Nursing, MOH)
Mr. Kam Wase (Director of Human Services & Health Promotion- MOH)
Mr. Paul Lalita (Director of Laboratory Services- MOH)
Ms. Sala Elbourne, (Microbiologist, MOH)
Mr. Kumi Hanerg (Director of Vital Statistics- MOH)
Dr. Kyaw Tut (Director of Dental Services, MOH)
Mrs. Ione Debrum (NCD coordinator)

World Health Organisation:

Dr. Temo K Waqanivalu, WHO South Pacific
Ms Leanne Riley, WHO HQ
Mr. Shalvindra Raj, WHO South Pacific

Fiji School of Medicine:

Dr. Jan Pryor (Director Research)
Ms. Monica Fong
Ms. Shakila Naidu (NCD Research Assistant)
Ms. Vizo Halavatau (NCD Research Assistant)

Menzies Center:

Dr. Leigh Blizzard - Senior Research Biostatistician
Dr. Robert Granger

Contributors:

Dr Philayrath Phongsavan (reviewer), Mr. Russell Edwards (Assistant Secretary for Primary Health Care- MOH), Mr. Sandy Alfred (Assistant Secretary for Majuro Hospital Services- MOH), Mr. Dwight Heine (Assistant Secretary for Finance & Personnel- MOH), Ms. Irene Paul (Assistant Secretary for Kwajalein Health Care Services- MOH), Mr. Wilbur Heine (Assistant Secretary for Health Planning & Statistics- MOH), Ms. Edlen Anzures (Health Planning & Statistics, MOH), Ms. Deborah Atwood (Manager, 177 Health Care Program- MOH)

AusAID

Community participation: (for NCD STEPS Training)

Marshall Islands Visitor's Authority (MIVA)
RRE Pacific Pure Water
Pacific Diabetes Today Resource Center
Papa Ola Lokahi, Honolulu, Hawaii

CONTENTS

1	FOREWORD	8
2	EXECUTIVE SUMMARY	10
3	INTRODUCTION	12
3.1	BACKGROUND INFORMATION	12
3.1.1	Geography	12
3.1.2	Population	12
3.1.3	Economy	12
3.1.4	Government	13
3.1.6	Burden of NCDs in RMI	13
3.1.7	NCD Prevention and Control Services	14
3.2	RATIONALE	14
3.3	DEVELOPING WHO STEPS IN RMI	15
3.4	PURPOSE	16
3.5	OBJECTIVES	16
4	METHODOLOGY	17
4.1	SCOPE	17
4.2	SAMPLING	17
4.2.1	Selection of households:	18
4.3	DATA COLLECTION PROCEDURE	19
4.3.1	STEP 1 – Behavioral Risk Factors	19
4.3.2	STEP 2 – Physical Measurements	19
4.3.3	STEP 3 – Biochemical Measurements	20
4.4	DATA ENTRY AND PROCESSING	20
4.5	DATA ANALYSIS	20
5	RESULTS	21
5.1	DESCRIPTION OF THE SAMPLE	21
5.1.1	Survey Sample Characteristics	21
5.1.2	Level of Education	22
5.1.3	Main Employment	23
5.2	BEHAVIOURAL MEASURES	24
5.2.1	Tobacco Use	24
5.2.2	Betel nut use	26
5.2.3	Alcohol Consumption	26
5.2.4	Diet	28
5.2.5	Physical Activity	30
5.3	PHYSICAL MEASURES	33
5.3.1	Body Mass Index	33
5.3.2	Waist Circumference	35
5.3.3	Blood Pressure	35
5.4	BIOCHEMICAL MEASURES	38
5.4.1	Fasting Blood Glucose	38
5.4.2	Blood Lipids (Total Cholesterol, Triglyceride, HDL, LDL)	39
5.4.3	Haemoglobin	42
5.5	COMBINED RISK FACTORS	44
6	CONCLUSIONS	46

7	RECOMMENDATIONS	47
8	LIMITATIONS AND LESSONS LEARNT.....	47
9	GLOSSARY	49
10	REFERENCES.....	50
11	APPENDIX.....	51
11.1	APPENDIX 1: RMI PROJECT TEAM MEMBERS	51
11.2	APPENDIX 2: DETAILED RESULTS	52
	A. DEMOGRAPHIC INFORMATION	52
	B. TOBACCO USE	52
	C. BETEL NUT USE.....	54
	D. ALCOHOL CONSUMPTION.....	54
	E. DIET.....	56
	F. PHYSICAL ACTIVITY	57
	G. MEDICAL HISTORY: HIGH BLOOD PRESSURE	59
	H. MEDICAL HISTORY: DIABETES.....	60
	I. PHYSICAL MEASURES	62
	J. BIOCHEMICAL MEASURES	63
	K. DATA QUALITY INDICES	63
11.3	APPENDIX 3 – WEIGHTING FORMULAE	64
11.4	APPENDIX 4 - QUESTIONNAIRE	65
11.5	APPENDIX 5 - LIST OF FORMS USED.....	80
11.6	APPENDIX 6 - BUDGET SUMMARY	81

List of Tables and Figures

Tables

Table 3.2.1	Risk factors common to major noncommunicable conditions	15
Table 5.1	Demographic Description of Study Sample and Sampling Frame	21
Table 5.1.3	Main employment by age-group and gender	23
Table 5.2.1	Smoking status by age-group and gender	24
Table 5.2.2	Age started smoking by age-group and gender	26
Table 5.2.3	Current alcohol consumption by age-group and gender	26
Table 5.2.4	Largest number of drinks consumed on single occasion by age-group and gender	27
Table 5.2.5	Alcohol consumption per drinking day during the past 12 months'	27
Table 5.2.6	Binge Drinking amongst men and women by age-group	28
Table 5.2.7	Proportion of population consuming less than 5 Servings of fruit & per vegetable consumed per day	28
Table 5.2.8	Type of oil or fat used, if subject prepares meals	29
Table 5.2.9	Mean time (mins) spent per day on Physical Activity by domain, age-group and gender	30
Table 5.2.10	Levels of Total Physical Activity by age-group and gender	32
Table 5.3.1	Mean BMI (kg/m ²) by age-group and gender	33
Table 5.3.2	BMI categories by age group and gender	33
Table 5.3.3	Mean Waist Circumference (cm) by age-group and gender	35
Table 5.3.4	Central obesity by age-group and gender	35
Table 5.3.5	Resting blood pressure (mmHg) by age-group and gender	36
Table 5.3.6	Blood pressure Prevalence 15-64yrs	37
Table 5.4.1	Mean Fasting blood glucose (mg/dL) by age-group and gender	38
Table 5.4.2	Elevated Fasting blood glucose by age-group and gender	38
Table 5.4.3	Prevalence of Diabetes by gender and age group	39
Table 5.4.4	Mean Total cholesterol (mg/dL) by age-group and gender	39
Table 5.4.5	Proportion of Elevated Total Cholesterol by age-group and gender	40
Table 5.4.6	Mean HDL cholesterol (mg/dL) by age-group and gender	40
Table 5.4.7	Proportion of Low HDL cholesterol by age-group and gender	41
Table 5.4.8	Mean LDL cholesterol (mg/dL) by age-group and gender	41
Table 5.4.9	Mean triglyceride Levels (mg/dL) by age-group and gender	42
Table 5.4.10	Proportion of Elevated Triglyceride by age-group and gender	42
Table 5.4.11	Mean Haemoglobin levels (mg/dL) amongst Men and Women by age-group	42
Table 5.4.12	Proportion of Low Haemoglobin levels by age-group and gender	43
Table 5.5.1	Combined Risk Categories by age-group and gender	44

Figures

Figure 4.2	Sampling for NCD STEPS Survey in Marshall Islands	19
Figure 5.1	Age and gender distribution of RMI Population and Survey Sample	22
Figure 5.2	Highest Level of education: Male	22
Figure 5.3	Highest Level of education: Female	23
Figure 5.4	Smoking Status: Men	25
Figure 5.5	Smoking Status: Women	25
Figure 5.6	Less than 5 Combined Servings of Fruits and Vegetables	29
Figure 5.7	BMI Categories by age-group: Male	34
Figure 5.8	BMI Categories by age-group: Female	34
Figure 5.9	Combined Risk Factors –Total Population	45
Figure 5.10	Combined Risk Factors –Male	45
Figure 5.11	Combined Risk Factors –Female	45

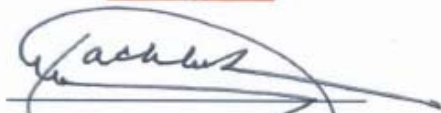
LIST OF ABBREVIATIONS

Term	Meaning
AusAID	Australian Agency for International Development
BP	Blood Pressure
BMI	Body Mass Index
CI	Confidence Interval
CVD	Cardiovascular Diseases
DBP	Diastolic Blood Pressure
DM	Diabetes Mellitus
FAO	Food and Agriculture Organisation
FBS	Fasting Blood Sugar
FSM	Fiji School of Medicine
HDL	High Density Lipoprotein
HP	Health Promotion
HTN	Hypertension
LDL	Low Density Lipoprotein
MIVA	Marshall Islands Visitor's Authority
MOH	Ministry of Health
NCEP	National Cholesterol European Project
NIDDM	Non-insulin Diabetes Mellitus
NCD	Noncommunicable diseases
OPD	Outpatient Department
PA	Physical Activity
PIC	Pacific Island Countries
RMI	Republic of Marshall Islands
SBP	Systolic Blood Pressure
SEARO	WHO Regional Office for South East Asia
VLDL	Very low density lipoprotein
WPRO	WHO Regional Office for the Western Pacific
WHO	World Health Organisation
WHO-EPI	World Health Organisation Expanded Programme on Immunisation
WHR	Waist Hip Ratio

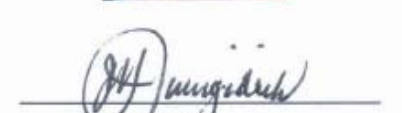
1. Foreword

A Joint Message from the Ministry of Health Republic of the Marshall Islands




Honorable Alvin T. Jacklick
Minister of Health




Ms. Justina R. Langidrik, MPH
Secretary of Health

We are very pleased to express, on behalf of the Ministry of Health, the Government and the people of the Marshall Islands, how rewarding it was for the Marshall Islands to participate in the World Health Organization's (WHO) Noncommunicable Diseases (NCD) STEPwise Approach Risk Factor (NCD STEPS) survey. The STEPS survey was a challenge for the staff in the Ministry of Health because of the need for baseline on NCDs. Furthermore, the STEPwise approach was an innovative process that would produce significant results of NCDs. MOH staff and local volunteers performed their very best during the implementation of the survey.

The WHO STEPwise approach provides the baseline data on NCDs in the Marshall Islands which can be further used for the development of appropriate steps and approaches to combat noncommunicable diseases in the Marshall Islands. These noncommunicable diseases often are related to changes in lifestyles. Having an aggressive Primary Health Care programs with skilled personnel in preventive services is a goal for the Republic.

The Ministry of Health, the Government and the people of the Marshall Islands are very grateful for the technical assistance provided from the World Health Organization, Menzies Centre for Population Research, the Fiji School of Medicine, and the financial assistance from AusAID. As a member of the World Health Organization, the Ministry of Health strives to continue supporting all WHO Initiatives including the Tonga Commitment to Healthy Lifestyles and Supportive Environments as endorsed by the Ministers of Health of the Pacific Island Countries (PIC) in March 2003.

We wish to extend our special acknowledgement to the Nutrition and Diabetes Prevention Control Program, Bureau of Primary Health Care in the Ministry of Health for the excellent work in the coordination and writing of the final report of the survey. Congratulations for a job well done. As the changes in the lifestyles reach our shores, we continue to face challenges in the health arena. As Marshallese, we know our own culture, we know our islands and our people. Therefore, it is our responsibility to do the best we can as a shared responsibility with every community of the Marshall Islands.

We look forward to the development of a Strategic Plan on Noncommunicable Diseases for the RMI in addition to implementation of preventive measures to support Primary Health Care approach as a shared responsibility.

World Health Organisation Representative in the South Pacific

Dr Chen Ken



The World Health Organisation is proud to be part of this collaborative effort between the Ministry of Health, the Fiji School of Medicine and the Menzies Centre for Population Health Research of the University of Tasmania (Australia) supported by AusAID.

The publishing of the Marshall Islands STEPwise Approach to Noncommunicable Disease Risk Factor (NCD STEPS) survey report marks a milestone in public health and medical research in the Marshall Islands as it provides baseline data that will assist the Ministry of Health in addressing the escalating issue of noncommunicable diseases (NCDs).

The STEPwise Approach is a simple, standardized method for collecting, analysing and disseminating data for NCD risk factors in WHO member countries. Marshall Islands was one of the four countries selected to pilot the WHO NCD STEPS Survey together with Fiji, the Federated States of Micronesia and Samoa.

By using the same standardized questions and protocols, all countries can use STEPS information not only for monitoring within country trends, but also for making between country comparisons. The approach encourages the collection of small amounts of useful data information on a regular and continuing basis adopting standard methodology and sample size to detect trends in age and sex group.

STEPS is a sequential process, starting with gathering information on key risk factors by the use of interviewer administered questionnaires (STEP 1), then moving to simple physical measurements (STEP 2), and only then recommending the collection of blood samples for biochemical assessment (STEP 3). Marshall Islands did all three steps which gives good comprehension to their information.

WHO is grateful to AusAID for their financial assistance, the Menzies Centre for Population Research and the Fiji School of Medicine for their technical assistance and the staff of the Ministry of Health who traveled the length and breadth of the country to obtain this much-needed data.

The baseline data provided in this NCD STEPS report will ensure that the right emphasis is placed on the risk factors that need to be addressed in the efforts to control obesity, high blood pressure, diabetes, cardiovascular diseases and other NCDs.

WHO congratulates you all on this tremendous effort as we continue to work together to tackle the concerning issue of NCD which is on a steep rise in Pacific Island countries and areas (PICs). There is now a need to take action to formulate and implement strategies based on the evidence presented in this report and other local and regional information to curb the growing epidemic of NCDs in Marshall Islands and the Pacific. WHO will continue to support Marshall Islands in these next steps after STEPS.

Dr Chen Ken
World Health Organisation Representative in the South Pacific

2 Executive Summary

The Republic of the Marshall Islands is a collection of 1,225 low-lying coral islands grouped into 29 atolls and 5 single islands covering a land area of about 70 square miles (181 square kilometers) spreading across an ocean area of 750,000 square miles with a total population of 50,840 (1999 census).

The WHO STEPwise approach to NCD risk factor surveillance (STEPS) is the WHO recommended surveillance tool which offers a simplified approach to surveillance and provides standardized materials and methods as part of technical collaboration with countries. The Ministry of Health agreed to participate with WHO to implement STEPS in Marshall Islands in 2002.

The overall aim of the RMI NCD STEPS survey was to determine the prevalence of and better understand major and associated risk factors for NCD, providing baseline information that would help develop a National Strategy for the Prevention and Control of NCDs.

The 3045 participants surveyed (15-64yrs) were selected through random locality-stratified multi-stage cluster sampling but with much of logistic consideration as the geography and communication were a big challenge. The STEPS methodology of questionnaire, physical measurements and biochemical were used.

Of the 3045 respondents in the survey 1234 (40.5%) were males and 1811 (59.5%) were females. In terms of locality, 50.9% of the respondents were from Majuro, 20.7% from Ebeye, 21.5% from the Outer Islands and 6.8% from the 177 Atoll.

This survey showed that the overall proportion of smokers was 23.1% (± 2.9) among which 19.8% (± 3.3) were current daily smokers and 3.3% (± 0.9) current but non-daily smokers. Alcohol binge drinking is defined as having 5 or more standard drinks per drinking day for males and 4 or more standard drinks per drinking day for females. The survey revealed that overall, 65.7% (± 9.7) of current alcohol consumers were binge drinkers, with a higher proportion for males (67.1% ± 8.4) as compared to females (55.1% ± 19.0).

According to WHO and FAO (1), the required intake for optimal health benefits is 400grams of fruits and vegetables a day which equates approximately to five daily serves of fruit and vegetable a day. Overall 91.0% (± 2.0) consume less than 5 servings of fruit and vegetable per day and only 8.1% of males and 9.9% of females consumed 5 or more servings of fruit per day.

The total prevalence of low physical activity is 66.1% (± 4.1) and 11.5% (± 1.9) take moderate physical activity whilst 22.4% (± 3.5) take vigorous physical activity. Women in general are notably less active than men.

By body mass index (BMI) measurements, 62.5% of the population were either overweight or obese increasing with age with a higher prevalence amongst females (65.4%) compared to males (59.8%). There is a four fold increase in obesity for the total population: from 10.6% (± 2.4) in the age group 15-24 years to 41.9% (± 3.8) in the age group 25-34 years. By waist circumference measurements, the overall percentage of central obesity in the population is 35.4% (± 5.2) with females three times (54.2% ± 6.5) more than males (18.4% ± 5.1) likely to be centrally obese. This gender difference is observed in most Pacific Island Countries (PICs).

The prevalence of hypertension in the 15-64 years age group was 10.5% (± 3.5) with 11.6% (± 5.3) for males and 9.3% (± 2.4) females. When excluding the youngest 10 year age group (15-24 years), the prevalence of hypertension is 15.9% (± 4.8) with 17.4% (± 6.7) for males and 14.3% (± 3.8) for females.

Meanwhile the prevalence of diabetes for the Marshallese population in the age group 15-64 years is 19.6% (± 3.2), with 18.9% (± 4.0) for males and 20.5% (± 4.3) for females.

The proportion of males having high cholesterol reading was 20.3% (± 9.0) and for females was 22.9% (± 13.1). In looking at the specific cholesterol measures, the mean HDL cholesterol of the surveyed population was 38.8mg/dL (± 4.0). The proportion of the population with high-risk levels of HDL cholesterol (≤ 35 mg/dL) for males was 48.8% (± 9.7) and for females was 29.1% ± 10.2 . The proportion of males with high-risk levels (≥ 151 mg/dL) of triglycerides was 9.5% (± 3.4) and for females was 6.0% (± 3.2).

The proportion of males with low haemoglobin levels was 7.6% (± 1.6) compared to females with 20.5% (± 3.1). The highest proportion of females at high-risk of low haemoglobin was in the youngest age group 15-24 years (25.2% ± 6.4) and 25-34 years (21.0 ± 6.5); the prevalence of low haemoglobin declined with age.

In an attempt to further estimate the burden of NCD risk factors in the country, core risk factors ascertained from STEPS 1 & 2 were clustered together and their prevalence described. These core risk factors were current daily smokers, consuming less than 5 servings of fruits and vegetables per day, low level of activity (< 600 MET-minutes/week), overweight or obese ($\text{BMI} \geq 25 \text{ kg/m}^2$), raised blood pressure ($\text{SBP} \geq 140$ and/or $\text{DBP} \geq 90$ mmHg). Those with at least three of these risk factors were described as having high risk and moderate risk for those with at least one or two of the risk factors.

The prevalence of those with high risk in the Marshall Islands was 60.2% (± 3.3) (males 62.1% ± 6.2 ; females 58.4% ± 3.1) and those with moderate risk 39.1% (± 3.1) (males 37.1% ± 6.2 ; females 41.0% ± 3.2). Only 3 (0.7% ± 0.4) individuals were free from any of the five risk factors with more males (0.8% ± 0.08) than females (0.6% ± 0.8).

The prevalence of NCD risk factors in the Marshall Islands is quite high and every effort should be made to address them at individual, community and national level.

3 Introduction

3.1 Background Information

3.1.1 Geography

The Republic of the Marshall Islands (RMI) is a collection of 1,225 low-lying coral islands grouped into 29 atolls and 5 single islands spreading across an ocean area of 750,000 square miles. RMI is approximately 2000 miles southwest of Hawaii, 8° north of the equator and is part of the Micronesian group. The total land area is about 70 square miles (181 square kilometers). The main height of land is about 7 feet above sea level (2 meters).



3.1.2 Population

Total number of persons counted in 1999 was 50,840 with 47% residing on Majuro and 21% in Kwajalein Atoll and 32% in the outer islands with 55% of the total population comprising the working age population (15-64 years) with 42.9% under 15 years and 2% over 65 years and older. The Marshall Islands has a total fertility rate of 5.7. One-third of the total population of five years old and over have had some elementary education, 18% completed primary school (grade 8) and 14% high school (grade 12). Five percent reported no schooling at all. There is no significant difference between female literacy rate of 97.2% and male literacy rate of 96.8%. Marshallese is the official language but English is taught in the schools and is widely spoken. With growing populations and very limited land areas, population density continues to be a concern with 406 persons/km² and greatly contribute to poor living conditions in urban communities.

3.1.3 Economy

The economy of the country, like many other central pacific island countries have three basic financial and economic problems: budget deficits, balance of payments and a low level of domestic savings. Both public and private investment has been low. As a result of the liberal foreign investment policy of the government, small business investment has increased with more traders from Asian countries like China, Taiwan, Hong Kong and Korea providing stiff competition for established local stores such as Gibson's and RRE. The small size of the market, legal restrictions to land, distances and isolated places, high transportation costs in importing goods and high wages are the factors detracting foreign investment in this country.

The economy is heavily dependant on funds from the US, the Asian Development Bank and assistance from other countries. The size of the annual budget is largely dependent on the size of the financial aid from these sources. Imports are rising without corresponding increase in exports and thus the balance of trade is unfavorable. The economic and administrative reforms carried out a few years ago although belated, are showing some favorable results for the economy. There are few reliable estimates of the GDP available, but is estimated that the GDP in 2002 grew by 3.8% based on current market prices. The RMI has no monetary system of its own and uses the US dollar. As a result, the economy has not had to face foreign exchange rate problems as experienced by other countries in the region that have their own monetary systems. The rate of inflation is minimal. The per capita income in 2002 was estimated at US\$1,867, among the highest in the region after the Federated States of Micronesia.

3.1.4 Government

The Government of the Marshall Islands, as some of the other jurisdiction of the former Trust Territory of the Pacific Islands, is politically and economically linked to the United States of America as a “freely associated state”. Under the terms of the Compact of Free Association between the Republic of the Marshall Islands (RMI) and the United States, the RMI is eligible for many of the Public Health Service programs and funds from the Department of Health and Human Services. However, the RMI is not eligible for Medicaid, Medicare, WIC, EPSDT, and federal funds for education (including development disabilities). These constraints limit the referral and resource options for health care providers striving to provide comprehensive services for their clients.

3.1.5 The Ministry of Health

The Constitution of the Marshall Islands has designated the Ministry of Health (MOH) as the “state” health agency. It is the only authorized agency that provides health care services to the people of the Marshall Islands. The health care system consists of two hospitals, in Majuro and Ebeye, and 54 community health centers in the outer atolls. The main hospital in Majuro is a 100-bed facility, and the hospital on Ebeye has 30 beds. Both facilities provide primary and secondary care, but limited tertiary care. Patients who need tertiary care are referred to hospitals in Honolulu or the Philippines. The Bureau of Primary Health Care (PHC) within the MOH also offers a full range of preventive and primary care programs in the main hospitals and is responsible for all preventive and primary care programs throughout the country.

The Ministry of Health is one of nine governmental agencies instituted under the Government of the Marshall Islands. The head of the MOH is an elected senator and a member of the President’s Cabinet. The Minister exercises executive authority for health on behalf of the Cabinet, and he/she is responsible for the development of policies for the Ministry with recommendations from the Secretary of Health and the administration of the MOH. The duties of the Minister are exercised while he/she remains an elected senator or until the President re-appoints another elected senator to the post. The Secretary of Health, on the other hand, is appointed as the “permanent” head of the Ministry. The Secretary of Health is responsible for daily management and administration of the Ministry and reports directly to the Minister of Health.

The MOH has six major bureaus: 1) Bureau of Primary Health Care (PHC), 2) Bureau of Majuro Hospital Services, 3) Bureau of Health Planning and Statistics (HP&S), 4) Bureau of Kwajalein Atoll Health Care Services (KAHCS), 5) Bureau of Administration, Personnel and Finance, and 6) Bureau of Medical Referral Services. An Assistant Secretary heads each bureau and all Assistant Secretaries report directly to the Secretary of Health.

3.1.6 Burden of NCDs in RMI

Like many developing nations, the RMI is facing the double burden of disease with rising rates of chronic diseases or noncommunicable diseases such as diabetes, hypertension, cancers, obesity and undernutrition compounding the still high prevalence of communicable diseases such as syphilis, gonorrhea, genital herpes, tuberculosis, hepatitis B and HIV. In addition, the RMI faces a large population increase with decreasing funds. In the 1999 national population and housing census, the population was at 50,840 with a Total Fertility Rate of 5.7 and an average annual growth rate (1988-1999) of 1.5%.

According to the 2004 MOH annual report, the top ten leading causes of deaths included: 1) Sepsis/Septicemia, 2) Cancers (all types), 3) Myocardial infarction, 4) Pneumonia, 5) Suicide, 6) End Stage Renal Disease and Cerebrovascular Disease, 7) Drowning, 8) Prematurity, 9) Trauma, 10) Congestive heart failure and Hepatitis B. Notwithstanding the degree of possible misclassification in mortality data, it is showing the culmination of the double burden of disease.

Outpatient department (OPD) patients by purpose of visits at the Majuro Hospital in 2001 observed that morbidity cases such as Diabetes mellitus, Bronchitis, Hypertension, Urinary tract infection, Abscess, etc still dominate the leading cases just as in the admissions purposes. In many cases they are follow up visits for earlier hospitalizations.

In recent years, diabetes has overtaken tuberculosis as the most common disease with the longest hospital stay in the Marshall Islands. Diabetic complications such as cataracts and gangrene or gangrene-related amputations have also been on the increase through the years. From 2000 to 2001, amputations increased by 28%. Furthermore, the trend of diabetes is affecting the younger population with a gradual increase of cases in the 20-35 years of age.

The increase in the number of diabetic patients and people at risk for diabetes is mainly due to the changes in the lifestyles of the Marshallese population. With more than 40% of the total population of RMI under the age of 15 years, this is seen as a disturbing trend. There was a need to look at risk factors in the general population and put in place 'primary prevention strategies' to delay or halt progression of individuals at-risk of getting NCD like Diabetes.

3.1.7 NCD Prevention and Control Services

Over the past ten years, there has been an increased awareness in NCD prevention and wellness promotion towards improving the quality of life for Marshallese people. The concept of "Health is a Shared Responsibility" remains the theme for the Ministry of Health. Other government agencies, local governments, non-government organisations, private sectors, outer island communities and designated individuals and groups as role models continue to be important key stakeholders to the Ministry. To ensure that communities actively participate in primary health care activities, the MOH implemented the Health and Population Project. One of the components of this project was to implement community participation in primary health care programs by establishing Community Health Councils (CHC) in the communities, consisting of community members, and it is a system that brings together a voice from the operating 54 health centers outside the urban towns of Majuro and Ebeye.

In 1999, the Ministry of Health submitted its 15 year strategic plan (2000-2015) to the government with strong emphasis on renovating and building new health care facilities, procurement of needed equipment and supplies, hiring of specialized staff members, improving access to health care services, reducing overseas referrals, increasing community awareness on the prevention of diseases, and increasing wellness activities.

The Ministry of Health has placed more emphasis on screening for early detection of diabetes and hypertension and instituting treatment and management for those that warrants. There has been an increase number of the population being screened.

3.2 Rationale

The growing burden of noncommunicable diseases (NCDs) represents a major challenge to health development as it is a burden that cannot be countered simply by accessing greater internal or external funding to spend within the system, due to the astronomical cost factor. A WHO report on the NCD burden in the Pacific countries identified the essentials need to mount preventative programs to halt the rapid rise in risk factors that underpins the disease increase.

In recognition of the increased burden of NCDs, WHO and the Republic of the Marshall Islands (RMI) has given NCD prevention, control and surveillance some priority in its program of work. NCD surveillance is seen as a necessary tool in designing prevention and control programs with specific goals and measurable outcomes. Country specific data on risk factors is essential in order to set priorities, develop targeted programs and monitor interventions on NCDs. It is this approach that has been implemented by RMI, while adding items of local relevance.

Primary Prevention and Health Promotion through both community based strategies together with individual high risk clinical intervention has been identified as the key components for the prevention and control of NCDs. The description and quantification of the major risk factors of NCDs is the opportunity that the STEPS survey presents for the prevention and control of a disease group that has been neglected long enough.

As identified in the WHO STEPwise approach, the underlying principle is that all surveillance sites gather the same core items on a limited number of risk factors, with the option of including additional items of local relevance. The WHO STEPS surveillance program aims to ensure that the STEPS implementation at the country level is strategic, coordinated, builds capacity and is sustainable.

A vast body of knowledge now exists about the risk factors for NCDs and experience in the prevention and control of them. It also has been shown in a number of countries, both developed and developing, that a comprehensive, long term approach has the potential to reduce risk factors in the population and in turn disability and death. In this sense, the risk factors of today predict the diseases of the future.

A risk factor refers to any attribute, characteristic or exposure of an individual, which increases the likelihood of developing a noncommunicable disease. The major risk factors for one NCD are also likely to affect one or more of the other NCDs as outlined in Table 3.2.1.

Table 3.2.1 Risk factors common to major noncommunicable conditions				
Risk factor	Condition			
	Cardio-vascular disease*	Diabetes	Cancer	Respiratory conditions**
Smoking	√	√	√	√
Alcohol abuse	√		√	
Poor nutrition	√	√	√	√
Physical inactivity	√	√	√	
Obesity	√	√	√	√
Raised blood pressure	√	√		
Raised blood glucose	√	√	√	
Raised blood lipids	√	√		

* Including heart disease, stroke, hypertension

** Including chronic-obstructive pulmonary disease and asthma

The Republic of Marshal Islands do not have national prevalence data on these risk factors hence the main reason for the decision to use the WHO STEPS surveillance tool to conduct a national prevalence survey on NCD risk factors.

3.3 Developing WHO STEPS in RMI

The WHO STEPwise Approach to Surveillance is the WHO recommended surveillance tool which offers a simplified approach to surveillance and provides standardized materials and methods as part of technical collaboration with countries. The information on risk factors is essential for planning primary prevention programs and for predicting future caseload of NCDs and will assist greatly in the efforts to control the epidemic.

In year 2001, the Ministry agreed to participate with WHO to implement STEPS and in 2002, a project manager was identified, trained and NCD STEPS Committee organized. NCD STEPS Committee consecutive meetings followed to:

- Define study population;
- Agree on objectives of the activity and data elements to be collected;
- Establish study methodology;
- Identify funding sources;
- Identify and recruit personnel and team members;
- Prepare and translate training materials, operational manual, survey tools;
- Identify, price and procure all required equipment and materials;
- Identify and scout proposed data collecting sites;
- Announcements to landowners, local governments, community health centers and the public, and;
- Schedule STEPS trainings.

3.4 Purpose

The overall aim of the RMI NCD STEPS survey was to determine the prevalence of and better understand major and associated risk factors for NCD, and provide baseline information that would help develop a National Strategy for the Prevention and Control of NCDs.

3.5 Objectives

The specific objectives of the RMI NCD Steps survey were:

- ♦ To investigate and document the prevalence of key NCD risk factors amongst the target population.
- ♦ To determine the prevalence of and better understand the major modifiable risk factors for common NCDs. These included physical inactivity, poor diet, obesity, high cholesterol, tobacco and alcohol abuse, and knowledge and attitude about diabetes and hypertension.
- ♦ To study NCD and its risk factors across different stratas of age, gender, and locality.

4 Methodology

4.1 Scope

The RMI Ministry of Health (MOH) in collaboration with local governments, traditional leaders, landowners, and Community Health Councils conducted the RMI STEPwise Approach to Surveillance of Risk Factors of Noncommunicable Diseases (RMI-STEPS) in a 3-month period from August to October 2002.

The 2002 RMI-STEPS survey was designed as a population-based cross-sectional survey of 15 to 64 year olds and involved the collection of data across 3 “steps” as follows:

STEP 1: Interview data on selected health risk behaviors included smoking, use of smokeless tobacco, alcohol consumption, poor nutrition, and physical inactivity. In addition to these core questions, Marshall Islands added expanded and optional questions which included knowledge and attitude questions to evaluate the public’s understanding of hypertension and diabetes, use of traditional treatments for hypertension and diabetes, use of betel nut, consumption of locally grown food crops and seafood, methods of cooking, influence of friends, family and relatives on the use of alcohol, smokeless tobacco products, tobacco smoking and betel nut chewing. The interview was done in both English and Marshalese where appropriate.

STEP 2: Physiological measures of health risks included blood pressure, height, weight, and waist circumference. RMI did not do the hip measurement.

STEP 3: Biochemical measures of health risks included fasting blood glucose, total cholesterol, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), and triglycerides. The RMI survey included hemoglobin level and stored blood samples for future Hepatitis B study. Blood glucose was read using the Advantage glucometer as well as a serum reading to compare results from the meter vs. serum test. Blood sample was collected through venipuncture.

4.2 Sampling

It was decided by the STEPS Survey Committee to stratify the country into two major groups (strata), Urban and Rural. Despite a long debate on whether some outer islands could be classified as urban, it was resolved that all outer islands should be classified as rural. It later became necessary to further sub-divide the two major strata into four sub-strata (zones). The Urban stratum was sub-divided into Majuro and Ebeye sub-strata and the rural stratum was also sub-divided into two sub-strata, the ‘nuclear exposed 177 atolls’ as a sub-stratum and the “Other Outer Islands” as another sub-stratum. The subdivision into sub-strata will ensure generalization of findings about prevalence estimates for such substrata.

Out of the 149 islands, 91 were excluded because their population were less than 100. Time and expense in moving personnel to those islands and setting up field testing stations would have restricted the scale of the survey that was possible using the available resources.

Hence the population listed for the four zones are 2002 projected population figures, derived from the 1999 Population and Housing Census, applying the Atoll Annual Growth Rates (AGRs) to each Island in order to arrive at the projected population figures. It should be noted here that some Islands had registered negative AGR in the 1998-1999 inter-censal period, hence the reduced population sizes in 2002. This is the simplistic calculation of projected population, used in the absence of any assumptions as usually applied in a more sophisticated methodology.

After the 2002 projected population was obtained, the next step was to estimate the (15-64 years) population age group. In the Marshall Islands, the 15-64 years age group corresponds to the labor force age group, and constitutes 54.78% of total population; this also differed across major Atoll classification. Majuro, Ebeye and Outer Islands have respectively 58.39%, 54.94%, and 49.87% of their population who are 15-64 years old.

Since the 4 zones (Majuro, Ebeye, 177 and the Other Outer Islands) were predetermined, clusters (villages for Majuro, whole island for Ebeye, Kili, Wotje, Jabor) were identified within each stratum using systematic random cluster sampling, resulting in instances, where more than one cluster fell into one island or zone in case of Majuro and Ebeye.

The next stage was to use the clusters as weights for arriving at the sample size required for each island selected. For example, in Majuro strata, 8 clusters were identified and since the sample size for each strata were predetermined, proportional to population size (pps), sample size for selected island in which two clusters were identified would have 2/8 times the predetermined sample size. Ebeye strata had a total of 3 clusters; all of them falling in Ebeye Island, hence the whole sample was obtained in Ebeye Island.

Since the proportional to population size (pps) methodology resulted in a sample size of only 136 people on the 177 Atoll, but the requirement is for each cluster to have at least 200 people, the 177 Atoll needs to be over sampled at 200 people, if the estimates obtained are to pass statistical significance test according to STEPS.

Hence the overall sample size for the whole country was decided at 3064 people if 177 Atoll sample 200 people, instead of the 136 people.

Where the sample sizes are larger than the target population of the selected island, the nearest island was selected to top up the required sample size. This is done when the selected island population has been exhausted.

RMI felt the need to add ages 15-24 years in STEP 3 and included hemoglobin screening for prevalence of anemia. Aside from the NCD study, the Ministry will also be conducting a future Hepatitis B study from the stored blood samples. Additional agreements to store blood were added to the recruitment form for STEP 3 in order to protect the rights of the participant.

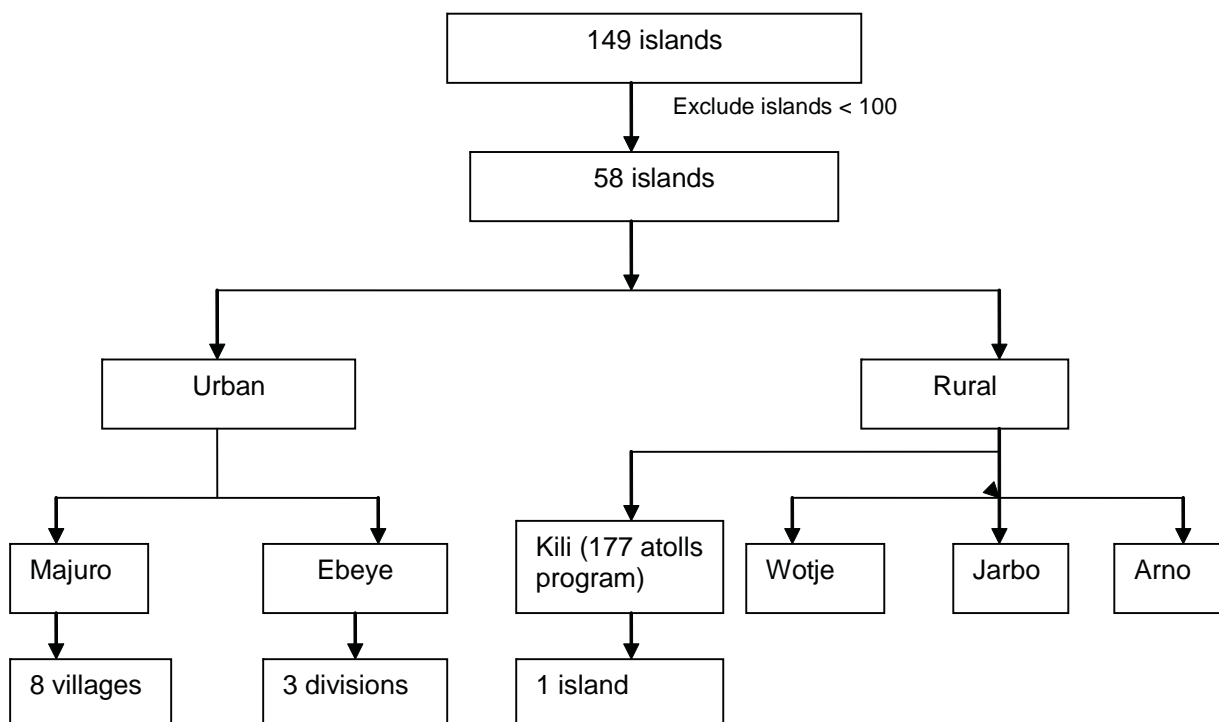
4.2.1 Selection of households:

For clusters on Majuro Atoll and Ebeye Island, selection of households involved driving out to each of the clusters (villages) to determine the size of the area. STEPS staff began at one end of the cluster and counted the number of houses by the road to determine the length of the cluster. After having done that, depending on the number of teams for each cluster, the cluster was then divided up into enumeration areas as equally as possible among the teams. Enumeration areas included Kili Island (the whole island), Arno, Arno (whole island), Ine, Arno (whole Island), Wotje, Wotje (whole Island), Jabor, Jaluit (whole Island), Ebeye (whole Island), Darrit, Uliga, Delap, Rairok, and Laura. Number of households in each enumeration area was once again counted to determine the center of the enumeration area. Once the center was determined, a flip of the coin decided which direction the team will take. A table of random numbers was used to determine the first household to be approached for the survey.

Within each cluster the selection of participants within the target population of 15 to 64 year olds for STEPs 1 and 2 was performed in a house-to-house search and with informed consent irrespective of age, sex or ethnicity, until the target participant number was reached. From those chosen for STEPs 1 and 2, participants for STEP 3 were chosen randomly (via a coin flip) and approximately one-half of those aged 15 to 64 years were selected.

For each cluster, data was also collected regarding the total number of households approached, the number of those who refused to being a participant, and the number of those in STEP 1 who also participated in STEP 2 and STEP 3. These data were included in a weighting formula used to calculate STEP-specific weighting factors for data analysis.

Fig 4.2: Sampling for NCD STEPS Survey in Marshall Islands



4.3 Data Collection Procedure

4.3.1 STEP 1 – Behavioral Risk Factors

Data for behavioral risk factors were collected using a face-to-face structured interview (Appendix 3) with questions on selected health risk behaviors including smoking, use of smokeless tobacco, alcohol consumption, fruit and vegetable consumption, physical inactivity, and knowledge and attitude about diabetes and hypertension. Questionnaire and consent forms included both English and the Marshallese language, and the interview was conducted in either Marshallese or English. All interviews followed a standardized informed consent procedure and were conducted in a private setting as individually arranged by one of 38 interviewers. Trained STEPS interviewers included MOH health workers and those recruited from the community with a minimum of high school level education. The MOH interviewer also made arrangements with the participants to come to a central site for STEPS 2 and 3 (on the following morning), and in the case of those participating in STEP 3, the interviewer also provided the participant with fasting instructions.

4.3.2 STEP 2 – Physical Measurements

Selected community centers and health centers were used as a temporary survey base for STEPS 2 and 3 where stations were set up for registration, physical measurements, biochemical measurements and checkout with light refreshments for fasting participants in the morning. Approximately 60-80 participants a day attended the STEP 2 and 3 stations each day.

Targeted physiological measures of health risks for NCDs were measured including blood pressure, height, weight, and waist circumference. Selected STEPS team members were trained in conducting these measurements through the use of specific protocols with quality control monitored through the use of periodically conducted performance checklists for each measurement.

Blood pressure (BP) was measured with the Omron HEM 907 BP monitor. BP was measured twice and if the difference between the first and second readings was 10 mm Hg or more then a third reading was taken. For those with two readings, the mean value of the two readings was used in the analysis. For those with three readings, the mean value of the second and third readings was used in the analysis.

Height was measured twice with a height board to the nearest 0.1 cm and the mean of these two measurements was used in the analysis. Weight was measured once to the nearest 0.1 kg with the Tanita Adult Scale, which was checked for accuracy against standard weights at the beginning and end of each day. Waist circumference was measured once to the nearest 0.1 cm with the Figure Finder constant tension tape. Waist circumference was not measured in female participants who responded affirmatively to a question as to whether or not they were pregnant.

4.3.3 STEP 3 – Biochemical Measurements

Targeted biochemical measures of health risks for NCDs were measured including fasting blood glucose, total cholesterol, HDL, LDL, triglycerides and hemoglobin. MOH laboratory personnel were trained in conducting these measurements through the use of specific protocols with monitored quality control. A venous blood sample was collected and prior to spinning the venous sample down to obtain a serum sample, a drop of whole blood was applied to a glucose test strip and measured in a hand-held glucometer. The serum samples were transported in ice coolers to Majuro hospital laboratory where the other three biochemical measurements were conducted using standard methods with a biochemical analyzer.

Check out procedure: Upon completion of STEPS 2 and 3 all participants were required to check out. Checks out personnel were trained to explain results, provide educational materials, and answer any questions. Breakfast was provided to fasting STEP 3 participants.

4.4 Data Entry and Processing

Data for all three STEPS were hand-entered using EpiInfo 6.04d database.

All questionnaires were kept in the Nutrition & Diabetes Prevention Office with access to data entry people, team leaders and project manager only. Each data entry personnel was able to enter from 15 to 30 questionnaires per hour. All questionnaires were entered twice. Upon completion, questionnaires were placed in boxes, sealed and stored in a secured storeroom. With the completion of this report, all questionnaires will be destroyed.

4.5 Data Analysis

To take into account the complex design of the Marshall Islands STEPS Survey, a weighting factor was applied to each participant record to adjust for varying probabilities of selection and non-representativeness in the stratum 10 year age sex groups. A detailed description of the weighting procedure can be found in Appendix 2.

Data analyses were conducted using EpiInfo for Windows. Weighted percentages, means and 95% confidence intervals for these percentages and means were computed.

5 RESULTS

5.1 Description of the sample

Data were obtained from 3097 individuals with the data being reduced to 3045 following the data cleaning process. All respondents were drawn from the 15- 64 years-old age category for STEP 1. Two thirds (2073) of the STEP 1 respondents participated in STEP 2 (Physical measurements), while one third (1067) of the STEP 1 respondents participated in STEP 3 (Biochemical measurements). Details of the sample characteristics are outlined in *Table 5.1* and *Figure 5.1* below.

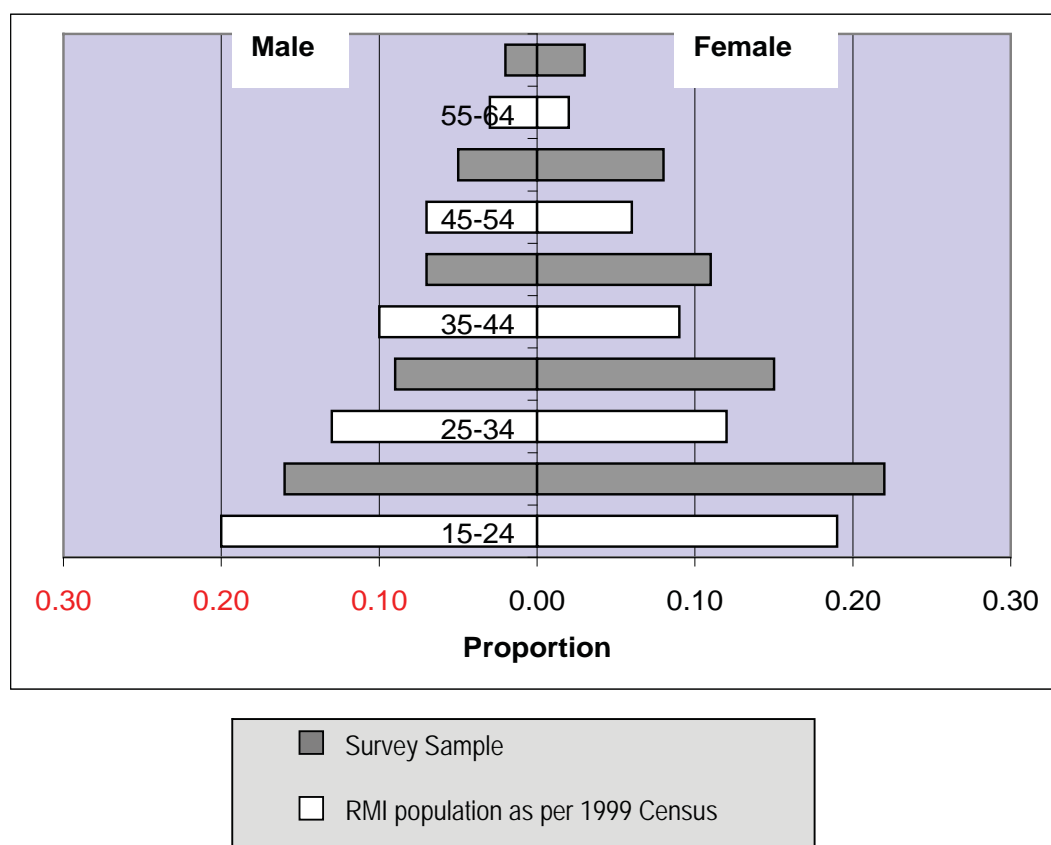
5.1.1 Survey Sample Characteristics

Table 5. 1: Demographic description of study sample and sampling frame

Demographic Characteristic	Study Sample				Sampling Frame*	
	Number	Unweighted Proportion	Weighted Proportion	95% CI	Number	Proportion
Gender						
Male	1234	40.5	51.0	±1.8	14,048	51.0
Female	1811	59.5	49.0	±1.8	13,473	49.0
Total	3045				27,521	
Locality						
Majuro	1550	50.9	49.1	±38.2	13,501	49.1
Ebeye	631	20.7	19.9	±39.2	5,478	19.9
Outer Islands	656	21.5	26.0	±29.0	7,150	26.0
177 Atoll	208	6.8	5.1	±11.9	1,392	5.1
Total	3045				27,521	
Age group						
15-24 years	1155	37.9	39.0	±3.2	10,727	39.0
25-34 years	751	24.7	24.9	±2.6	6,865	24.9
35-44 years	567	18.6	18.9	±1.8	5,191	18.9
45-54 years	395	13.0	12.2	±1.3	3,357	12.2
55-64 years	177	5.8	5.0	±0.8	1,381	5.0
Total	3045				27,521	

Of the 3045 respondents in the survey 1234 (40.5%) were males and 1811 (59.5%) were females. In terms of locality, 50.9% of the respondents were from Majuro, 20.7% from Ebeye, 21.5% from the Outer Islands and 6.8% from the 177 Atolls. Of all those, 37.9% were in the 15-24 age group, 24.7% in the 25-34 age group, 18.6% in the 35-44 age group, 13.0% in the 45-54 age group and 5.8% in the 55-64 age group.

Figure 5.1: Age and gender distribution of RMI Population and Survey Sample



5.1.2 Level of Education

The population surveyed were well-educated with only a small proportion having never attended school (male= 0.4%; female=1.4%). Over 55% of the population surveyed have completed at least secondary (male=53.5%; female=59.1%) and approximately 10% have completed high school (male=2.3%; female=1.2%). *Figure 5.2 and 5.3 below shows proportion of level of education by gender.*

Figure 5.2: Highest level of education: Male

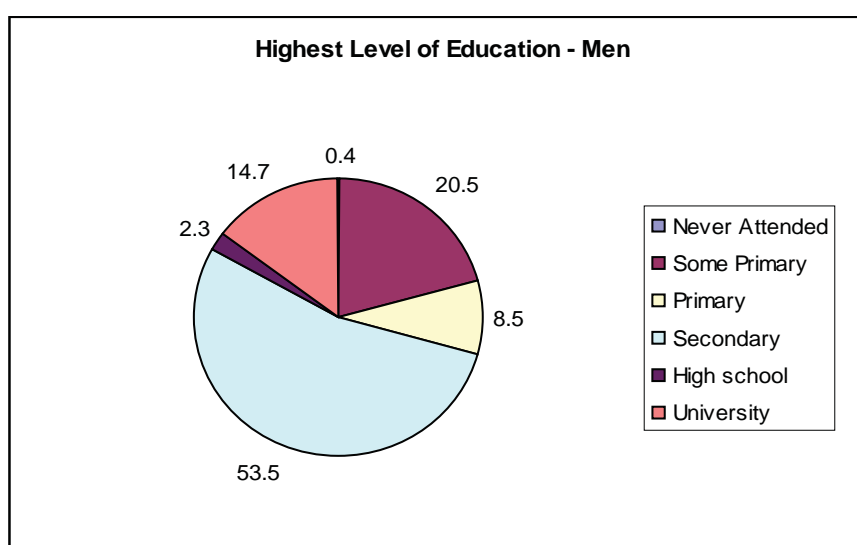
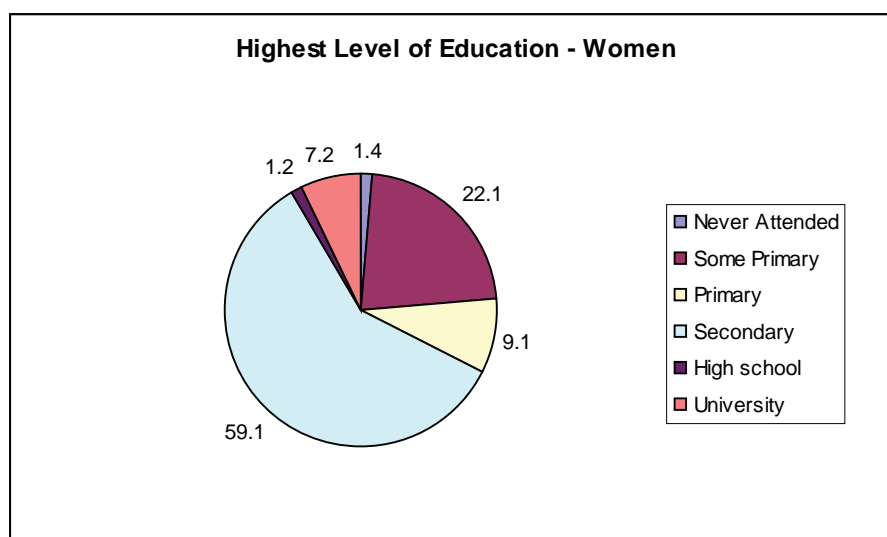


Figure 5.3: Highest level of education: Female



The average number of years spent in school was 10.1 years (± 0.3) with 10.0 years (± 0.3) for women and 10.2 years (± 0.3) for men (*Annex Table 1.1*).

5.1.3 Main Employment

There were more females in the unemployed (able to work) category (30.5%) compared to males (17.9%). 20.2% of males were government employees compared to 8.1% of females, 25.1% of males were non-government employees compared to 12.3% of female, 15.5% of males were students compared to 14.2% of females and 7.4% of males were unemployed (unable to work) compared to 9.9% of females. Unable to work meant those who were sick or disabled. A more positive indicator for females was that 13.7% of females were self-employed compared to 8.7% of males (*Table 5.1.3*).

Table 5.1.3 Main employment by agegroup and gender

		Men																	
Age	N	Employment Categories																	
		1		2		3		4		5		6		7		8		9	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
15-24	486	22	4.7	58	12.5	21	5.7	7	1.6	188	37.6	8	1.5	0	----	127	22.8	55	13.5
25-34	287	61	18.7	99	34.5	28	12.5	2	0.5	11	4.6	12	3.2	0	----	65	22.2	9	3.7
35-44	221	78	33.0	79	35.9	18	9.9	0	----	1	0.4	9	3.8	0	----	28	12.9	8	4.2
45-54	154	64	41.1	52	32.5	11	8.9	0	----	0	----	6	3.4	7	5.0	11	7.4	3	1.7
55-64	73	32	40.2	11	13.4	3	6.9	0	----	0	----	0	----	20	26.9	4	6.3	3	6.2
Total	1221	257	20.2	299	25.1	81	8.7	9	0.8	200	15.5	35	2.5	27	2.1	235	17.9	78	7.4
		Women																	
15-24	648	13	1.8	49	7.2	28	6.4	1	0.1	234	35.3	54	8.6	1	0.3	195	29.6	73	10.8
25-34	460	36	7.5	65	13.1	57	17.2	3	0.7	7	1.1	59	10.8	3	0.8	181	36.7	49	12.1
35-44	343	52	15.5	78	21.9	53	20.1	2	0.5	1	0.2	36	8.7	1	0.2	103	28.0	17	4.9
45-54	237	36	17.1	29	10.3	34	17.2	3	1.9	0	----	34	12.5	12	4.4	70	28.0	19	8.6
55-64	101	13	11.9	18	16.3	17	21.6	1	1.0	0	----	8	7.7	10	7.5	23	21.0	11	13.0
Total	1789	150	8.1	239	12.3	189	13.7	10	0.6	242	14.2	191	9.6	27	1.2	572	30.5	169	9.9

1=Government employee, 2=Non-government employee, 3=Self-employed, 4=Non-paid, 5=Student, 6=Homemaker, 7=Retired, 8=Unemployed (able to work), 9=Unemployed (unable to work)

5.2 Behavioural Measures

5.2.1 Tobacco Use

Prevalence of tobacco use was assessed according to smoking status that each participant reported on in response to the questions. These are defined as follows:

- Current smokers – those who have smoked any tobacco products (such as cigarettes, cigars or rolled tobacco) in the past 12 months
- Daily smokers – those who are smoking any tobacco products every day.

This survey showed that the overall proportion of smokers was 23.1% (± 2.9) among which 19.8% (± 3.3) were current daily smokers and 3.3% (± 0.9) current but non-daily smokers (Table 5.2.1).

Table 5.2.1 Smoking status by agegroup and gender

Total Population													
Age	N	Current Daily			Current Non-daily			Daily and Non-daily			Non-Smokers		
		n	%	CI(\pm)	n	%	CI(\pm)	n	%	CI(\pm)	n	%	CI(\pm)
15-24	1131	173	18.2	5.4	51	4.5	1.4	224	22.7	4.6	907	77.3	4.6
25-34	739	133	22.7	4.2	14	2.0	1.3	147	24.7	4.6	592	75.3	4.6
35-44	566	107	22.9	3.4	16	3.1	2.2	123	26.0	4.1	443	74.0	4.1
45-54	388	53	17.5	4.7	11	3.1	2.1	64	20.6	4.3	324	79.4	4.2
55-64	174	14	11.4	5.9	4	2.2	2.2	18	13.6	6.3	156	86.4	6.3
Total	2998	480	19.8	3.3	96	3.3	0.9	576	23.1	2.9	2422	76.9	2.9
Men													
15-24	483	156	33.8	7.4	38	7.0	3.0	194	40.8	5.5	289	59.2	5.5
25-34	283	116	40.6	8.4	7	2.3	2.6	123	42.9	8.9	160	57.1	8.9
35-44	221	81	37.9	4.6	12	5.3	4.2	93	43.2	4.8	128	56.8	4.8
45-54	152	41	28.0	8.7	5	3.5	3.9	46	31.2	6.8	106	68.8	6.6
55-64	73	10	18.6	11.3	3	3.4	3.9	13	22.0	11.5	60	78.0	11.5
Total	1212	404	34.7	5.4	65	4.9	1.6	469	39.5	4.4	743	60.4	4.4
Women													
15-24	645	16	2.4	0.9	13	2.1	1.1	29	4.5	1.4	616	95.5	1.4
25-34	455	17	4.3	1.9	7	1.6	1.2	24	5.9	2.7	431	94.1	2.7
35-44	345	26	7.6	2.5	4	0.9	0.5	30	8.5	2.4	315	91.5	2.4
45-54	236	12	5.0	2.0	6	2.8	1.6	18	7.8	2.1	218	92.2	2.1
55-64	101	4	3.3	1.8	1	0.9	0.2	5	4.2	1.8	96	95.8	1.8
Total	1782	75	4.2	1.2	31	1.8	0.8	106	6.0	1.5	1676	94.0	1.5

There was a greater proportion of current daily smokers amongst males (34.7 ± 5.4) compared to females ($4.2\% \pm 1.2$). The greatest proportion of current daily smokers among males was in the age group 25-34 years ($40.6\% \pm 8.4$) and decreases with increasing age. For females the greatest proportion for current daily smokers is in the age group 35-44 years ($7.6\% \pm 2.5$) then decreasing with increasing age.

Figure 5.4: Smoking status: Men

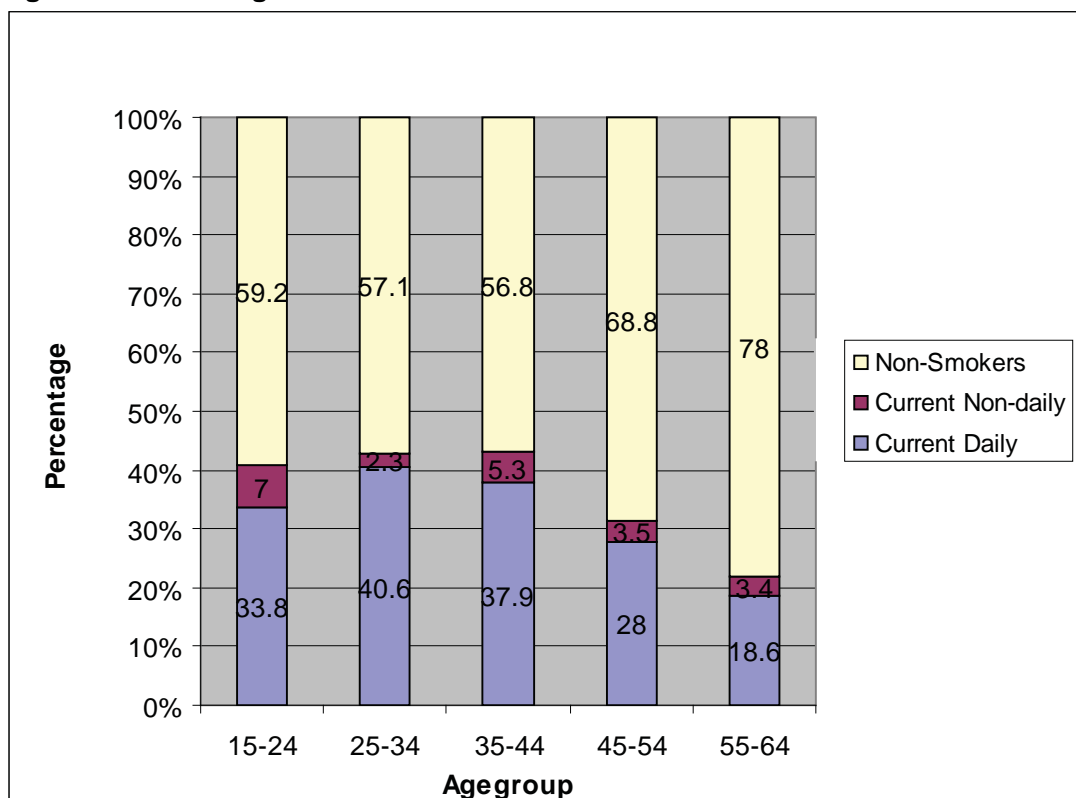
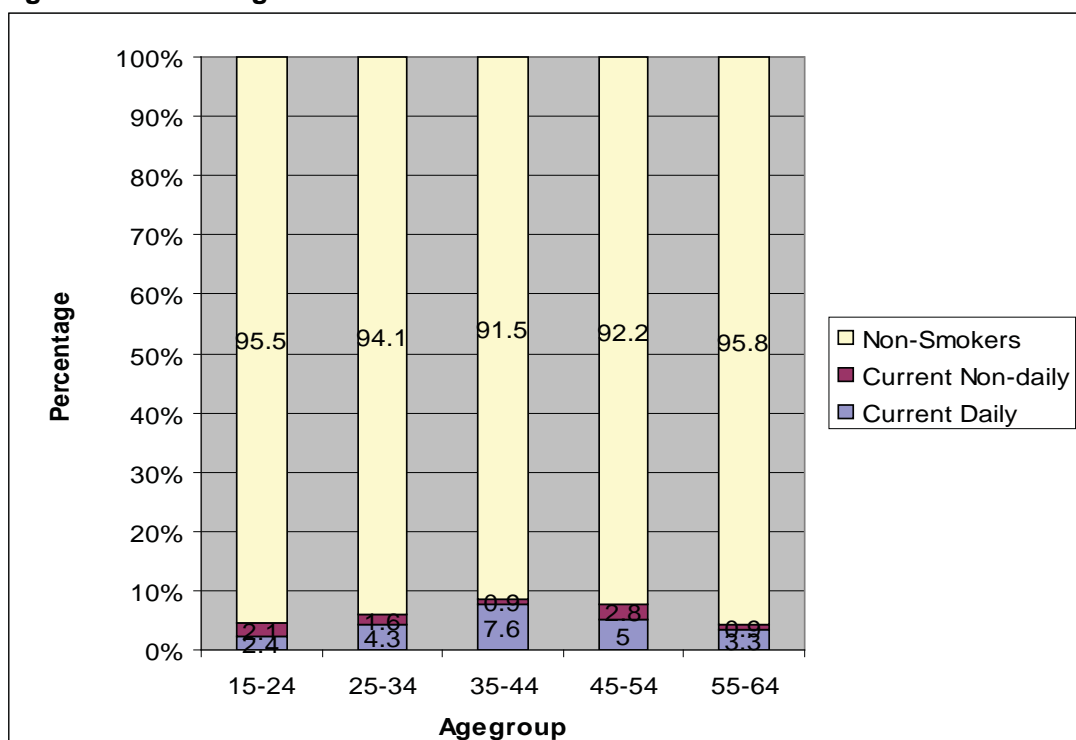


Figure 5.5: Smoking status: Women



As noted in *Table 5.2.2*, this survey revealed that the mean age of initiation among current smokers was lower among males (17.6 ± 0.4) than females (19.9 ± 1.8). There was not much difference in the age of initiation between males and females in the 15 – 24 years age group. This suggests that younger smokers are beginning to smoke earlier than the older age groups.

The mean number of years a current smoker has smoked is 13.3 years (± 1.1), with 13.2 years (± 0.9) for males and 14.7 years (± 4.1) for females (*Annex Table 2.1*).

Table 5.2.2 Mean age started smoking† by agegroup and gender

Age	Men (N=404)			Women (N=75)			Total Population (N=480)		
	n	Mean	CI(\pm)	n	Mean	CI(\pm)	n	Mean	CI(\pm)
15-24	153	16.2	0.7	15	15.9	1.4	169	16.2	0.6
25-34	114	18.5	0.6	17	20.2	3.0	131	18.7	0.6
35-44	80	17.8	1.3	26	21.2	3.7	106	18.4	1.5
45-54	40	19.5	1.5	11	20.3	1.2	51	19.6	1.3
55-64	10	16.9	3.3	4	27.3	14.4	14	18.3	3.7
Total	397	17.6	0.4	73	19.9	1.8	471	17.8	0.4

† Current smokers

The most frequently used cigarette is the manufactured ones with 97.7% (± 1.1) of the current smokers using it (males: 97.6% ± 1.3 ; females: 98.7% ± 0.3). The mean number of manufactured cigarettes smoked daily was 11.5 ± 1.6 (*Annex Table 2.2*). More manufactured cigarettes were smoked by males (12.0 ± 1.7 per day) compared to females (7.4 ± 1.7 per day) (*Annex Table 2.3*).

Amongst current smokers, there was a great proportion (65.1% ± 9.0) of tobacco users who chew tobacco which existed for each age group across both males and females. Notwithstanding the small numbers, it indicates that there is a lot of chewing tobacco that exists in the Marshall Islands for both males and females (*Annex Table 2.7*).

5.2.2 Betel nut use

With the increased health concerns related to betel nut chewing the survey wanted to look at the proportion of the total population currently using betel nut and it revealed that 1.8% of the total population were daily betel nut users with the highest proportion of users in the 25-34 years age group (3.0 % ± 2.3). (*Annex Table 3.1*) This trend amongst the young age group could increase further if not addressed.

5.2.3 Alcohol Consumption

Current alcohol use was defined as having had any alcohol consumption in the past 12 months. Overall, 19.3% (± 4.8) were current consumers. As with ever consumers, there was noted to be a higher proportion of males (33.5% ± 7.5) that were currently consuming alcohol as compared to females (4.5% ± 1.2) (*Table 5.2.3*).

Table 5.2.3 Current alcohol consumption by agegroup and gender

Age	Men				Women				Total population			
	N	Current Consumers			N	Current Consumers			N	Current Consumers		
		n	%	CI(\pm)		n	%	CI(\pm)		n	%	CI(\pm)
15-24	483	172	37.1	9.9	648	39	6.2	3.0	1135	213	21.9	6.6
25-34	283	115	42.7	10.5	454	15	4.0	3.1	738	130	23.7	6.6
35-44	220	63	30.1	7.7	344	13	3.7	2.2	564	76	17.0	4.3
45-54	152	27	18.4	6.3	237	7	2.8	2.8	389	34	11.3	3.4
55-64	73	9	12.4	8.7	101	1	0.6	1.6	174	10	6.8	5.4
Total	1211	386	33.5	7.5	1784	75	4.5	1.2	3000	463	19.3	4.8

The percentage of current consumers is highest in the age group 25-34 years (23.7% ± 6.6) and then decreases with increasing age. This trend persisted when stratified by gender. In terms of standard drinks (100ml of wine OR 30ml of spirit OR 300mls of regular beer), this survey revealed that 73.2% consumed 4 or more standard drinks per day during the past 12 months and 16.9% consumed 2-3 standards drinks per day. The proportion of males who consumed 4 or more standard drinks per day was 76.0% compared to females (55.1%) (*Table 5.2.5*).

The mean number of standard drinks consumed on any single occasion was 13.9 (± 2.7) per drinking day for males and 9.1 (± 2.8) for females (*Table 5.2.4*). There was also a trend for younger age groups to consume more number of drinks per drinking day overall and in both genders.

Table 5.2.4 Largest number of drinks consumed on single occasion by agegroup and gender amongst current consumers

Age	Men			Women			Total Population		
	n	Mean	CI(\pm)	n	Mean	CI(\pm)	n	Mean	CI(\pm)
15-24	164	14.4	4.6	39	9.4	5.6	205	13.5	4.6
25-34	110	13.1	2.5	15	7.3	3.6	125	12.6	2.5
35-44	60	14.4	6.5	13	12.7	4.3	73	14.2	5.5
45-54	26	14.1	3.3	6	3.1	1.4	32	12.9	2.3
55-64	9	9.7	5.4	1	10.0	----	10	9.7	5.2
Total	369	13.9	2.7	74	9.1	2.8	445	13.2	2.6

Table 5.2.5 Alcohol consumption per drinking day amongst current consumers

Total Population													
Age	Standard Drinks per Day												
	N	1			2-3			4-5			6+		
		n	%	CI(\pm)	n	%	CI(\pm)	n	%	CI(\pm)	n	%	CI(\pm)
15-24	208	24	11.8	5.0	40	20.5	12.9	22	11.1	7.4	122	56.6	16.4
25-34	124	8	8.0	5.1	17	14.5	6.9	15	13.4	5.8	84	64.1	13.1
35-44	73	7	10.0	6.1	8	8.9	6.7	6	9.2	7.7	52	71.9	10.8
45-54	34	4	8.9	9.6	7	18.6	10.7	5	19.1	25.0	18	53.4	25.1
55-64	8	0	----	----	3	36.7	40.3	0	----	----	5	63.3	40.3
Total	447	43	10.0	3.5	75	16.9	6.7	48	11.9	4.8	281	61.3	9.3
Men													
15-24	167	17	9.9	5.3	29	18.8	12.7	18	11.4	9.0	103	59.8	15.4
25-34	109	7	7.6	4.7	13	12.6	5.9	13	13.5	6.4	76	66.3	13.2
35-44	60	6	9.8	4.6	5	6.8	6.6	5	8.7	6.0	44	74.7	9.1
45-54	27	3	7.4	10.2	6	19.7	9.5	4	18.8	24.5	14	54.1	22.5
55-64	7	0	----	----	3	38.7	40.4	0	----	----	4	61.3	40.4
Total	370	33	8.8	3.0	56	15.2	6.9	40	12.0	4.6	241	64.0	8.2
Women													
15-24	39	6	17.2	17.2	11	32.0	15.1	4	10.0	14.0	18	40.9	17.6
25-34	15	1	12.5	20.6	4	34.1	25.1	2	12.3	21.1	8	41.1	19.2
35-44	13	1	11.3	27.5	3	25.5	24.2	1	12.9	25.4	8	50.3	37.5
45-54	7	1	20.8	34.4	1	10.0	24.0	1	20.8	34.4	4	48.3	54.8
55-64	1	0	----	----	0	----	----	0	----	----	1	100.0	0.0
Total	75	9	15.3	14.3	19	29.6	8.7	8	11.7	16.9	39	43.4	17.8

A big proportion of current consumers take 5 or more standard drinks per drinking day both for men and women. Binge drinking is defined as having 5 or more standard drinks per drinking day for males and 4 or more standard drinks per drinking day for females on any day in the last week. The survey showed (*Table 5.2.6*) that overall 65.7% (± 9.7) of current alcohol consumers were binge drinkers, with a higher proportion for males (67.1% ± 8.4) as compared to females (55.0% ± 19.0). The highest proportion of binge drinking were in the younger age groups, with men engaging in binge drinking more frequently than women (men: 33.4 days; women 16.8 days) (*Annex Table 4.3*). However these differences were not statistically significant.

Table 5.2.6 Binge drinking† amongst men and women by agegroup†

Age	Men (N=377)			Women (N=75)			Total Population (N=452)		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
15-24	108	60.9	15.5	22	50.9	25.8	130	59.4	16.8
25-34	80	68.6	13.6	10	53.4	26.0	90	67.3	13.9
35-44	47	78.6	11.6	9	63.2	24.1	56	76.9	11.6
45-54	18	72.9	16.9	5	69.2	24.6	23	72.5	15.6
55-64	4	57.8	36.5	1	100.0	0.0	5	59.9	36.8
Total	257	67.1	8.4	47	55.0	19.0	304	65.7	9.7

The survey also asked where alcoholic beverages were commonly obtained from and 76.4% reported that they get their alcoholic drinks from stores and 18.1% from friends and relatives (*Annex Table 4.6*). Men were more likely to obtain alcohol from stores whilst women were more likely to obtain alcohol from friends and relatives.

Foods that were commonly eaten while consuming alcohol were sashimi (72.5%), raw poultry parts (49.6%) and cooked meats/poultry (48.9%). There were also preferences, especially amongst females, for sweets (53.1%), and chips/pretzels/popcorn (50.9%) (*Annex Table 4.7*).

5.2.4 Diet

Low consumption of fruit and vegetables has been identified as a risk factor in the development of a range of chronic diseases, including coronary heart disease, stroke and many forms of cancer.

In order to assess the eating habits of the surveyed population, the respondents were asked how often they ate fruit, vegetables, local foods and the type of oil or fat used in food preparation.

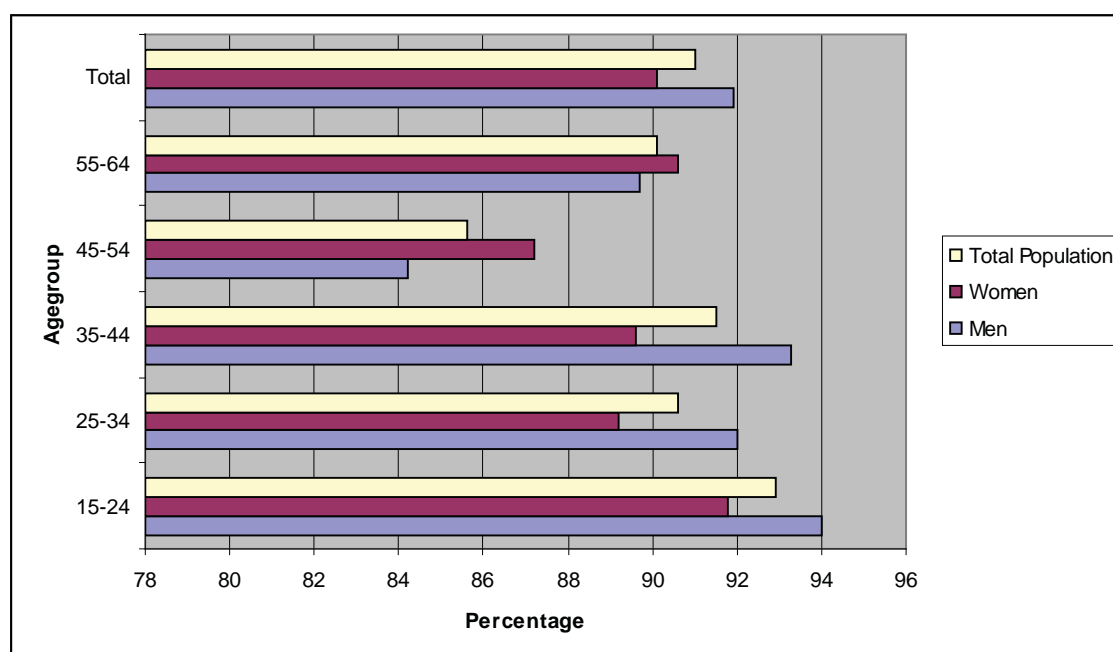
Table 5.2.7 Proportion of population consuming less than 5 servings of fruit and vegetables per day

Age	Men			Women			Total Population		
	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	436	94.0	3.0	570	91.8	3.3	1010	92.9	2.8
25-34	257	92.0	2.6	396	89.2	2.5	654	90.6	2.2
35-44	200	93.3	2.7	296	89.6	2.8	496	91.5	2.0
45-54	128	84.2	7.2	201	87.2	4.2	329	85.6	4.9
55-64	64	89.7	7.3	84	90.6	4.9	148	90.1	4.5
Total	1085	91.9	2.2	1547	90.1	2.4	2637	91.0	2.0

According to WHO and FAO (1), the required intake for optimal health benefits is 400grams of fruits and vegetables a day which equates approximately to five daily serves of fruit and vegetable a day. Overall 91.0% (± 2.0) consumed less than 5 servings of fruit and vegetable per day (*Table 5.2.7 and Figure 5.6*). This means that only 9.0% of the population would have consumed 5 or more servings of fruit and vegetables per day. Respondents aged 45–54 years reported the highest prevalence of consuming 5 combined servings of fruits and vegetables (*Fig 5.6*) although this difference is not statistically significant.

This situation has become a common observation in many Pacific Island Countries (PICs), and both availability and behavioural factors are the major determinants of fruit and vegetable consumption. On average the mean number of days when fruit or vegetable was consumed was 2.6 days a week for men and 2.7 days for women (*Annex Tables 5.1 and 5.3*). It could be stated that the survey population were not taking adequate servings of fruits and vegetables and on too few days

Fig 5.6 Less than 5 Combined Servings of Fruits and Vegetables



With regards to the type of oil most often used for food preparation at home, among those who usually prepared food, the vast majority reported using suet/lard (70.7%) (Table 5.2.8). Among the female respondents, 70.8% also reported using suet followed by butter or ghee (25.3%) (animal-based fat). These statistics could provide a basis for possible intervention in either trade regulations combined with behavioural marketing for change in the type of oil marketed and used by consumers.

Table 5.2.8 Type of oil or fat used, if respondent prepares meals

Total Population																			
Age	N	Vegetable oil			Butter or ghee			Margarine			Suet/Lard			None			Other		
		n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	532	26	5.0	3.6	130	29.0	10.4	0	----	----	376	65.9	10.5	0	----	----	0	----	----
25-34	463	13	2.8	3.1	97	24.1	9.0	2	0.3	0.5	351	72.8	9.7	0	----	----	0	----	----
35-44	370	10	2.9	3.1	68	23.3	9.4	0	----	----	290	73.4	11.2	2	0.4	0.8	0	----	----
45-54	234	8	4.5	2.3	46	23.5	10.3	0	----	----	180	72.0	12.2	0	----	----	0	----	----
55-64	92	6	8.4	8.7	10	14.6	10.7	0	----	----	75	75.7	9.2	0	----	----	1	1.4	3.1
Total	1691	63	4.0	2.9	351	25.1	8.7	2	0.1	0.1	1272	70.7	9.8	2	0.1	0.2	1	0.1	0.2
Men																			
15-24	78	3	3.0	7.3	18	31.2	27.5	----	----	----	57	65.8	25.3	0	----	----	0	----	----
25-34	78	6	6.5	7.5	10	11.8	12.0	----	----	----	62	81.8	14.2	0	----	----	0	----	----
35-44	59	1	1.0	2.5	17	33.6	31.2	----	----	----	40	64.4	29.7	1	1.0	2.5	0	----	----
45-54	39	3	9.4	8.7	11	22.8	7.4	----	----	----	25	67.8	11.5	0	----	----	0	----	----
55-64	22	2	11.4	15.3	3	11.5	14.2	----	----	----	16	73.3	13.1	0	----	----	1	3.8	9.5
Total	276	15	5.1	4.5	59	23.4	18.8	----	----	----	200	71.1	19.0	1	0.2	0.5	1	0.3	0.6
Women																			
15-24	452	23	5.6	2.7	110	27.6	5.6	0	----	----	319	66.8	7.2	0	----	----	----	----	----
25-34	384	7	1.5	1.9	87	28.7	10.6	2	0.4	0.7	288	69.5	10.2	0	----	----	----	----	----
35-44	311	9	3.5	3.9	51	20.0	6.5	0	----	----	250	76.3	7.2	1	0.3	0.6	----	----	----
45-54	195	5	2.7	2.3	35	23.7	12.7	0	----	----	155	73.6	13.1	0	----	----	----	----	----
55-64	70	4	6.6	8.5	7	16.4	11.3	0	----	----	59	77.0	14.8	0	----	----	----	----	----
Total	1412	48	3.7	2.6	290	25.3	6.9	2	0.1	0.2	1071	70.8	7.9	1	0.1	0.1	----	----	----

5.2.5 Physical Activity

Physical activity participation in the STEPS survey was measured by asking participants to report on the frequency and amount of different types of activity they undertook on a typical day as part of work, travel and leisure. The respondents were required to estimate how much time they spent for each of the domains in a 24 hour period and also how many days in a week they do so.

The unit for measuring physical activity is Metabolic Equivalent (MET) which is the ratio of the activity metabolic rate to the resting metabolic rate. One MET is defined as 1 kcal/kg/hour and is equivalent to the energy cost of sitting quietly. A MET is also defined as oxygen uptake in ml/kg/min with one MET equal to the oxygen cost of sitting quietly, around 3.5 ml/kg/min.

For the calculation of physical activity the following MET values are used:

Domain	METS value
Work	o Moderate MET value = 4.0
	o Vigorous MET value = 8.0
Transport Cycling and walking	o MET value = 4.0
Recreation/ Leisure	o Moderate MET value = 4.0
	o Vigorous MET value = 8.0

MET values are applied to vigorous and moderate intensity variables in the work and recreation settings. These have been calculated using an average of the typical types of activity undertaken. Different types of activities have been grouped together and given a MET value based on the intensity of the activity. Applying MET values to activity levels allows us to calculate total physical activity.

Table 5.2.9 Mean time (mins) spent per day on physical activity by domain, agegroup and gender

Age	Total population								
	Work			Transport			Leisure		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	754	18.2	9.3	754	47.2	13.4	754	13.3	6.2
25-34	490	11.9	5.4	490	51.8	15.7	490	18.6	19.0
35-44	388	26.2	8.7	388	38.2	16.1	388	10.0	7.1
45-54	279	16.4	14.0	279	43.7	24.0	279	5.2	5.3
55-64	121	26.0	19.5	121	20.1	8.4	121	3.2	2.6
Total	2032	18.4	5.8	2032	44.6	13.7	2032	12.3	7.1
Men									
15-24	295	27.7	20.2	295	55.6	17.5	295	20.2	10.7
25-34	163	13.9	6.2	163	59.8	29.7	163	31.0	34.8
35-44	141	29.6	10.4	141	35.1	17.8	141	12.6	8.3
45-54	103	18.3	10.3	103	42.8	30.9	103	6.5	9.3
55-64	48	38.7	37.0	48	17.9	8.3	48	4.5	4.5
Total	750	24.2	9.5	750	48.4	16.5	750	18.2	12.1
Women									
15-24	458	10.2	4.0	458	40.2	13.7	458	7.6	4.4
25-34	326	10.2	6.1	326	45.5	13.2	326	8.7	6.9
35-44	247	23.2	11.9	247	40.8	21.6	247	7.7	7.8
45-54	176	14.1	22.4	176	44.8	20.4	176	3.8	5.2
55-64	73	12.4	13.2	73	22.5	14.7	73	1.9	2.3
Total	1280	13.3	6.4	1280	41.3	12.9	1280	7.2	3.7

Whilst median time would have been a better measure this was not possible due to responses given hence the use of mean as measure of central tendency. There is great consensus on the recommendation of taking 30minutes moderate intensity physical activity for most days of the week for improved health(2). The mean time spent per day in moderate or vigorous intensity physical activity at

leisure (12.3 ± 7.1) is significantly less than work (18.4 ± 5.8) and travel (44.6 ± 13.7) and this trend persists across gender and age groups (Table 5.2.9). It could be stated that the population of the Marshall Islands accrue most of their physical activity during work and travel and that not too many are doing physical activity at leisure time for health benefits.

Overall, men spent more time per day doing moderate and vigorous-intensity physical activity than women across the three domains.

The levels of total physical activity were then categorized as follows:

- High** : IF the sum of days spent in vigorous intensity physical activity during work and leisure ≥ 3 days **AND** total physical activity MET minutes per week is ≥ 1500
- OR**
- :IF the sum total of days spent in moderate or vigorous intensity physical activity across the three domains ≥ 7 days **AND** total physical activity MET minutes per week is ≥ 3000
- Moderate** : IF the sum of days spent in vigorous intensity physical activity during work and leisure ≥ 3 days **AND** sum of actual time spent per day doing those activities ≥ 60 minutes
- OR**
- : IF the sum total of days spent in moderate intensity physical activity across the three domains ≥ 5 days **AND** sum of actual time spent per week doing those activities ≥ 150 minutes
- OR**
- : IF the sum total of days spent in moderate or vigorous intensity physical activity across the three domains ≥ 5 days **AND** total physical activity MET minutes per week ≥ 600
- Low** : the value does not reach the criteria for either high or moderate levels of physical activity

A strength of this approach is that it provides sufficient detail to determine how much of each individual's work and travel activity contributed towards the accumulation of the recommended amounts of activity for health gain, which are stated in terms of the duration of moderate- and vigorous-intensity activity.

Table 5.2.10 Levels of total physical activity by agegroup and gender

Age	Total population									
	N	Low			Moderate			High (Vigorous)		
		n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	754	484	63.6	5.8	85	11.2	2.9	185	25.2	5.0
25-34	490	332	66.4	4.0	56	10.9	3.8	102	22.7	4.6
35-44	388	249	64.3	4.7	54	14.1	2.2	85	21.6	4.0
45-54	279	204	72.9	4.6	33	11.3	3.6	42	15.8	2.6
55-64	121	88	71.5	7.2	10	6.9	3.3	23	21.6	7.1
Total	2032	1357	66.1	4.1	238	11.5	1.9	437	22.4	3.5
Men										
15-24	295	165	56.7	9.2	38	11.9	4.5	92	31.4	7.7
25-34	163	95	59.2	8.4	24	13.4	6.5	44	27.5	8.4
35-44	141	88	62.2	10.1	18	13.1	6.2	35	24.7	5.9
45-54	103	75	75.6	5.8	10	9.2	5.1	18	15.2	3.6
55-64	48	29	59.5	12.3	4	5.9	4.5	15	34.6	12.3
Total	750	452	61.3	6.8	94	11.7	3.4	204	27.0	5.6
Women										
15-24	458	318	69.3	5.8	47	10.7	3.2	93	20.0	4.8
25-34	326	237	72.3	2.2	32	9.0	2.6	57	18.7	3.1
35-44	247	161	66.2	4.7	36	14.9	3.4	50	18.8	4.2
45-54	176	129	69.9	7.1	23	13.7	4.0	24	16.4	4.7
55-64	73	59	84.3	7.1	6	8.0	4.1	8	7.8	6.4
Total	1280	904	70.3	2.8	144	11.3	1.2	232	18.4	2.5

As noted in Table 5.2.10, the total prevalence of low physical activity is 66.1% (± 4.1) which is higher than those who take moderate physical activity (11.5% ± 1.9) whilst 22.4% (± 3.5) take vigorous physical activity. Although not statistically significant, women in general are notably less active with low total physical activity (70.3% ± 2.8) compared to men (61.3% ± 6.8). In general, women and men in the youngest age group are more active than the older age groups

For leisure-time physical activity, it is interesting to note from *Annex Table 6.2* that 6.6% (± 4.4) of the total population engage in moderate-intensity physical activity and a further 4.4% (± 2.6) who engage in vigorous intensity physical activity. Males by far engaged in more moderate and vigorous-intensity physical activity than females. However, at work women engage more in moderate-intensity physical activity (14.8% ± 7.5) than males (11.2% ± 3.9) (*Annex Table 6.3*), while men are more likely to engage in vigorous-intensity physical activity at work.

5.3 Physical Measures

5.3.1 Body Mass Index

All STEP 2 participants had measurements of height, weight, and waist circumference. The height and weight measurements were used to calculate body mass index in order to demonstrate the status of obesity, and waist measurement to determine central obesity. Body mass index (BMI) was calculated for each participant as the weight in kilograms over the height in meters squared. Risk categories were calculated for BMI as follows (International standard):

Underweight	BMI <18.5
Normal weight	BMI=18.5-24.9
Overweight	BMI = 25.0 to 29.9 (Risk)
Obese	BMI \geq 30.0 (Risk)

Height and Weight

Males had a mean height of 163.3 cm (\pm 1.4) and a mean weight of 72.2kg (\pm 1.4). In comparison, females were significantly shorter with a mean height of 151.6cm (\pm 0.6) and significantly lighter with a mean weight of 66.1kg (\pm 1.4) (*Annex Tables 11.1 and 11.2*).

Table 5.3.1 Mean BMI (kg/m²) by agegroup and gender

Age	Men (N=762)			Women* (N=1187)			Total population* (N=1954)		
	n	Mean	CI(\pm)	n	Mean	CI(\pm)	n	Mean	CI(\pm)
15-24	273	23.5	0.9	410	24.7	0.8	687	24.1	0.7
25-34	176	28.3	1.2	300	29.8	0.6	477	29.0	0.6
35-44	147	28.9	1.0	231	31.8	0.9	378	30.3	0.8
45-54	114	29.8	0.8	170	31.6	1.8	284	30.7	1.0
55-64	52	27.2	1.4	76	31.2	2.0	128	29.1	1.5
Total	762	26.7	0.5	1187	28.5	0.7	1954	27.6	0.5

* Pregnant females excluded

Table 5.3.2 BMI categories by age group and gender*

Age	N	Total Population											
		Underweight (<18.5)			Normal weight (18.5-24.9)			Overweight (25.0-29.9)			Obese (\geq 30.0)		
		n	%	CI(\pm)	n	%	CI(\pm)	n	%	CI(\pm)	n	%	CI(\pm)
15-24	687	44	6.6	1.8	412	58.8	6.3	158	23.9	4.6	73	10.6	2.4
25-34	477	3	0.7	1.2	118	25.2	3.4	147	32.3	5.6	209	41.9	3.8
35-44	378	2	0.8	1.5	51	15.6	5.9	137	36.1	5.7	188	47.4	3.8
45-54	284	2	0.8	1.8	40	12.0	6.0	97	38.1	11.7	145	49.1	6.1
55-64	128	4	3.1	7.6	22	18.1	6.6	47	40.5	9.5	55	38.3	9.3
Total	1954	55	3.1	0.7	643	34.4	3.4	586	30.9	3.4	670	31.6	2.8
Men													
15-24	273	27	9.0	4.4	168	59.5	9.3	57	23.4	7.4	21	8.0	2.9
25-34	176	1	0.5	1.2	51	27.2	5.5	62	35.8	6.6	62	36.5	4.1
35-44	147	1	1.3	3.1	33	21.7	7.9	57	39.0	9.0	56	38.1	6.7
45-54	114	1	1.0	2.3	13	9.9	6.0	46	43.4	15.4	54	45.7	9.6
55-64	52	1	2.8	6.8	14	25.1	14.2	22	48.0	17.3	15	24.1	7.6
Total	762	31	4.1	1.3	279	36.1	3.9	244	33.3	5.0	208	26.6	3.3
Women													
15-24	410	17	4.2	1.8	242	58.2	4.6	100	24.3	3.3	51	13.3	3.2
25-34	300	2	0.9	1.6	67	22.9	6.1	85	28.3	7.4	146	47.8	5.2
35-44	231	1	0.4	0.9	18	9.3	5.9	80	33.0	5.0	132	57.3	4.2
45-54	170	1	0.4	1.1	27	14.4	7.9	51	31.9	10.4	91	53.2	7.8
55-64	76	3	3.4	8.5	8	10.7	6.8	25	32.7	11.3	40	53.1	15.8
Total	1187	24	2.2	0.7	362	32.4	4.8	341	28.3	2.7	460	37.1	4.4

* Pregnant females excluded

On average both men and women of the Marshall Islands are overweight according to the international classification with the mean BMI of 28.5 (± 0.7) for females and 26.7 (± 0.5) for males (Table 5.3.1). There was a trend of increasing BMI with age for both genders, and declining in the oldest age group.

Overall 62.5% of the population were either overweight or obese, increasing with age with a higher prevalence amongst females (65.4%) compared to males (59.8%) (Table 5.3.2). The survey revealed a four fold increase in obesity in the surveyed population: from 10.6% (± 2.4) among 15-24 year olds to 41.9% (± 3.8) among 25-34 years (Figures 5.7 and 5.8). This trend persisted across both gender groups with more marked effect in males where there is almost a five-fold increase. In a country where there is coexistence of under- and overnutrition this is an expected trend as population picks up weight at late adolescent years after puberty. Rapid weight gain after the first post-natal period for women may explain the sharp increase in obesity but the increase in men needs to be further explored.

Figure 5.7: BMI Categories by agegroup: Male

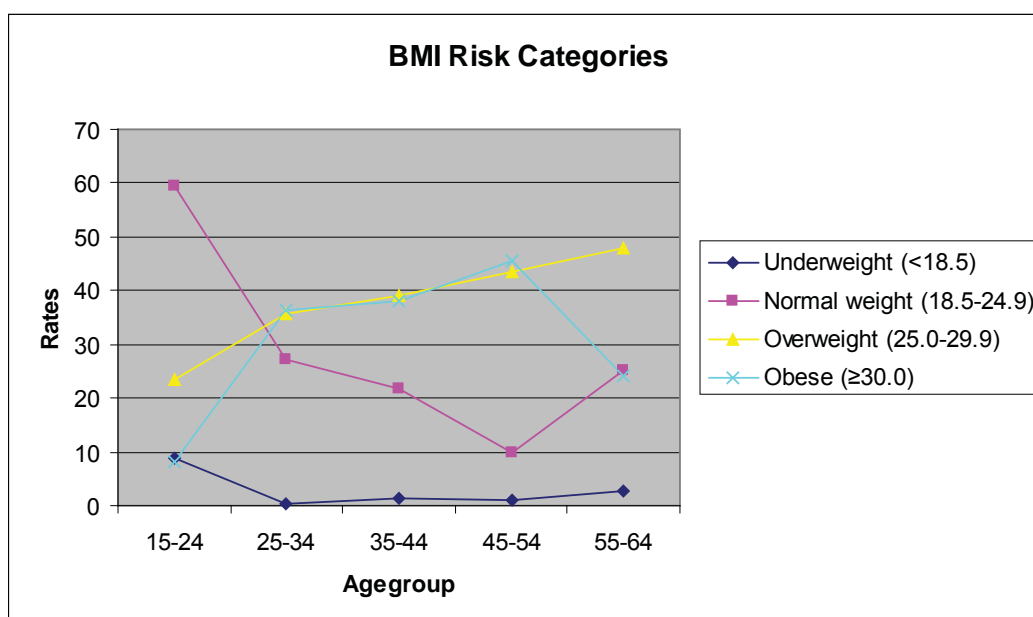
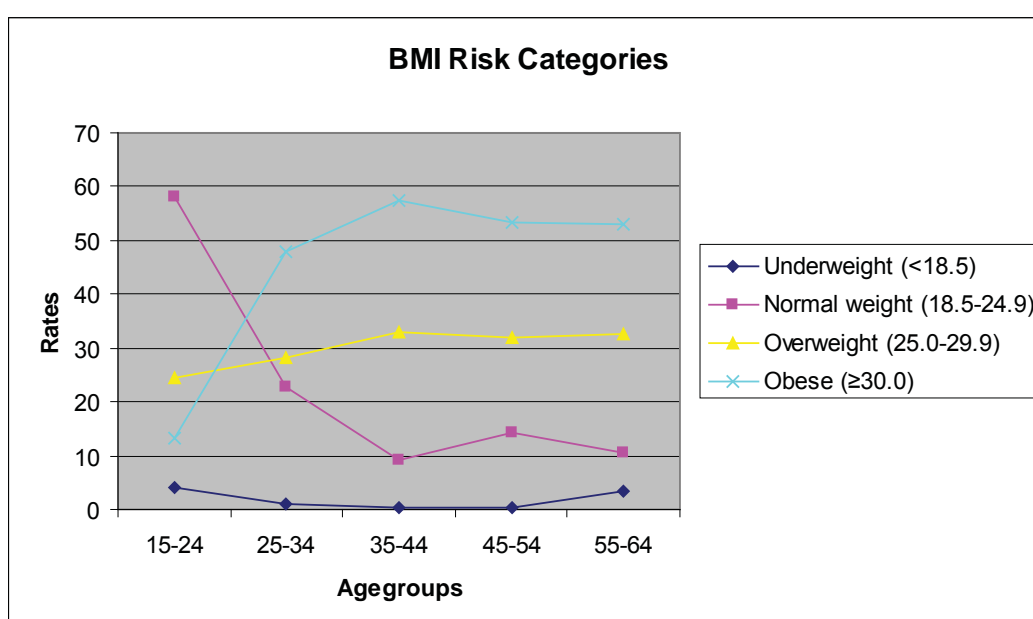


Figure 5.8: BMI Categories by agegroup: Female



5.3.2 Waist Circumference

The presence of excess fat in the abdomen out of proportion to total body fat is an independent NCD risk factor. Waist circumference is positively correlated with abdominal fat content. It provides a clinically acceptable measurement for assessing a patient's abdominal fat content before and during weight loss treatment. The sex-specific cutoffs noted can be used to identify increased relative risk for the development of obesity-associated risk factors in most adults with a BMI of 25 to 34.9 kg/m (3).

High Risk:
Men ≥ 102 cm (≥ 40 in)
Women ≥ 88 cm (≥ 35 in)

Table 5.3.3 Mean waist circumference (cm) by agegroup and gender

Age	Men			Women*			Total population*		
	n	Mean	CI(\pm)	n	Mean	CI(\pm)	n	Mean	CI(\pm)
15-24	279	78.0	1.9	414	79.0	2.3	696	78.5	1.9
25-34	175	91.7	3.4	301	93.1	3.0	477	92.4	2.9
35-44	151	95.9	2.3	233	99.3	3.3	384	97.6	2.3
45-54	116	102.0	3.1	169	99.4	3.5	285	100.8	3.1
55-64	53	96.9	5.9	76	100.7	4.4	129	98.7	4.5
Total	774	88.8	1.7	1193	89.9	2.7	1971	89.3	2.0

* Pregnant females excluded

The survey revealed that the mean waist circumference for males is 88.8cm (± 1.7) compared to females of 89.9cm (± 2.7) (Table 5.3.3). Waist circumference for males remained below the high risk category classified as central obesity (≥ 102 cm) while females on average are centrally obese with mean waist circumference (≥ 88 cm) starting from age 25 and above. Overall, the percentage of central obesity in the population is 35.4% (± 5.2) (Table 5.3.4) with females being three times ($54.2\% \pm 6.5$) more likely than males ($18.4\% \pm 5.1$) to be centrally obese. There was a trend of increasing proportion of females having central obesity with increasing age whilst in males the prevalence peaked at 45-54 years. This gender differences is observed in most pacific island countries.

Table 5.3.4 Central obesity by agegroup and gender

Age	Men				Women**				Total population**			
	N	Obese			N	Obese			N	Obese		
		n	%	CI(\pm)		n	%	CI(\pm)		n	%	CI(\pm)
15-24	279	7	2.6	1.9	414	83	20.6	6.8	696	90	11.2	3.8
25-34	175	36	20.6	10.2	301	200	65.1	6.8	477	236	41.6	7.9
35-44	151	37	24.4	9.3	233	189	82.5	6.8	384	226	52.5	7.4
45-54	116	57	47.4	11.1	169	137	81.7	10.7	285	194	63.1	9.4
55-64	53	18	31.0	18.3	76	66	87.2	12.2	129	84	58.0	11.3
Total	774	155	18.4	5.1	1193	675	54.2	6.5	1971	830	35.4	5.2

** Pregnant females excluded

5.3.3 Blood Pressure

STEP 1 data regarding hypertension included information on knowledge about contributing factors for hypertension, complications of hypertension, whether they had received information on hypertension from various sources, when participants had last had their blood pressure measured by a health professional, whether they had ever been told by a health worker that they had high blood pressure, and whether they were currently receiving any treatment for high blood pressure.

STEP 2 data regarding hypertension included the measurements of blood pressure. Summary data on the prevalence of hypertension includes those classified as having:

- ✓ a mean systolic pressure ≥ 140 mmHg, whether or not they had previously been told by a health worker that they had high blood pressure, OR
- ✓ a mean diastolic pressure ≥ 90 mmHg, whether or not they had previously been told by a health worker that they had high blood pressure, OR
- ✓ those who were currently receiving anti-hypertensive medication, whether or not they had previously been told by a health worker that they had high blood pressure and they had normal mean systolic and diastolic pressures.

Those participants who reported having been ever told by a health worker that they had high blood pressure but who had normal blood pressure measurement and NOT on anti-hypertensive medication were NOT included among those considered to have hypertension.

The survey revealed that overall the mean systolic blood pressure measurement was 113.0mmHg (± 2.9) and the mean diastolic blood pressure was 68.0mmHg (± 2.6) (Table 5.3.5) excluding those taking hypertension medications. On average, males had higher blood pressure measurements than females for both systolic (males 117.8mmHg ± 3.4 : females 107.8mmHg ± 2.9) and diastolic (males 69.3mmHg ± 2.8 : females 66.7mmHg ± 2.4) readings.

Table 5.3.5 Mean resting blood pressure (mmHg) [†] by age group and gender

Total Population						
Age	Systolic			Diastolic		
	n	Mean	CI(\pm)	n	Mean	CI(\pm)
15-24	719	108.4	3.6	718	62.4	2.9
25-34	497	111.2	3.5	497	68.7	3.0
35-44	378	115.5	2.8	378	72.9	2.0
45-54	259	122.6	4.6	259	75.2	3.6
55-64	100	129.2	6.9	100	75.0	2.9
Total	1953	113.0	2.9	1952	68.0	2.6
Men						
15-24	277	113.5	4.5	276	63.0	3.6
25-34	175	116.7	4.2	175	70.6	3.0
35-44	147	119.6	3.3	147	74.0	2.4
45-54	108	126.8	5.7	108	76.6	4.2
55-64	50	128.6	8.1	50	75.1	4.0
Total	757	117.8	3.4	756	69.3	2.8
Women						
15-24	438	103.4	3.4	438	61.8	2.5
25-34	321	105.5	3.7	321	66.7	3.4
35-44	231	111.3	2.6	231	71.6	2.4
45-54	151	117.3	3.7	151	73.4	3.2
55-64	50	130.1	10.3	50	74.9	3.4
Total	1191	107.8	2.9	1191	66.7	2.4

[†] Excludes persons taking medication for high blood pressure

Table 5.3.6 Prevalence of hypertension by age group and gender

Age	Total population			
	N	Prevalence of Hypertension†		
		n	%	CI(±)
15-24	720	13	1.9	1.4
25-34	501	25	5.6	3.2
35-44	390	54	14.9	8.1
45-54	285	77	26.4	7.7
55-64	134	65	45.6	12.9
Total	2030	234	10.5	3.5
Men				
15-24	276	7	2.2	2.3
25-34	177	14	7.9	5.9
35-44	150	26	18.6	13.4
45-54	118	34	27.9	10.6
55-64	55	16	32.8	12.9
Total	776	97	11.6	5.3
Women				
15-24	440	6	1.7	1.5
25-34	323	11	3.3	2.0
35-44	240	28	11.1	3.4
45-54	167	43	24.6	6.9
55-64	79	49	59.5	18.6
Total	1249	137	9.3	2.4

† SBP \geq 140 and/or DBP \geq 90 or on medication for hypertension

The prevalence of hypertension for 15-64 years is 10.5% (\pm 3.5): 11.6% (\pm 5.3) of men and 9.3% (\pm 2.4) of women. Whilst there is no specific trend for men, there seems to be a monotonic increase of prevalence of hypertension with increasing age for women. When excluding the youngest 10 year age group (15-24 years), the prevalence of hypertension is 15.9% (\pm 4.8), with 17.4% (\pm 6.7) for males and 14.3% (\pm 3.8) for females (*Annex Table 11.3*).

5.4 Biochemical Measures

5.4.1 Fasting Blood Glucose

STEP 1 data regarding diabetes included information on knowledge of contributing factors for diabetes, symptoms and complications of diabetes, whether they had received information on diabetes from various sources, whether participants had had their blood sugar measured in the last 12 months, whether they had ever been told by a health worker that they had diabetes, and whether they were currently receiving any treatment for diabetes. STEP 3 data regarding diabetes were collected on one-half of the participants in the 15-64 year age group and included the fasting blood glucose measurement as noted in the Methodology section. Summary data on the prevalence of diabetes for those in the 15-64 years age group includes those with:

- ✓ a fasting blood glucose greater than or equal to 126 mg/dl (7.0 mmol/L), whether or not they had previously been told by a health worker that they had diabetes, **OR**
- ✓ a normal fasting blood glucose (i.e. < 126 mg/dl (7.0 mmol/L)) **AND** who were currently receiving anti-diabetes medication or were on a special diet prescribed by a health worker.

Those participants who reported having ever been told by a health worker that they had diabetes but who had a normal fasting blood glucose and who were NOT on anti-diabetes medication or on a special diet prescribed by a health worker were NOT included among those considered to have diabetes.

Table 5.4.1 *Mean fasting blood glucose (mg/dL) by agegroup and gender

Age	Men			Women			Total population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	95	93.7	4.7	136	93.7	8.9	233	93.6	5.4
25-34	92	103.4	8.3	150	94.8	6.7	242	99.1	5.4
35-44	90	114.0	14.4	144	131.7	15.0	234	122.7	13.1
45-54	69	139.8	14.2	81	149.3	24.4	150	143.7	15.3
55-64	35	145.4	30.5	27	142.5	19.7	62	144.3	18.3
Total	381	107.9	5.9	538	108.1	7.5	921	107.9	6.0

* Excluding those on medication

Overall the mean fasting blood glucose was 107.9mg/dl \pm 6.0 (6.0 \pm 0.3mmol/L) with no significant difference between males (107.9 mg/dl \pm 5.9) and females (108.1 mg/dl \pm 7.5). Overall there was a trend of increasing mean fasting blood glucose levels with age with 93.6mg/dl \pm 5.4 among those aged 15-24 years to 144.3mg/dl \pm 18.3 among those aged 55-64 years (*Table 5.4.1*).

Table 5.4.2 Elevated fasting blood glucose by agegroup and gender

Age	N	Men Elevated (≥126 mg/dl)			N	Women Elevated (≥126 mg/dl)			Total population Elevated (≥126 mg/dl)			
		n	%	CI(±)		n	%	CI(±)	N	n	%	CI(±)
15-24	95	4	4.7	5.5	136	11	7.3	5.1	233	15	5.9	3.2
25-34	92	8	9.7	6.3	152	11	7.1	5.0	244	19	8.4	2.7
35-44	95	24	25.7	14.0	151	55	33.4	11.7	246	79	29.5	10.2
45-54	80	44	53.4	4.7	107	57	54.2	11.7	187	101	53.7	6.3
55-64	42	18	44.0	13.3	42	28	66.7	12.4	84	46	53.6	7.4
Total	404	98	18.6	3.8	588	162	20.1	4.4	994	260	19.3	3.1

Overall 19.3% \pm 3.1 had elevated fasting blood glucose (\geq 126mg/dl) with the proportions increasing with age: from 8.4% \pm 2.7 among those aged 25-34 years to 29.5% \pm 10.2 in the 35-44 years age group with the prevalence doubling for the next 10 year age group (*Table 5.4.2*). The same trend was noted in both males and females with a higher prevalence in women. This could represent newly diagnosed cases of diabetes as it excludes those currently on medication for diabetes.

Table 5.4.3 Prevalence of diabetes by gender and age group

Age	Men				Women				Total population			
	N	n	%	CI(±)	N	n	%	CI(±)	N	n	%	CI(±)
15-24	95	4	4.7	5.5	136	11	7.3	5.1	233	15	5.9	3.2
25-34	92	8	9.7	6.3	152	11	7.1	5.0	244	19	8.4	2.7
35-44	95	24	25.7	14.0	151	57	34.7	11.6	246	81	30.1	10.2
45-54	80	45	53.9	5.3	107	58	54.9	11.1	187	103	54.4	6.1
55-64	42	19	47.4	10.8	42	29	68.5	13.2	84	48	56.4	7.0
Total	404	100	18.9	4.0	588	166	20.5	4.3	994	266	19.6	3.2

When including those already diagnosed with diabetes and currently on treatment, the prevalence of diabetes for the Marshallese population in the age group 15-64 years is 19.6% (± 3.2) with 18.9% (± 4.0) for men and 20.5% (± 4.3) for women. This rate is high compared to some PICs (Fiji 16%, Nauru 16.2%) but low compared with American Samoa (47.3%).

5.4.2 Blood Lipids (Total Cholesterol, HDL, LDL Triglyceride)

A follow-up from the famous Framingham Heart Study (8) found that under age 50 years, cholesterol levels are directly correlated with 30-year overall and cardiovascular disease (CVD) mortality — overall death increases 5% and CVD death increases 9% for each 10 mg/dL increase in cholesterol. The same study also found an inverse correlation between cholesterol levels and mortality in participants over 50 years of age — an 11% increase overall and a 14% increase in CVD mortality per 1 mg/dL per year drop in cholesterol levels. However, the authors attributed that inverse correlation to terminal participants with diseases that affected cholesterol levels.

Elevated levels of the lipoprotein fractions, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and Very Low Density Lipoprotein (VLDL) are regarded as *atherogenic* (prone to cause atherosclerosis). Levels of these fractions, rather than the total cholesterol level, correlate with the extent and progress of atherosclerosis. Conversely, the total cholesterol can be within normal limits, yet be made up primarily of small LDL and small HDL particles, under which conditions atheroma growth rates would still be high. In contrast, however, if LDL particle number is low (mostly large particles) and a large percentage of the HDL particles are large, then atheroma growth rates are usually low, even negative, for any given total cholesterol concentration.

Total cholesterol

The mean total cholesterol level of surveyed males was 165.6 mg/dl (± 12.6) and of surveyed females was 173.8 mg/dl (± 21.7), a difference of no statistical significance (*Table 5.4.4*). For both males and females, there was a trend of an increasing mean cholesterol level with age and with a persistent tendency for rates in each age group to be higher for females than males although not statistically significant.

Table 5.4.4 Mean total cholesterol (mg/dL) by agegroup and gender

Age	Men (N=401)			Women (N=585)			Total population (N=988)		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	95	137.3	14.7	131	150.4	15.5	228	144.6	13.8
25-34	93	175.1	18.9	155	174.5	24.4	248	174.8	19.1
35-44	93	189.0	19.4	147	191.7	34.1	240	190.3	25.8
45-54	79	185.3	14.0	108	197.9	28.6	187	190.9	18.7
55-64	41	193.8	27.8	44	232.1	40.6	85	210.4	27.3
Total	401	165.6	12.6	585	173.8	21.7	988	169.8	16.9

The mean cholesterol levels were used to categorize individuals into a high-risk group if total cholesterol is ≥ 200 mg/dl. The proportion of males in this high-risk group was 20.3% (± 9.0) and for females was 22.9% (± 13.1) (Table 5.4.5), a difference that was not statistically significant. There is usually higher levels of hypercholesterolemia with males at population level than females due to the protective action of estrogen in women.

Table 5.4.5 Proportion of elevated total cholesterol by agegroup and gender

Age	Men				Women				Total population			
	N	Elevated (≥ 200 mg/dL)			N	Elevated (≥ 200 mg/dL)			N	Elevated (≥ 200 mg/dL)		
		n	%	CI(\pm)		n	%	CI(\pm)		n	%	CI(\pm)
15-24	95	7	6.5	7.6	131	17	11.9	10.0	228	25	9.4	7.7
25-34	93	25	24.2	20.5	155	33	20.2	13.9	248	58	22.2	14.9
35-44	93	30	32.2	14.6	147	46	32.5	21.2	240	76	32.3	16.9
45-54	79	26	30.4	11.4	108	38	33.5	17.6	187	64	31.7	12.5
55-64	41	15	33.8	21.2	44	29	63.6	17.7	85	44	46.8	15.6
Total	401	103	20.3	9.0	585	163	22.9	13.1	988	267	21.6	10.8

High Density Lipoprotein (HDL) Cholesterol

Data from the Framingham Heart Study showed that for a given level of LDL, the risk of heart disease increases 10-fold as the HDL varies from high to low. Conversely, for a fixed level of HDL, the risk increases 3-fold as LDL varies from low to high.

Epidemiological studies have shown that high concentrations of HDL (over 60 mg/dL) have protective value against cardiovascular diseases such as stroke and myocardial infarction. As such, low levels of HDL cholesterol (≤ 35 mg/dL) are recognized as an independent risk factor for coronary artery disease.

The mean HDL cholesterol of the surveyed population was 38.8mg/dl (± 4.0) with 36.1mg/dl (± 2.7) for males and 41.5mg/dl (± 5.1) for surveyed females but this gender difference was not statistically significant. No trend for difference in mean HDL cholesterol level was shown with age for either males or females. As expected HDL cholesterol levels were consistently lower in males than in females although not statistically significant.

Table 5.4.6 Mean HDL cholesterol (mg/dL) by agegroup and gender

Age	Men			Women			Total population		
	n	Mean	CI(\pm)	n	Mean	CI(\pm)	n	Mean	CI(\pm)
15-24	96	36.7	3.1	131	42.1	4.7	229	39.5	3.8
25-34	93	37.6	3.1	156	41.2	6.2	249	39.4	4.6
35-44	93	34.8	3.0	148	41.3	6.2	241	38.0	4.7
45-54	79	34.2	2.3	108	40.0	5.1	187	36.8	3.1
55-64	41	35.0	5.9	44	42.4	8.9	85	38.2	6.2
Total	402	36.1	2.7	587	41.5	5.1	991	38.8	4.0

The HDL cholesterol level for each respondent was used to categorize individuals into a high-risk group with a HDL cholesterol level ≤ 35 mg/dl. The proportion of males in this high-risk group was 48.8% ± 9.7 and for females was 29.1% ± 10.2 (Table 5.4.7).

Table 5.4.7 Proportion of low HDL cholesterol by agegroup and gender

Age	Men				Women				Total population			
	N	Low (≤ 35 mg/dL)			N	Low (≤ 35 mg/dL)			N	Low (≤ 35 mg/dL)		
		n	%	CI(\pm)		n	%	CI(\pm)		n	%	CI(\pm)
15-24	96	45	46.3	13.5	131	36	24.5	13.1	229	81	35.3	12.3
25-34	93	39	39.7	9.5	156	51	32.8	12.3	249	90	36.3	9.8
35-44	93	59	60.8	10.8	148	45	31.4	14.5	241	104	46.4	12.4
45-54	79	49	53.5	12.2	108	32	30.1	13.1	187	81	43.0	11.5
55-64	41	21	54.9	20.9	44	15	34.7	12.1	85	36	46.2	13.8
Total	402	213	48.8	9.7	587	179	29.1	10.2	991	392	39.1	9.9

Low Density Lipoprotein (LDL) Cholesterol

Because LDLs transport cholesterol to the arteries and can be retained there by arterial proteoglycans starting the formation of plaques, increased levels are associated with atherosclerosis, and thus heart attack, stroke and peripheral vascular disease. This is why cholesterol inside LDL lipoproteins is called *bad* cholesterol. Still, it is not the cholesterol that is *bad*; it is instead *how* and *where* it is being transported, and in what amounts over time.

Increasing evidence has revealed that the concentration and size of the LDL particles more powerfully relates to the degree of atherosclerosis progression than the concentration of cholesterol contained within all the LDL particles. The healthiest pattern, though relatively rare, is to have small numbers of large LDL particles and no small particles. Having small LDL particles, though common, is an unhealthy pattern; high concentrations of small LDL particles (even though potentially carrying the same total cholesterol content as a low concentration of large particles) correlates with much faster growth of atheroma, progression of atherosclerosis and earlier and more severe cardiovascular disease events and death. The optimal level of LDL is 100mg/dl and any measurements beyond 130mg/dl is classified high.

The mean LDL level for the Marshallese population was 111.5mg/dl (± 11.2) with 108.6mg/dl ± 8.7 for males and 114.3mg/dl (± 14.8) for females. On average the measurements are near optimal with monotonic increase level with increasing age for both males and females.

Table 5.4.8 Mean LDL cholesterol (mg/dl) by agegroup and gender

Age	Men			Women			Total population		
	n	Mean	CI(\pm)	n	Mean	CI(\pm)	n	Mean	CI(\pm)
15-24	96	88.0	11.4	130	94.7	10.9	228	91.9	9.9
25-34	93	118.7	14.7	154	115.8	15.8	247	117.3	13.3
35-44	90	124.1	12.2	146	130.0	25.3	236	127.0	17.9
45-54	75	123.6	10.0	105	132.1	18.1	180	127.5	12.3
55-64	38	124.9	15.1	44	160.7	30.8	82	141.2	18.5
Total	392	108.6	8.7	579	114.3	14.8	973	111.5	11.2

Triglycerides

Triglycerides, as major components of very low density lipoprotein (VLDL), play an important role in metabolism as energy sources and transporters of dietary fat. In the human body, high levels of triglycerides in the bloodstream have been linked to atherosclerosis, and, by extension, the risk of heart disease and stroke. However, the negative impact of raised levels of triglycerides is lower than that of LDL:HDL ratios. The risk can be partly accounted for by a strong inverse relationship between triglyceride level and HDL-cholesterol level.

The mean triglyceride of surveyed males was 103.5mg/dl (± 13.8) and of surveyed females was 92.9mg/dl (± 13.0). Mean triglyceride for both males and females increased with age.

Table 5.4.9 Mean triglyceride Levels (mg/dL) by agegroup and gender

Age	Men			Women			Total Population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	93	61.8	11.1	125	72.1	12.9	220	66.6	9.0
25-34	93	95.9	19.0	153	88.5	18.9	246	92.3	15.4
35-44	93	144.6	25.6	146	105.7	19.7	239	125.7	16.8
45-54	79	143.9	24.6	107	129.6	29.5	186	137.5	18.7
55-64	41	185.0	95.5	44	137.7	23.6	85	164.4	62.6
Total	399	103.5	13.8	575	92.9	13.0	976	98.3	12.5

The triglyceride level for each respondent was used to categorize individuals into a high-risk group with a triglyceride level ≥ 151 mg/dl. The proportion of males in this high-risk group was 9.5% (± 3.4) and for females was 6.0% (± 3.2), a difference that was not statistically significant. As with mean cholesterol, there was a trend of increasing proportion in the high-risk triglyceride group with age for both males and females.

Table 5.4.10 Proportion of elevated triglyceride by agegroup and gender

Age	Men				N	Women			N	Total population		
	N	Elevated (≥151 mg/dL)				n	Elevated (≥151 mg/dL)			n	Elevated (≥151 mg/dL)	
		n	%	CI(±)			%	CI(±)			%	CI(±)
15-24	93	1	0.8	2.1	125	2	1.2	1.5	220	3	1.0	1.3
25-34	93	8	7.5	5.9	153	9	6.7	4.8	246	17	7.1	4.1
35-44	93	16	17.1	6.9	146	9	5.6	5.7	239	25	11.5	4.0
45-54	79	16	18.5	8.7	107	17	15.4	9.0	186	33	17.1	6.8
55-64	41	11	30.2	32.8	44	9	18.4	10.9	85	20	25.1	21.8
Total	399	52	9.5	3.4	575	46	6.0	3.2	976	98	7.8	3.0

5.4.3 Haemoglobin

Hemoglobin was measured in the population with the use of the hemoglobinometer.

Table 5.4.11 Mean haemoglobin levels (mg/dL) by agegroup and gender

Age	Men			Women			Total population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	91	14.9	0.3	115	12.7	0.4	208	13.8	0.3
25-34	89	15.5	0.3	148	13.1	0.4	237	14.3	0.2
35-44	87	15.6	0.2	132	13.2	0.4	219	14.5	0.3
45-54	66	15.2	0.1	96	13.5	0.2	162	14.5	0.3
55-64	34	14.6	0.7	39	13.3	0.7	73	14.0	0.6
Total	367	15.2	0.1	530	13.0	0.2	899	14.2	0.2

Mean hemoglobin level for the total population was 14.2mg/dL (± 0.2) with 15.2mg/dL (± 0.1) for males and 13.0g/dL (± 0.2) for females. The hemoglobin level for each respondent was used to categorize individuals into a high-risk group with levels defined in Table 5.4.12. The proportion of males at high-risk was 7.6% (± 1.6) compared to females with 20.5% (± 3.1), a difference that is statistically significant. The highest proportion of females at high-risk was in the younger age group 15-24 years (25.2% ± 6.4) and 25-34 years (21.0% ± 6.5) and decreases with age. This could possibly point to another major impediment in womens health in the Marshall Islands which could be anemia related to menstruation and natality in addition to dietary. Coexistence of undernutrition and overnutrition is the new concern and we may be seeing the evidence of it in this survey.

Table 5.4.12 Proportion of low haemoglobin levels by agegroup and gender*

Age	Men				Women				Total population			
	N	n	Low %	CI(±)	N	n	Low %	CI(±)	N	n	Low %	CI(±)
15-24	91	7	9.8	5.6	115	30	25.2	6.4	208	37	16.8	2.8
25-34	89	5	4.6	3.4	148	30	21.0	6.5	237	35	12.8	3.6
35-44	87	7	6.6	5.7	132	23	17.8	5.2	219	30	11.9	4.8
45-54	66	2	4.2	3.3	96	11	11.1	6.0	162	13	7.3	3.5
55-64	34	5	18.1	8.5	39	5	11.4	10.4	73	10	15.1	8.1
Total	367	26	7.6	1.6	530	99	20.5	3.1	899	125	13.6	1.6

* The cut-off values used are as follows: Men (Non-smoker):13 mg/dL; Women (Non-smoker):12 mg/dL; Men (Smoker):13.3 mg/dL; Women (Smoker): 12.3 mg/dL.

5.5 Combined Risk Factors

In an attempt to further estimate the burden of NCD risk factors in the country, core risk factors ascertained from STEPS 1 and 2 were grouped and their prevalence described. These were:

- current daily smokers
- consumed less than 5 servings of fruits and vegetables per day
- low level of activity (<600 MET–minutes/week)
- overweight or obese (BMI ≥ 25 kg/m²)
- raised BP (SBP ≥ 140 and/or DBP ≥ 90 mmHg)

Those with at least three of the above risk factors were described as having high risk. The prevalence of those with high risk in the Marshall Islands was 60.2% (± 3.3) with 62.1% (± 6.2) for males and 58.4% (± 3.1) for females.

Moderate risk was defined as having at least one or two of the risk factors above and 39.1% (± 3.1) of the total population (males: 37.1% ± 6.2 ; females: 41.0% ± 3.2) fall into that category. Low risk was defined as having none of the above risk factors and only 3 individuals (0.7% ± 0.4) were free from any of the risk factors with more males (0.8% ± 0.1) than females (0.6% ± 0.8).

Subsequently there are more males with high risk (62.1% ± 6.2) compared to females (58.4% ± 3.1) and this is common trend in most populations with males being more at risk. This effect could be bigger if the biochemical risk factors are added to the module.

Table 5.5.1 Combined risk categories by agegroup and gender

Total Population									
Age	Low Risk (no risk factors)			Moderate Risk (1-2 risk factors)			High Risk (3+ risk factors)		
	n	%	CI (\pm)	n	%	CI (\pm)	n	%	CI (\pm)
25-44	2	0.8	0.6	228	41.2	3.1	295	58.0	3.3
45-64	1	0.3	0.1	89	34.2	4.8	168	65.5	4.8
Total	3	0.7	0.4	317	39.1	3.1	463	60.2	3.3
Male									
25-44	1	1.1	0.1	70	38.6	7.4	101	60.3	7.5
45-64	0	----	0.0	35	34.1	7.0	68	65.9	7.0
Total	1	0.8	0.1	105	37.1	6.2	169	62.1	6.2
Female									
25-44	1	0.5	1.0	157	43.4	4.0	194	56.0	3.9
45-64	1	0.7	0.2	54	34.3	6.3	100	65.0	6.3
Total	2	0.6	0.8	211	41.0	3.2	294	58.4	3.1

Figure 5.9: Combined risk factors – Total Population

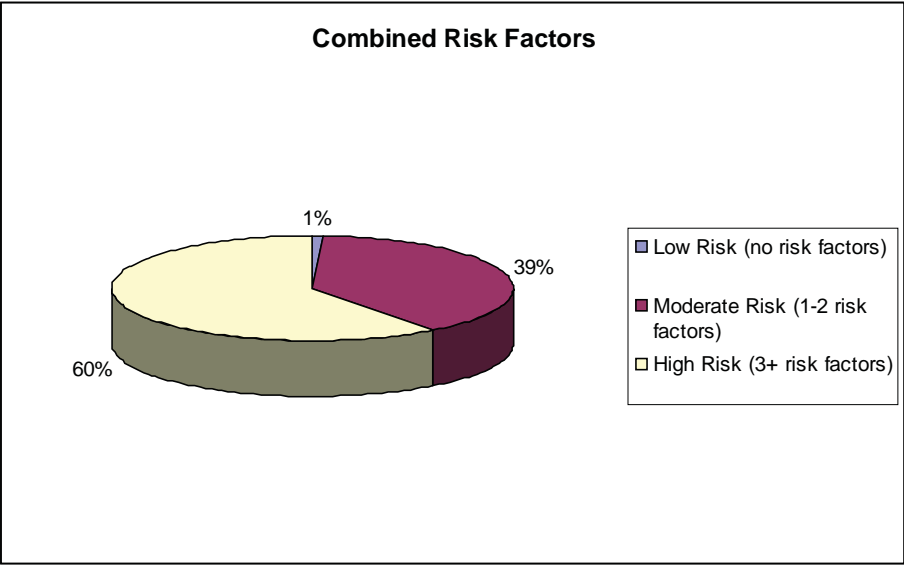


Figure 5.10: Combined risk factors – Males

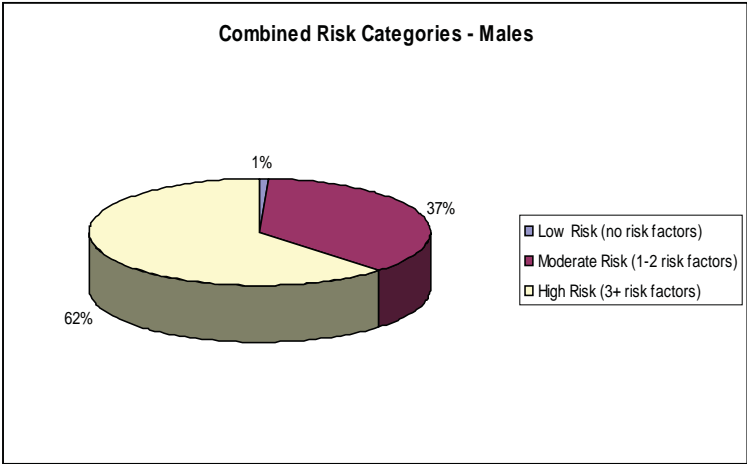
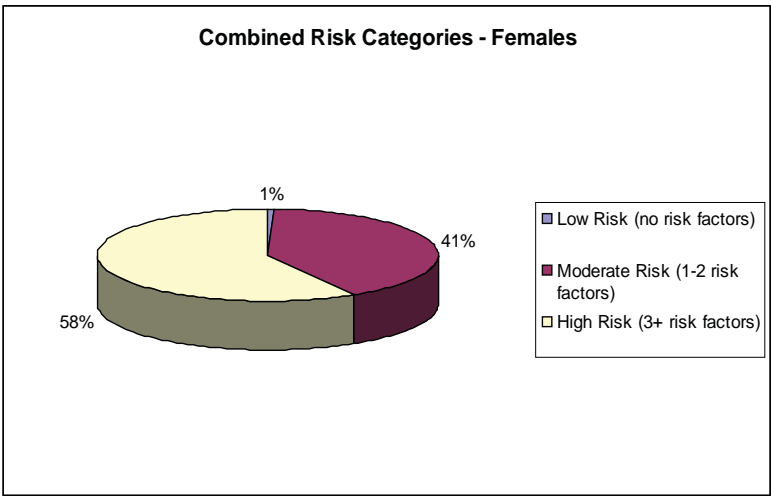


Figure 5.11: Combined risk factors – Females



6 Conclusions

NCD risk factors are highly prevalent in the RMI population as summarised in the table below. The RMI NCD-STEPPS survey revealed that these very significant levels of behavioral, physical and biochemical risk factors for NCDs affect nearly all sectors of the RMI population although certain stratas are experiencing the burden significantly higher than others.

Results for adults aged 15-64 years (incl. 95% CI)	TOTAL	Males	Females
Step 1 Tobacco Use			
Percentage of current daily smokers	19.8 ± 3.3	34.7 ± 5.4	4.2 ± 1.2
Step 1 Alcohol Consumption			
Percentage of current drinkers (who drank alcohol in the past 12 months)	19.3 ± 4.8	33.5 ± 7.5	4.5 ± 1.2
Percentage of binge drinkers : women who had 4 or more drinks on any day in the last week or men who had 5 or more drinks on any day in the last week	65.7 ± 9.7	67.1 ± 8.4	55.0 ± 19.0
Step 1 Fruit and Vegetable Consumption (in a typical week)			
Percentage who ate less than 5 of combined servings of fruits and vegetables per day	91.0 ± 2.0	91.9 ± 2.2	90.1 ± 2.4
Step 1 Physical Activity			
Percentage with low levels of physical activity (<600 MET-minutes/week)	66.1 ± 4.1	61.3 ± 6.8	70.3 ± 2.8
Step 2 Physical Measurements			
Mean body mass index - BMI (kg/m ²)	27.6 ± 0.5	26.7 ± 0.5	28.5 ± 0.7
Percentage who are overweight or obese (BMI ≥ 25 kg/m ²)	62.5 ± 3.8	59.8 ± 4.2	65.4 ± 5.0
Central Obesity (Men: waist circumference ≥ 102cm, Women: waist circumference ≥ 88cm)	35.4 ± 5.2	18.4 ± 5.1	54.2 ± 6.5
Prevalence of hypertension (high blood pressure)	10.5 ± 3.5	11.6 ± 5.3	9.3 ± 2.4
Step 3 Biochemical Measurement			
Prevalence of diabetes	19.6 ± 3.2	18.9 ± 4.0	20.5 ± 4.3
Percentage with raised total cholesterol (≥ 5.2 mmol/L or ≥ 200 mg/dl)	21.6 ± 10.8	20.3 ± 9.0	22.9 ± 13.1
Percentage with low HDL cholesterol (≤ 35mg/dl)	39.1 ± 9.9	48.8 ± 9.7	29.1 ± 10.2
Percentage with high triglyceride (≥ 151mg/dl)	7.8 ± 3.0	9.5 ± 3.4	6.0 ± 3.2
Percentage of low hemoglobin: Men (Non-smoker): 13mg/dL; Women (Non-smoker): 12mg/dL; Men (Smoker): 13.3mg/dL; Women (Smoker): 12.3mg/dL	13.6 ± 1.6	7.6 ± 1.6	20.5 ± 3.1
Summary of combined risk factors <ul style="list-style-type: none"> current daily smokers less than 5 servings of fruits & vegetables per day low level of activity (<600 MET -minutes) overweight or obese (BMI ≥ 25 kg/m²) raised BP (SBP ≥ 140 and/or DBP ≥ 90 mmHg or currently on medication for raised BP) 			
Percentage with low risk (i.e. none of the risk factors included above)	0.7 ± 0.4	0.8 ± 0.1	0.6 ± 0.8
Total percentage with raised risk (at least three of the risk factors above)	60.2 ± 3.3	62.1 ± 6.2	58.4 ± 3.1

Many of the NCD risk factors are linked and the combined risk analysis shows that more than 60% of the population have at least three of the main risk factors. With all these in mind, there is a need to develop and implement an integrated, comprehensive, multi-sectoral approach to combat these risk factors.

7 Recommendations

There is a great need to:

1. Take more aggressive measures in decreasing tobacco use particularly targeting the younger age groups, especially in schools.
2. Take more aggressive measures in reducing alcohol consumption particularly targeting the younger age groups who mostly binge drink.
3. Greatly increase promotion of production and consumption of fruits and vegetables highlighting the benefits of the behaviour through communication and education strategies.
4. Increase awareness and educate the public in regards to the adverse effects of excessive consumption of high-fat, high-salt, and high-sugar foods.
5. Develop specific programs and improve environments to encourage increased physical activity for everyone and especially targeting women.
6. Improve the capacity of the healthcare system in preventive measures to identify, monitor and treat individuals with obesity, hypertension and/or diabetes.
7. Reinforce and strengthen integrated screening measuring the multiple risks in a STEPwise approach.
8. Carry out, establish and maintain an ongoing NCD risk factor surveillance system to monitor and assess the effectiveness of health promotion and disease prevention strategies targeting NCDs and their risk factors with regular STEPS surveys as part of this initiative.
9. To develop a comprehensive multisectoral national NCD strategy that incorporates the above recommendations
10. To establish a multisectoral coordinating committee to drive and oversee the implementation of the national strategy

8 Limitations and Lessons Learnt

The following information is being provided to assist with planning and implementing future surveys in the Marshall Islands.

For STEP 1:

1. For Majuro and Ebeye (urban centers), it was a challenge to interview household members with full time jobs and students. Interviewers found it difficult to find them at home during the day and during revisits in the evenings as well.
2. Difficulty interviewing in the evening hours due to no electricity for Ebeye, Wotje, and Arno.
3. Younger household members would run away when they saw the interviewers approaching the household.
4. Some households did not want to open doors.
5. Some households did not want to cooperate with the interviewers. They felt it was a waste of their precious time.
6. No private areas in or around the households (urban centers) to allow interviewer to conduct the interview without interruptions and other household members looking on.
7. Some households complained of interviewers not displaying good personal hygiene (messy hair and clothing) and not wearing name tags for identification.
8. Due to the length of the questionnaire (21 pages), some participants became restless.
9. Marital status question was always a concern, more participants practiced common marriage and not legally married in the court's view so interviewers not sure whether to tick married or single.
10. Too many questionnaires with missing data due to incomplete entry by data collector.
11. Some of the answers were not consistent with the question due to misinterpretation by interviewer.
12. Physical activity section very challenging for interviewers.
13. Some of the questionnaires had missing pages.

For STEPS 2 & 3:

1. Reasons given by participants for not completing STEPS 2 & 3 included fear of blood collection, too lazy to get up, participants with jobs and therefore too busy, homemakers too busy with children and no one to baby-sit, too embarrassed to do Step 2, heard rumors that blood test will include HIV/STD screening and were afraid, forgot to fast and therefore, decided not to show up.

2. Some participants for Step 3 were given appointments in the afternoon and therefore did not come to the site in a fasting stage and had to be rescheduled. Due to the rescheduling, some did not return.
3. Some participants left the station after waiting too long (over 1 ½ hours).
4. We learned that in order to have a full turn out for STEPS 2 & 3, providing transportation was the way to go.
5. STEPS 2&3 personnel were sometimes late to survey base resulting in delayed set-up and processing of participants.

Problems with data entry: Besides the problems we faced with the attendance of trained data entry staff members, we also encountered a major problem with incomplete questionnaires. Data entry also began while technical experts were still on island and we soon found out after we began data entry that there were still a lot of inconsistencies between the data entry program and the questionnaire. These issues were immediately corrected at the beginning of data entry. Some minor problems were encountered later but due to easy access to the internet and telephone communication, we were able to correct the problems with technical experts abroad quickly. It is very important to train data entry staff well and to start data entry as soon as completed questionnaires were returned.

Other problems encountered included the following:

1. Despite efforts to secure transportation by coordinating with other departments, we still could not avoid unexpected situations which sometimes left the teams to find their own way to the survey sites.
2. Towards the end of the survey, some interviewers dropped out, tardiness became frequent, and some interviewers became careless in completing questionnaires and this added more work for the team leaders to correct errors.
3. Sometimes the interviewers left behind important tools such as calculators and measuring cups.
4. Rainy days were always a difficult time to work out in the field and for participants to get to the survey base.
5. Writing the final report was an overwhelming task for one person and it was difficult to allocate and assign sections of the report for others to write.
6. Time allocated for data collection was insufficient and we found ourselves rushing to meet deadlines.

9 Glossary

Age-specific rate:	A rate for a specified age group. The numerator and denominator refer to the same age group.
Blood pressure:	A measure of the force that circulating blood exerts on the walls of the arteries.
Body mass index (BMI):	A measure of a person's weight in relation to their height calculated as weight in kilograms divided by height in metres squared (synonym: Quetelet's index).
Cholesterol:	A fat-like substance found in the bloodstream, in various bodily organs and nerve fibres. Most cholesterol is made in the liver from a variety of foods but particularly from saturated fats. Cholesterol is a key component in the development of atherosclerosis, the accumulation of fatty deposits on the inner lining of the arteries, and as such is a determinant for increased risk of stroke and heart disease.
Confidence interval:	The computed interval with a given probability, i.e., 95%, that the true value of a variable such as a mean, proportion or rate is contained within the interval.
Diabetes mellitus:	A group of heterogeneous disorders with the common elements of hyperglycaemia and glucose intolerance, resulting from insulin deficiency, impaired effectiveness of insulin action or both.
Diastolic blood pressure:	The blood pressure created when the heart fills with blood.
Health behaviour:	The combination of knowledge, practices, and attitudes that together contribute to motivate the actions that we take regarding health. These behaviours may promote good health or if harmful, be a determinant of disease.
Intervention:	Any health action, promotion, preventive, curative or rehabilitative, where the primary intent is to improve health.
Leisure-time physical activity:	Sport and recreational physical activity, including a range of activities conducted specifically for enjoyment, social, competitive or fitness purposes, and performed during leisure or discretionary time.
Measurement validity:	An expression of the degree to which a measurement measures what it purports to measure.
Obesity:	A measure of how overweight an individual is defined using WHO criteria to be those individuals having a BMI equal to or greater than 30.
Physical activity:	Any bodily movement produced by large skeletal muscles, carried out throughout the day, that result in energy expenditure.
Physical inactivity:	No reported physical activity (in a health survey).
Prevalence:	The number of events (disease or other condition), in a given population at a specific time.
Prevention:	Actions aimed at eradicating, eliminating or minimizing the impact of disease and disability.
Reliability:	The degree of stability exhibited when a measurement is repeated under identical conditions.
Risk:	A probability of an adverse outcome, or a factor that raises this probability.
Risk Factor:	Any attribute, characteristic or exposure of an individual, which increase the likelihood of developing a disease or injury.
Sedentary:	People who report no physical activity in the context of a health survey. This usually refers to people who report no participation in activities such as walking, moderate or vigorous intensity activity.
Standard deviation:	The mean tells where the values for a group are centred and the standard deviation is a summary of how widely dispersed the values are around this center.
Standard error:	The standard deviation of an estimate. It is used to calculate confidence intervals for the estimate.
Surveillance:	Systematic, ongoing collection, collation, and analysis of data and the timely dissemination of information to those who need to know so that action can be taken.
Survey:	An investigation in which information is systematically collected not using experimental method but by using a questionnaire or medical examination.
Systolic blood pressure:	The blood pressure that is created by the heart contracting.
Weighted sample:	A sample that is not strictly proportional to the distribution of classes in the total population. A weighted sample has been adjusted to include larger proportions of some other parts of the total population, because those parts accorded greater "weight" would otherwise not have the sufficient numbers in the sample to lead to generalizable conclusions.

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11 Appendix

11.1 Appendix 1: RMI project team members

Damiana Ishoda, Health Assistant, 177 Health Care Program, MOH
George Yoshitaro, Health Assistant, 177 Health Care Program, MOH
Janet Nemra, Diabetes Health Educator, MOH
Jeffery Yoshikawa, Health Educator, MOH
Tom Schmidt, Thyroid Program, MOH
Florina Nathan, Nurse Supervisor, Public Health, MOH
Sarah Robert, Health Assistant, MOH
Diana Jamodre, Administrative Assistant, RH/FP, MOH
Arti Mattala, Health Educator, MOH
Kenneth Kedi, Director, Thyroid Program, MOH
Toji Jawin, Health Assistant, MOH
Cathleen Zedkaia, Health Nutrition Educator, MOH
Jacqueline Mojilong, Mental Health Nurse, MOH
Kumi Hanerg, Director of Vital Statistics, MOH
Cathy Saito, Administrative Assistant, PHC, MOH
Marlyna Laibwiji, Social Worker, MOH
Tinar Lalimo, Public Health Nurse, MOH
Laling Riklon, Public Health Nurse, MOH
Josephine Matthew, Graduate Nurse, MOH
Sherlynn Langidrik, Health Assistant, MOH
Harry Takwon, Lab Technician, MOH
Sala Elbourne, Microbiologist, MOH
Huston Luke, Lab Technician, MOH
Casner Jekkar, Lab Technician, MOH
Timothy Alik, Lab Technician, MOH
Harrington Nenam, Lab Technician, MOH
Paul Lalita, Supervisor, Majuro Lab, MOH
Reapi Manula, Lab Technologist, MOH
Tony Maika, Ebeye Lab Technician, MOH
Foli Paolo, Ebeye Lab Supervisor, MOH
Johannes Seremai, Ebeye Coordinator, Chronic Disease, MOH
Henchi Luther, Community Volunteer
Jennifer Lakjohn, Community Volunteer
Donny Aster, Community Volunteer
Kaious Arelong, Community Volunteer
Lisen Torren, Community Volunteer
Hermon Schmidt, Community Volunteer
Elizabeth Tibon, Community Volunteer
Pauline Malachi, Community Volunteer
Maria deBrum, Community Volunteer
Emilla Ned, Community Volunteer
Hespy John, Community Volunteer
Tino Alex, Community Volunteer
Myra Elbourne, Community Volunteer
Grace Banda, Community Volunteer
Ajlok Batlok, Zone Health Volunteer, Ebeye
Shirley Jajo, Zone Health Volunteer, Ebeye
Wadrik Gold, Zone Health Volunteer, Ebeye
Rosana Naisher, Volunteer, Ebeye
Emlen Morris, Zone Health Volunteer, Ebeye
Belean Korok, Zone Health Volunteer, Ebeye
Roana Bolkeim, Zone Health Volunteer, Ebeye
Neiwane Mapa, Zone Health Volunteer, Ebeye
Martha Anjain, Zone Health Volunteer, Ebeye

11.2 Appendix 2: Detailed Results

a. Demographic Information

Table 1.1 Years spent in school

Age	Men			Women			Total Population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	481	9.9	0.3	631	10.2	0.3	1116	10.1	0.2
25-34	276	10.4	0.4	448	10.3	0.4	725	10.3	0.4
35-44	211	10.2	0.6	331	9.9	0.4	542	10.1	0.5
45-54	150	10.5	0.6	232	9.6	0.4	382	10.1	0.4
55-64	72	10.9	0.6	97	8.1	1.0	169	9.6	0.6
Total	1190	10.2	0.3	1739	10.0	0.3	2934	10.1	0.3

Table 1.2 Highest level of education: Men and Women

Age	N	Men											
		Never Attended		Some Primary		Primary		Secondary		High school		University	
		n	%	n	%	n	%	n	%	n	%	n	%
15-24	481	1	0.2	83	21.5	51	9.7	283	55.3	9	1.8	54	11.6
25-34	286	3	0.8	48	19.0	24	7.3	142	49.7	7	2.8	62	20.4
35-44	217	2	0.8	40	17.9	18	7.5	118	55.1	5	3.5	34	15.3
45-54	155	0	----	38	23.1	15	8.7	81	55.6	3	2.3	18	10.4
55-64	73	0	----	17	23.2	7	9.5	34	48.1	0	----	15	19.2
Total	1212	6	0.4	226	20.5	115	8.5	658	53.5	24	2.3	183	14.7
Age	N	Women											
		Never Attended		Some Primary		Primary		Secondary		High school		University	
		n	%	n	%	n	%	n	%	n	%	n	%
15-24	644	10	1.8	91	16.6	43	7.2	444	66.2	8	1.2	48	7.1
25-34	452	7	1.9	82	19.5	37	8.5	275	60.1	7	1.5	44	8.6
35-44	339	1	0.2	74	23.0	37	10.9	202	58.7	4	1.4	21	5.8
45-54	234	2	0.7	75	32.0	31	11.8	106	47.0	2	0.7	18	7.8
55-64	99	2	1.9	49	54.4	16	14.6	26	24.0	0	----	6	5.1
Total	1768	22	1.4	371	22.1	164	9.1	1053	59.1	21	1.2	137	7.2

b. Tobacco Use

Table 2.1 Years of smoking, for current smokers

Age	Men (N=404)			Women (N=75)			Total Population (N=480)		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	153	3.9	0.6	15	4.3	2.1	169	3.9	0.5
25-34	114	10.9	0.8	17	9.5	2.7	131	10.8	0.7
35-44	80	21.2	1.6	26	18.1	3.6	106	20.7	1.7
45-54	40	29.2	1.7	11	27.4	1.0	51	29.0	1.4
55-64	10	40.4	2.4	4	32.6	15.4	14	39.3	3.3
Total	397	13.2	0.9	73	14.7	4.1	471	13.3	1.1

Table 2.2

Percentage smoking various types of cigarettes, for current smokers

Age	Total Population											
	Manufactured Cigarettes			Hand-rolled Cigarettes			Pipes full of tobacco			Cigars, cheroots, Cigarillos		
	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	169	97.9	2.0	0	----	----	1	0.5	1.0	1	0.4	0.1
25-34	130	97.4	2.8	1	0.6	----	1	0.5	1.1	1	1.5	2.8
35-44	105	98.4	1.3	0	----	----	1	0.6	1.2	0	----	----
45-54	52	95.9	7.6	0	----	----	0	----	----	0	----	----
55-64	14	100.0	0.0	0	----	----	0	----	----	0	----	----
Total	470	97.7	1.1	1	0.2	0.3	3	0.5	0.9	2	0.6	0.8
Male												
15-24	153	98.2	2.1	0	----	----	1	0.5	1.0	1	0.4	0.1
25-34	113	97.1	3.1	1	0.7	1.3	1	0.6	1.2	1	1.7	3.1
35-44	79	98.1	1.5	0	----	----	1	0.7	1.5	0	----	----
45-54	40	95.3	9.0	0	----	----	0	----	----	0	----	----
55-64	10	100.0	0.0	0	----	----	0	----	----	0	----	----
Total	395	97.6	1.3	1	0.2	0.4	3	0.5	1.0	2	0.6	0.9
Female												
15-24	15	94.1	1.9	----	----	----	----	----	----	----	----	----
25-34	17	100.0	0.0	----	----	----	----	----	----	----	----	----
35-44	26	100.0	0.0	----	----	----	----	----	----	----	----	----
45-54	12	100.0	0.0	----	----	----	----	----	----	----	----	----
55-64	4	100.0	0.0	----	----	----	----	----	----	----	----	----
Total	74	98.7	0.3	----	----	----	----	----	----	----	----	----

Table 2.3

Consumption of manufactured cigarettes/day, for current smokers of manufactured cigarettes

Age	Men			Women			Total Population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	154	9.4	1.3	15	4.5	1.5	170	9.0	1.2
25-34	115	14.1	2.7	17	5.6	2.9	132	13.3	2.6
35-44	80	13.5	3.5	26	9.3	3.3	106	12.8	3.2
45-54	40	11.7	2.4	12	9.7	6.4	52	11.4	2.3
55-64	10	15.4	7.1	4	8.9	2.8	14	14.5	5.7
Total	399	12.0	1.7	74	7.4	1.7	474	11.5	1.6

Table 2.7

Chew tobacco, for current users

Age	Men				Women				Total Population			
	N	Yes			N	Yes			N	Yes		
		n	%	CI(±)		n	%	CI(±)		n	%	CI(±)
15-24	76	47	63.9	11.3	25	16	61.8	37.8	101	63	63.5	13.7
25-34	46	33	67.1	23.1	6	3	66.5	55.5	52	36	67.1	21.0
35-44	7	5	76.9	36.2	2	1	64.1	63.9	9	6	75.0	37.5
45-54	1	0	----	----	----	----	----	----	1	0	----	----
55-64	----	----	----	----	----	----	----	----	----	----	----	----
Total	130	85	65.5	8.3	33	20	62.8	30.2	163	105	65.1	9.0

c. Betel Nut Use

Table 3.1 Betel nut use status

Total Population										
Age	N	Daily users			Non-daily users			Non-users		
		n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	1137	19	1.8	0.8	5	0.6	0.8	1113	97.6	1.3
25-34	744	15	3.0	2.3	5	0.9	0.4	724	96.1	2.6
35-44	564	4	0.7	0.4	0	----	----	560	99.3	0.4
45-54	390	4	1.5	1.5	1	0.2	0.0	385	98.3	1.5
55-64	173	0	----	----	0	----	----	173	100.0	0.0
Total	3008	42	1.8	0.9	11	0.5	0.3	2955	97.8	1.2

d. Alcohol Consumption

Table 4.1 Mean number of standard drinks consumed during past 7 days, for current consumers of alcohol

Age	Men			Women			Total Population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	169	10.3	2.7	39	6.2	2.3	210	9.6	2.6
25-34	110	9.4	2.5	15	5.2	2.3	125	9.0	2.4
35-44	61	10.8	3.0	13	6.9	4.0	74	10.3	2.7
45-54	27	7.2	1.4	7	4.4	1.9	34	6.9	1.4
55-64	8	8.5	6.7	1	6.0	----	9	8.4	6.4
Total	375	9.8	1.8	75	6.0	2.0	452	9.3	1.8

Table 4.2 Heavy drinking* for current consumers of alcohol: Men and Women

Men						
Age	5 or more Drinks			4 or more Days		
	n	%	CI(±)	n	%	CI(±)
15-24	50	32.6	8.2	2	1.6	2.1
25-34	39	37.5	12.6	1	0.5	0.2
35-44	26	48.7	14.5	4	8.0	8.0
45-54	8	39.2	21.2	1	4.4	2.1
55-64	3	35.8	19.8	0	----	0.0
Total	126	37.4	7.8	8	2.5	1.4
Women						
Age	4 or more Drinks			4 or more Days		
	n	%	CI(±)	n	%	CI(±)
15-24	10	24.6	17.7	2	7.2	11.2
25-34	5	27.3	23.1	0	----	0.0
35-44	5	36.1	25.2	0	----	0.0
45-54	3	39.5	46.6	0	----	0.0
55-64	0	----	0.0	0	----	0.0
Total	23	27.9	13.6	2	3.9	5.0

* Men: ≥5 standard drinks/day; Women: ≥4 standard drinks/day

Table 4.3 Mean days binge drinking, for current consumers of alcohol

Age	Men (N=372)			Women (N=62)		
	n	Mean	CI (±)	n	Mean	CI (±)
15-24	170	34.5	14.6	34	16.7	7.1
25-34	108	34.2	12.6	13	21.6	33.9
35-44	60	34.8	11.5	9	13.3	23.5
45-54	25	21.4	16.7	5	3.4	2.0
55-64	9	25.9	26.5	1	50.0	----
Total	372	33.4	8.7	62	16.8	9.0

Table 4.4 Mean age started consuming alcohol, for current consumers of alcohol

Age	Men			Women			Total Population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	164	16.7	0.6	38	16.8	0.5	204	16.7	0.6
25-34	111	18.2	0.7	15	20.5	2.2	126	18.4	0.7
35-44	62	19.0	1.4	13	27.3	3.3	75	19.9	0.9
45-54	27	19.7	0.8	6	31.2	6.5	33	20.8	1.4
55-64	9	16.8	4.5	1	30.0	----	10	17.4	5.3
Total	373	17.8	0.6	73	20.4	1.7	448	18.1	0.4

Table 4.6 Places from which alcoholic beverages are commonly obtained, for current drinkers

Gender	N	Total Population								
		Store			Friends and Relatives			Home Brew		
		%	CI(±)	n	%	CI(±)	n	%	CI(±)	n
Male	379	78.0	9.7	299	16.3	6.1	56	5.7	5.8	24
Female	77	65.0	20.5	53	30.4	14.9	22	4.6	7.6	2
Total	456	76.4	10.4	352	18.1	6.7	78	5.5	5.5	26

Table 4.7 Foods eaten while consuming alcohol, for current consumers of alcohol

Foods	Total Population	Male	Female
	%	%	%
Sashimi	72.5	74.1	60.8
Raw poultry parts	49.6	51.3	38.0
Chips/pretzels/popcorn	41.9	40.5	50.9
Cooked meats/poultry	48.9	50.4	37.9
Sweets	32.1	28.9	53.1
Other	11.7	10.8	17.6
Nothing at all	10.0	10.2	8.9

e. Diet

Table 5.1 Mean number of days fruits are consumed per week

Age	Men			Women		
	n	Mean	CI(±)	n	Mean	CI(±)
15-24	456	2.3	0.3	617	2.4	0.4
25-34	275	2.6	0.5	435	2.8	0.4
35-44	210	2.7	0.4	327	3.0	0.5
45-54	145	3.1	0.5	224	2.8	0.4
55-64	70	2.9	0.6	94	2.8	0.5
Total	1156	2.6	0.3	1697	2.7	0.3

Table 5.2 Mean number of servings of fruit consumed per day

Age	Men			Women			Total Population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	457	0.7	0.2	618	0.8	0.3	1079	0.8	0.2
25-34	276	1.0	0.3	437	1.1	0.4	714	1.0	0.3
35-44	211	0.9	0.2	329	1.1	0.4	540	1.0	0.3
45-54	146	1.2	0.5	228	1.2	0.4	374	1.2	0.5
55-64	70	1.1	0.4	94	1.0	0.5	164	1.1	0.3
Total	1160	0.9	0.2	1706	1.0	0.3	2871	0.9	0.3

Table 5.3 Mean number of days vegetables are consumed per week

Age	Men			Women		
	n	Mean	CI(±)	n	Mean	CI(±)
15-24	436	2.3	0.3	585	2.6	0.4
25-34	269	2.6	0.5	422	2.8	0.4
35-44	207	2.6	0.5	317	3.0	0.4
45-54	141	3.6	0.5	215	3.0	0.6
55-64	70	3.0	0.6	91	3.0	0.6
Total	1123	2.6	0.3	1630	2.8	0.2

Table 5.4 Mean number of servings of vegetables consumed per day

Age	Men			Women			Total Population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	440	0.8	0.2	588	0.9	0.4	1032	0.8	0.2
25-34	269	0.8	0.2	424	1.1	0.4	694	1.0	0.2
35-44	207	0.8	0.1	319	1.2	0.3	526	1.0	0.2
45-54	141	1.4	0.4	218	1.2	0.5	359	1.3	0.4
55-64	70	1.1	0.4	91	1.1	0.4	161	1.1	0.3
Total	1127	0.9	0.2	1640	1.1	0.3	2772	1.0	0.2

f. Physical Activity

Table 6.1 Total physical activity (minutes/day) by agegroup

Age	Men			Women			Total Population		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	295	103.5	36.2	458	58.0	16.1	754	78.7	23.4
25-34	163	104.7	63.2	326	64.4	17.6	490	82.3	34.7
35-44	141	77.3	26.0	247	71.7	33.3	388	74.3	25.4
45-54	103	67.6	41.0	176	62.7	36.9	279	65.3	34.6
55-64	48	61.2	34.2	73	36.8	25.6	121	49.4	21.2
Total	750	90.8	33.8	1280	61.7	19.1	2032	75.3	23.9

Table 6.2 Levels of physical activity during leisure time by age group

Men						
Age	Moderate			Vigorous		
	n	%	CI(±)	n	%	CI(±)
15-24	340	6.9	5.2	321	11.4	5.7
25-34	189	15.4	19.4	188	10.8	13.4
35-44	154	5.5	4.2	166	5.3	5.9
45-54	111	8.3	10.3	137	0.4	1.0
55-64	50	2.0	2.8	64	2.0	2.4
Total	844	8.6	6.9	876	7.7	4.5
Women						
15-24	474	5.0	4.3	561	2.0	2.3
25-34	339	5.9	7.3	411	2.0	2.0
35-44	254	6.0	6.3	305	1.3	2.0
45-54	181	0.5	1.0	222	2.5	4.8
55-64	75	1.8	2.6	95	0.0	----
Total	1323	4.7	2.4	1594	1.8	2.1
Total Population						
Age						
15-24	815	5.9	3.1	883	6.0	3.3
25-34	529	10.5	12.9	600	5.7	5.7
35-44	408	5.8	4.9	471	3.1	3.0
45-54	292	4.7	5.5	359	1.4	2.2
55-64	125	1.9	1.7	159	1.0	1.2
Total	2169	6.6	4.4	2472	4.4	2.6

Table 6.3 Levels of physical activity at work by agegroup

Men						
Age	Moderate			Vigorous		
	n	%	CI(±)	n	%	CI(±)
15-24	467	11.8	6.4	467	21.6	11.7
25-34	268	13.5	8.9	270	24.4	16.9
35-44	211	12.5	10.1	211	29.5	16.0
45-54	143	4.6	3.2	145	13.3	7.3
55-64	69	8.4	13.1	69	31.2	31.1
Total	1158	11.2	3.9	1162	23.2	8.8
Women						
15-24	622	11.4	3.8	624	5.0	4.9
25-34	439	13.4	8.9	441	6.8	6.0
35-44	333	20.1	11.0	335	6.5	7.8
45-54	227	21.7	19.4	227	6.5	8.0
55-64	97	12.6	17.1	97	6.5	13.1
Total	1718	14.8	7.5	1724	6.0	3.8
Age	Total Population					
15-24	1093	11.5	3.8	1095	13.2	6.3
25-34	708	13.5	6.9	712	15.7	10.9
35-44	544	16.3	9.6	546	18.0	11.0
45-54	370	12.4	10.2	372	10.2	6.5
55-64	166	10.4	12.9	166	19.3	16.1
Total	2881	13.0	5.3	2891	14.7	5.7

g. Medical History: High Blood Pressure

Table 7.3 Confirmed or new diagnosis of hypertension by health worker in past 12 months

Age	Total population				Men				Women			
	N	HTN*			N	HTN*			N	HTN*		
		%	CI(±)	n		%	CI(±)	n		%	CI(±)	n
15-24	1143	1.2	0.7	14	489	0.8	1.2	3	654	1.5	1.0	11
25-34	745	3.6	1.6	29	283	4.0	2.5	12	462	3.3	1.5	17
35-44	562	10.5	3.4	63	220	7.4	4.4	18	342	13.7	5.8	45
45-54	387	15.7	7.0	69	151	13.5	8.8	25	236	18.2	7.3	44
55-64	172	31.3	6.4	59	73	16.2	8.4	14	99	48.1	12.2	45
Total	3009	6.8	1.8	234	1216	5.3	2.3	72	1793	8.4	1.9	162

* HTN = Hypertension or high blood pressure

Table 7.6 Type of blood pressure treatment for hypertension[†]

Age	Total Population														
	Drugs			Diet			Weight			Smoking			Exercise		
	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	3	21.9	22.7	6	42.7	13.2	8	58.9	29.4	4	31.2	14.6	8	58.9	29.4
25-34	5	20.3	16.7	17	62.3	13.0	16	60.8	19.1	8	27.4	27.5	15	54.1	22.8
35-44	25	36.8	14.0	32	52.4	6.0	31	47.0	9.5	20	32.6	13.0	37	56.6	10.2
45-54	35	45.5	15.4	41	59.8	15.0	40	56.4	9.7	29	39.4	20.3	45	65.3	18.4
55-64	38	56.9	17.4	39	70.5	12.1	38	69.8	14.9	28	52.4	14.0	42	77.2	11.9
Total	106	41.1	9.4	135	59.7	5.1	133	57.7	7.3	89	38.1	11.8	147	63.7	6.8
Age	Men														
	Drugs			Diet			Weight			Smoking			Exercise		
	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	0	----	----	0	----	----	1	47.5	59.0	1	47.5	61.0	1	47.5	61.0
25-34	3	29.8	38.1	8	72.4	28.5	8	72.6	26.0	3	27.9	35.9	7	62.1	39.6
35-44	7	36.5	26.7	8	43.7	7.9	6	29.7	14.4	5	26.3	14.9	8	39.2	19.9
45-54	11	38.6	21.0	12	50.8	15.2	12	48.0	16.9	9	37.8	22.0	15	58.9	23.7
55-64	6	38.9	22.7	10	73.0	15.6	12	83.6	18.1	10	74.6	18.9	11	82.3	18.7
Total	27	35.6	12.8	38	55.2	5.3	39	54.2	11.1	28	39.5	10.1	42	57.6	8.1
Age	Women														
	Drugs			Diet			Weight			Smoking			Exercise		
	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	3	29.9	29.8	6	58.4	18.5	7	68.0	26.8	3	30.1	30.0	7	68.0	26.8
25-34	2	10.3	22.6	9	51.2	22.7	8	45.2	16.4	5	26.9	27.7	8	45.2	16.4
35-44	18	37.0	13.0	24	57.9	10.5	25	57.8	13.5	15	36.4	13.3	29	67.5	9.2
45-54	24	51.9	10.8	29	68.0	17.3	28	64.5	16.3	20	40.9	24.4	30	71.4	17.8
55-64	32	64.3	18.3	29	69.4	16.0	26	63.8	17.8	18	42.1	17.4	31	75.2	13.1
Total	79	45.0	11.3	97	63.0	6.4	94	60.5	12.3	61	37.5	14.8	105	68.3	7.8

[†] Hypertensives only

Table 7.7 Consultation with a traditional healer by those with hypertension

Age	Men				Women				Total Population			
	N	Yes			N	Yes			N	Yes		
		n	%	CI(±)		n	%	CI(±)		n	%	CI(±)
15-24	4	0	----	----	12	1	7.6	19.1	17	1	4.4	10.9
25-34	14	1	4.3	1.8	18	1	6.5	2.9	32	2	5.2	1.3
35-44	19	1	4.7	10.1	45	5	14.0	10.9	64	6	10.6	7.8
45-54	24	5	17.2	10.6	43	6	19.0	14.7	67	11	18.1	10.1
55-64	14	2	11.4	14.4	44	9	16.0	6.5	58	11	14.8	3.7
Total	75	9	9.1	7.3	162	22	14.5	5.9	238	31	12.3	3.3

Table 7.8 Herbal treatment by those with hypertension

Age	Men				N	Women			N	Total Population		
	N	Yes				n	Yes			N	Yes	
		n	%	CI(±)			n	%			CI(±)	n
15-24	----	----	----	----	1	1	100.0	0.0	1	1	100.0	0.0
25-34	----	----	----	----	1	0	----	----	2	1	46.7	0.0
35-44	----	----	----	----	4	4	100.0	0.0	5	4	81.8	43.2
45-54	----	----	----	----	6	3	27.7	52.7	11	7	46.8	39.9
55-64	----	----	----	----	9	9	100.0	0.0	10	9	85.0	36.6
Total	----	----	----	----	21	17	71.6	26.5	29	22	66.6	31.7

h. Medical History: Diabetes**Table 9.1 Blood sugar measured in the last 12 months**

Age	Men				N	Women			N	Total population		
	N	Yes				n	Yes			n	Yes	
		n	%	CI(±)			%	CI(±)			%	CI(±)
15-24	476	16	4.0	2.9	639	39	6.0	1.6	1119	55	5.0	2.0
25-34	282	48	16.9	5.8	453	80	18.0	4.4	736	128	17.4	4.6
35-44	216	70	32.5	8.7	340	122	35.7	5.9	556	192	34.1	5.4
45-54	154	91	55.1	8.1	236	121	50.0	7.8	390	212	52.8	7.6
55-64	72	43	57.1	16.6	97	67	67.0	14.1	169	110	61.7	12.6
Total	1200	268	22.1	4.0	1765	429	22.7	1.8	2970	697	22.4	2.5

Table 9.3 Previously Diagnosed with diabetes

Age	Men				Women				Total population			
	N	n	%	CI(±)	N	n	%	CI(±)	N	n	%	CI(±)
15-24	474	2	0.3	0.8	630	3	0.4	0.7	1108	5	0.4	0.5
25-34	280	9	2.7	2.5	443	12	3.1	2.2	724	21	2.9	1.5
35-44	212	13	6.9	5.3	330	33	9.5	2.4	542	46	8.2	3.1
45-54	151	34	22.6	5.3	226	60	25.7	8.3	377	94	24.0	3.6
55-64	71	19	26.5	8.8	95	40	42.8	9.4	166	59	34.2	6.2
Total	1188	77	6.4	1.5	1724	148	7.7	1.2	2917	225	7.0	1.2

Table 9.4 Type of blood glucose treatment for diabetics

Age	Total Population																	
	Insulin			Drugs			Diet			Advice/treatment to lose weight			Advice/treatment to stop smoking			Exercise		
	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)	n	%	CI(±)
15-24	0	----	----	0	----	----	1	8.0	16.9	1	11.0	24.0	0	----	----	2	19.0	21.3
25-34	3	9.0	2.8	5	19.9	26.9	12	36.4	13.4	12	34.5	17.6	14	41.3	16.3	13	37.5	17.5
35-44	8	16.3	12.2	21	41.6	18.0	37	65.0	17.1	31	53.9	15.6	16	32.8	16.3	36	62.0	12.6
45-54	19	17.3	9.3	71	65.3	15.6	69	75.4	14.8	51	55.6	12.4	36	40.0	6.6	68	71.6	11.0
55-64	13	22.7	17.4	44	67.9	15.0	36	61.8	20.4	26	46.6	21.3	23	43.5	18.9	36	62.0	23.3
Total	43	16.6	8.5	141	52.2	7.7	155	62.5	8.0	121	48.9	8.1	89	37.7	5.7	155	61.1	8.0
Men																		
15-24	0	----	----	0	----	----	0	----	----	1	50.0	0.0	0	----	----	1	50.0	0.0
25-34	0	----	----	0	----	----	4	33.7	30.5	3	25.4	37.9	3	25.4	37.9	3	25.4	37.9
35-44	3	23.7	27.7	6	48.1	37.9	9	57.8	25.9	8	53.9	25.1	5	38.6	33.9	8	53.9	25.1
45-54	6	18.6	17.5	19	59.6	29.7	25	80.8	26.4	14	51.9	23.9	12	41.3	14.2	22	73.8	21.5
55-64	5	28.4	27.1	11	55.3	28.8	12	69.0	25.9	9	56.3	35.8	10	60.1	36.3	13	75.0	30.9
Total	14	19.5	18.3	36	48.6	24.0	50	66.7	16.7	35	50.2	18.4	30	42.0	9.9	47	63.9	15.7
Women																		
15-24	0	----	----	0	----	----	1	10.2	19.3	0	----	----	0	----	----	1	10.2	19.3
25-34	3	14.9	8.1	5	31.6	38.0	8	38.2	18.7	9	40.4	19.5	11	51.6	15.5	10	45.4	21.7
35-44	5	11.2	11.0	15	37.0	12.8	28	69.6	20.2	23	53.8	26.6	11	28.4	14.0	28	67.3	18.4
45-54	13	15.9	10.1	52	70.8	18.0	44	69.6	17.7	37	59.2	13.4	24	38.8	14.1	46	69.4	11.6
55-64	8	17.7	13.8	33	77.3	15.4	24	56.3	24.3	17	39.3	14.4	13	30.3	12.7	23	52.2	24.6
Total	29	14.2	5.6	105	54.8	5.1	105	59.2	10.5	86	47.8	11.7	59	34.2	7.0	108	58.8	10.1

Table 9.5 Consultation with a traditional healer by those with diabetes

Age	Men				Women				Total population			
	N	Yes			N	Yes			N	Yes		
		n	%	CI(±)		n	%	CI(±)		n	%	CI(±)
15-24	2	1	50.0	0.0	8	0	----	----	10	1	10.0	22.1
25-34	11	2	21.5	20.5	21	5	26.4	15.7	32	7	24.5	17.1
35-44	17	5	39.8	38.3	42	7	15.8	11.4	59	12	25.8	15.3
45-54	36	10	27.3	19.2	68	20	30.3	13.4	104	30	28.8	13.7
55-64	21	7	39.5	30.2	44	17	35.4	17.6	65	24	37.1	17.9
Total	87	25	32.5	18.9	183	49	25.7	8.2	270	74	28.7	10.1

Table 9.6 Herbal treatment by those with diabetes

Age	Men				Women				Total population			
	N	Yes			N	Yes			N	Yes		
		n	%	CI(±)		n	%	CI(±)		n	%	CI(±)
15-24	1	1	100.0	0.0	----	----	----	----	1	1	100.0	0.0
25-34	2	2	100.0	0.0	5	5	100.0	0.0	7	7	100.0	0.0
35-44	6	4	63.4	56.7	7	6	87.6	28.2	13	10	70.8	37.9
45-54	10	8	80.7	32.9	20	18	92.4	14.7	30	26	86.9	15.9
55-64	7	7	100.0	0.0	17	16	92.5	17.2	24	23	95.9	9.6
Total	26	22	81.7	21.4	49	45	92.8	9.0	75	67	87.1	12.0

i. Physical Measures

Table 11.1 Height (cm)

Age	Men (N=778)			Women (N=1268)			Total population (N=2051)		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	279	162.0	1.8	444	151.0	0.9	727	156.5	1.2
25-34	177	164.1	1.1	328	151.4	1.2	506	157.8	0.7
35-44	151	164.6	1.3	246	153.7	1.6	397	159.1	1.1
45-54	117	164.5	2.9	171	151.6	3.5	288	158.6	3.5
55-64	54	161.9	8.6	79	149.7	3.9	133	156.1	4.9
Total	778	163.3	1.4	1268	151.6	0.6	2051	157.6	1.0

Table 11.2 Weight (kg)

Age	Men (N=773)			Women* (N=1264)			Total population* (N=2042)		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	278	62.7	3.0	442	57.2	1.5	724	60.0	1.9
25-34	177	76.2	2.3	328	68.7	2.0	506	72.5	1.5
35-44	148	78.5	3.0	244	75.2	2.6	392	76.8	2.0
45-54	116	82.4	2.1	171	73.6	3.4	287	78.3	2.5
55-64	54	75.2	5.1	79	71.9	4.4	133	73.6	4.1
Total	773	72.2	1.4	1264	66.1	1.4	2042	69.2	1.2

* Pregnant females excluded

Table 11.3 Blood pressure risk categories for age group 25-64 years

Age	Total population			
	N	Prevalence of Hypertension‡		
		n	%	CI(±)
25-34	501	25	5.6	3.2
35-44	390	54	14.9	8.1
45-54	285	77	26.4	7.7
55-64	134	65	45.6	12.9
Total	1310	221	15.9	4.8
Men				
25-34	177	14	7.9	5.9
35-44	150	26	18.6	13.4
45-54	118	34	27.9	10.6
55-64	55	16	32.8	12.9
Total	500	90	17.4	6.7
Women				
25-34	323	11	3.3	2.0
35-44	240	28	11.1	3.4
45-54	167	43	24.6	6.9
55-64	79	49	59.5	18.6
Total	809	131	14.3	3.8

‡ SBP≥140 and/or DBP≥90 or on medication for hypertension

j. Biochemical Measures

Table 12.1 Fasting status

Age	Men				Women				Total population			
	N	Fasted			N	Fasted			N	Fasted		
		n	%	CI(±)		n	%	CI(±)		n	%	CI(±)
15-24	82	82	100	0.0	125	125	100	0.0	209	209	100	0.0
25-34	92	92	100	0.0	148	148	100	0.0	240	240	100	0.0
35-44	90	90	100	0.0	146	146	100	0.0	236	236	100	0.0
45-54	68	68	100	0.0	99	99	100	0.0	167	167	100	0.0
55-64	40	40	100	0.0	43	43	100	0.0	83	83	100	0.0
Total	372	372	100	0.0	561	561	100	0.0	935	935	100	0.0

[†] Step 3 participants only

Table 12.2 Mean fasting blood glucose (mmol/L) by agegroup and gender

Age	Men (N=381)			Women (N=540)			Total population (N=923)		
	n	Mean	CI(±)	n	Mean	CI(±)	n	Mean	CI(±)
15-24	95	5.2	0.3	136	5.2	0.5	233	5.2	0.3
25-34	92	5.7	0.5	150	5.3	0.4	242	5.5	0.3
35-44	90	6.3	0.8	144	7.3	0.8	234	6.8	0.7
45-54	69	7.8	0.8	81	8.3	1.4	150	8.0	0.9
55-64	35	8.1	1.7	27	7.9	1.1	62	8.0	1.0
Total	381	6.0	0.3	538	6.0	0.4	921	6.0	0.3

k. Data quality indices

Table 13.1 Number of pregnant women

Age	N	Pregnant		
		%	CI(±)	n
15-24	136	9.4	8.3	11
25-34	147	8.9	5.5	11
35-44	145	2.7	4.3	3
45-54	102	----	----	0
55-64	45	1.7	3.7	1
Total	575	6.5	4.7	26

11.3 Appendix 3 – Weighting formulae

Weighting Formulae

1) Adjustment for different probabilities of selection (sampling weights)

$$W1 = \text{Stratum population} / (\text{No. of islands/atolls/villages sampled} * S1_{\text{part}})$$

$$W2(\text{STEP2}) = W1 * (S2_{\text{elig}}/S2_{\text{part}})$$

$$W2(\text{STEP3}) = W1 * (S3_{\text{elig}}/S3_{\text{part}})$$

Note: $S2_{\text{elig}} = S3_{\text{elig}} = S1_{\text{part}}$

2) Adjustment for non-representativeness

$$W3 = \text{Stratum age-sex population proportion} / \text{Stratum Sample age/sex population proportion}$$

Total Weighting Formulae

1) Total weighting for STEP 1

$$WT1 = W1 * W3$$

2) Total weighting for STEP 2

$$WT2 = W2(\text{STEP2}) * W3$$

3) Total weighting for STEP 3

$$WT3 = W2(\text{STEP3}) * W3$$

11.4 Appendix4 - Questionnaire

REPUBLIC OF THE MARSHALL ISLANDS

Ministry of Health

&

World Health Organisation

In collaboration with the Fiji School of Medicine & the Menzies Center for Population Health Research

WHO STEPwise Approach to NCD Risk Factor Surveillance in the Republic of the Marshall Islands

CHECKLIST

<u>For Interviewer:</u>	Consent	<input type="checkbox"/>	Appointment / fasting instructions	<input type="checkbox"/>
<u>For Team Leader:</u>	Questionnaire review	<input type="checkbox"/>	STEP 1 done	<input type="checkbox"/> see Team Leader
<u>For Registration:</u>	Participant is fasting	<input type="checkbox"/>	(only if STEP 3 required)	
	Consent	<input type="checkbox"/>	STEP 1 done	<input type="checkbox"/>
<u>For Checkout:</u>	STEP 2 done	<input type="checkbox"/>	STEP 3 done	<input type="checkbox"/> (only if STEP 3 required)
	Results form given	<input type="checkbox"/>	Health promotion material given if needed	<input type="checkbox"/>
	Checkout completed	<input type="checkbox"/>		
<u>For data entry:</u>	Data entry complete	<input type="checkbox"/>		
	Data entry problems	<input type="checkbox"/>	(write comments on page at end of form)	

Identification Information

I1 Family name

I2 First name

I3 Address

I4 Phone number

I5 Whose phone Work ☐¹ or Home ☐² or Neighbor / Relative ☐³ (choose one)

I6 Cluster name: I7 Cluster #:

I8 Interviewer: I9 House:

I10 Date of completion of the questionnaire:

I11 Interview time: AM ☐¹ or PM ☐² (choose one)

I12 Interview language: Marshallese ☐¹ or English ☐² (choose one)

STEP 1: QUESTIONNAIRE BASED ASSESSMENT

Demographic Information

D1 Sex: Male ☐¹ or Female ☐² (choose one)

D2 What is your date of birth? (Kwar lotak naaf?)

D3 How old are you? (Jete am iio?) ☐ years ONLY IF UNSURE OF DATE OF BIRTH
(Kajjitok wot ne rejaje raan in lotak eo aer)

D4 What is the highest level of education you have completed?

(Jete iio in am kar bed ilo jikuul jen jinoin?)

(choose one)

Never attended school (Iar jab jikuul) ----- ☐¹

Primary school (Elementary) ----- ☐²

Middle school ----- ☐³

High school ----- ☐⁴

Vocational/Technical training school (Job corp/JTPA) ----- ☐⁵

College or university ----- ☐⁶

D5 In total, how many years have you spent at school and in full-time study?

(Kwar jemlok ilo kilaaj jete ak jete iio in am kar jikuul?)

☐ years

D6 Marital status Married ☐¹ or Single ☐²

(choose one)

D7 What is your ethnicity? (Kwe ria?) Marshallese ☐¹ or Other ☐² (choose one)

D8 In what island/city were you born? (Kwar lotak ia, kwalok ene im aelon?)

□□□□□□□□□□□□□□□□

- D9 Where (island/city) did you live in the first 10 years of your life?
(Ilo iio ko jonoul imaan tata ilo mour eo am, ia ko kwar jokwe ie?)

Location (Ene ta)

Number of Years (Jete yio)

- D10 Which of the following best describes your main employment status over the last 12 months?
(Ilo allon ko 12 rej mootlok, kwar jerbal rot?)

(choose one)

- Government employee (*Rijerbal in kien*) ☐¹
 Non-government employee (*Rijerbal in private*) ☐²
 Self-employed (including copra processing, fishing, handicraft making)
 (*Make kobajet ainwot kowainini, anod, amimono*) ☐³
 Non-paid (volunteer, subsistence etc) (*Volunteer pajok ilo ejjelok woneen*) ☐⁴
 Student (*Rijikuul*) ☐⁵
 Homemaker ☐⁶
 Retired ☐⁷
 Unemployed (able to work) (*Ijjab jerbal ak imaron*) ☐⁸
 Unemployed (unable to work) (*Ijjab maron jerbal*) ☐⁹

- D11 How many people in total, including yourself, live in your household?
(Jete armej mwiin koba kwe?)

- D12 How many people 18 years or older, including yourself, live in your household?
(Jete armij im rej jokwe mwiin im re-ritto jen 18 iio?)

- D13 Over the past year, can you tell me what the average gross earnings of the household have been?
(Ilo iio eo ej jemlok, kwomaron ke kwalok jonan jeen eo ear delontok mwiin, aolep kola jen aolep rijerbal ro im ro jet im jeen ej itok jen er (total mokta jen aer ebbok tax im allotment ko?)

- Bi-weekly ¹ \$
 or per month ² \$
 or per year ³ \$
 or refuse to reply ☐⁴
 or don't know ☐⁵

If other than "don't know",
then skip to S1

- D14 If you don't know the amount, can you give an estimate of the annual household income if I read some options to you? (*Ne kwojjab jela, kwomaron ke kwalok emaron jete ?*)

(choose one)

- Is it less than \$5,000? (*Edik jen \$5,000?*) ☐¹
 Is it between \$5,000 and \$10,000? (*Kotaan \$5,000 and \$10,000?*) ☐²
 Is it between \$10,000 and \$15,000? (*Kotaan \$10,000 and \$15,000?*) ☐³
 Is it between \$15,000 and \$20,000? (*Kotaan \$15,000 and \$20,000?*) ☐⁴
 Is it more than \$20,000? (*Elap jen \$20,000*) ☐⁵

Smoking/Tobacco use

- S1a Do you currently smoke any tobacco products such as cigarettes, cigars, pipes?
(Kwoj ke kobataat jikka, cigar ak pipe ko?)

Yes ☐¹
 No ☐²

(if no, skip to S5)

S1b If yes, do you currently smoke tobacco products daily?
(*Ne aet, kwoj ke kobataat aolep raan?*)

Yes ☐¹
No ☐²
(if no, skip to S5)

S2a How old were you when you first started smoking daily?
(*Kar jete am iio ke kwar jinoo kobataat aolep raan?*)

S2b If you don't know how old you were, do you remember how long ago it was?
(*Ne kwojjab kememej, kwomaron ke kwalok ewi toon am kobataat aolep raan?*)

weeks ago ¹ ☐
or months ago ² ☐
or years ago ³ ☐

S3 On average, how many of the following items do you smoke each day?
(*Ewi jonan am kobataat men kein ilo kajjojo raan?*)

	Number per day
a) Manufactured cigarettes (<i>Jikka jen mon wia ko</i>)	<input type="checkbox"/>
b) Hand-rolled cigarettes (<i>Jikka ko kwoj make limi</i>)	<input type="checkbox"/>
c) Pipes full of tobacco (<i>Pipe ko</i>)	<input type="checkbox"/>
d) Cigars/cheroots (<i>Cigar</i>)	<input type="checkbox"/>
e) Other – specify (<i>Ebar wor ke</i>)	<input type="checkbox"/>

S4 What influenced you to start smoking? (*Ta eo bwe kwon jinoo kobataat?*)

a) My friends smoked (*Ro motta rej kobataat*) ----- ☐
b) Family members smoked (*Ro nuku rej kobataat*) ----- ☐
c) I just wanted to try it (*Iar konaan kajjion*) ----- ☐
d) No one told me not to (*Ejelok en ear ba injab*) ----- ☐
e) Other – specify (*Ebar wor ke*) ----- ☐

S5 In the past, did you ever smoke daily?
(*Kwar ke juon rikobataat aolep raan?*)

Yes ☐¹
No ☐²
(if no, skip to S7)

S6a How old were you when you stopped smoking daily?
(*Jete am iio ke kwar bojrak kobataat?*)

S6b If you don't know how old you were, do you remember how long ago it was?
(*Ne kwojjab kememej, emaron ewi toon jen ke kwar bojrak?*)

weeks ago ¹ ☐
or months ago ² ☐
or years ago ³ ☐

Assessing use of smokeless tobacco

S7a Do you currently use smokeless tobacco such as snuff or chewing tobacco? Yes ☐¹
(Kwoj ke kojerbal Copenhagen ak chewing tobacco?) No ☐²
(if no, skip to S10)

S7b If yes, do you currently use these products daily? Yes ☐¹
(Ne aet, kwoj ke kojerbali aolep raan?) No ☐²
(if no, skip to S10)

S8 On average, how many times do you use the following items each day?
(Ewi jonan eo ekka am boke ilo kajjojo raan?)

	Number per day
a) Snuff – oral use	<input type="checkbox"/>
b) Snuff – nasal use	<input type="checkbox"/>
c) Chewing tobacco (Copenhagen)	<input type="checkbox"/>
d) Other – specify (Ebar wor ke)	<input type="checkbox"/>

S9 What influenced you to start using smokeless tobacco products such as snuff or chewing tobacco?
(Ta eo ear komman bwe kwon jinoe kojerbale chewing tobacco?)

a) My friends used (Ro motta rej kommane) ----- ☐
b) Family members used (Ro nuku rej kommane) ----- ☐
c) I just wanted to try it (Iar konaan kajjion) ----- ☐
d) No one told me not to (Ejjelok en ear ba injab) ----- ☐
e) Other – specify (Ebar wor ke) ----- ☐

}

Note: ask the following question ONLY to those who are NOT a current daily user

(Lelok kajitok kein nan ro wot im rejjab kojerbal chewing tobacco aolep raan ilo torein)

S10 In the past, did you ever use smokeless tobacco such as snuff or chewing tobacco daily? Yes ☐¹
(Kwar ke juon eo ej kojerbal chewing tobacco aolep raan?) No ☐²

Assessing exposure to passive smoking (Etale jonan baat eo armej eo ej emmenonoiki)

S11 How often are you exposed to other people smoking in your presence?
(Ewi ekutkutin am emmenonoik baat jen ro jet ilo jikin kein?)

	Daily <u>Aolep raan</u>	Occasionally <u>Jet wot iien</u>	Never <u>Ijjab</u>
a) At work (ilo jikin jermal) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
b) At home (ilo mweo imom) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
c) On public transport (ilo taxi ak bus ko) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
d) In public eating places (ijoko jikin public) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³

Betel nut use

BN1 Do you currently use betel nut? Yes ☐¹
(Kwoj ke kojerbal betel nut?) No ☐²
(if no, skip to BN6)

BN2 If yes, do you currently use betel nut daily? Yes ☐¹
(Ne aet, kwoj ke kojerbal betel nut aolep raan?) No ☐²
(if no, skip to BN6)

BN3 On average, how many times do you use betel nut each day?
(Ewi jonan eo ekka am kojerbale ilo kajjojo raan?)

BN4 What influenced you to start using betel nut?
(Ta eo ear kommane bwe kwon jinoe kojerbal betel nut?)

a) My friends used (Ro motta rej kommane) ----- ☐
b) Family members used (Ro nuku rej kommane) ----- ☐
c) I just wanted to try it (Iar konaan kajjion) ----- ☐

}

d) No one told me not to (*Ejjelok en ear ba injab*) ----- ☐

e) Other – specify (*Ebar wor ke*) ----- ☐

BN5

When you chew betel nut, do you add cigarettes or tobacco?

(*Ne kwoj kojerbal betel nut, kwoj ke ilik jikka ie?*)

(choose one)

Yes, all the time (*Aet, aolep iien*) ----- ☐¹

Yes, but not all the time (*Aet botaab ejjab aolep iien*) ----- ☐²

No, never (*Ijjab*) ----- ☐³

Note: ask the following question ONLY to those who are NOT a current daily user

(*Lelok kajitok kein nan armej eo ejjab kojerbal betel nut aolep raan ilo torein*)

BN6 In the past, did you ever use betel nut daily?

Yes ☐¹

(*Kwar ke juon eo ej kojerbal betel nut aolep raan?*)

No ☐²

Alcohol Consumption

A1a Have you ever consumed any type of alcoholic beverage – such as beer, wine, liquor, coolers, fermented cider?

(*Kwonanin ke kar idaak dennin kadok kein ainwot bia, wain, vodka, wain cooler,*

Yes ☐¹

jemanin?)

No ☐²

(if no, skip to N1a)

A1b If yes, was this within the past 12 months? (*Ne aet, ear ke ilo allon ko 12 rej jemlok?*)

Yes ☐¹

No ☐²

(if no, skip to N1a)

A2 In the past 12 months, how frequently have you had at least one alcoholic drink?

(*Ilo allon ko 12 rej jemlok, ewi emakijij in am idaak dik tata juon dennin kadok?*)

(choose

one)

5 or more days a week (*5 allen im lonlok ilo juon wiik*) ----- ☐¹

1-4 days per week (*1-4 raan ilo juon wiik*) ----- ☐²

1-3 days per month (*1-3 raan ilo juon allon*) ----- ☐³

Less than once per month (*Edik jen juon allen ilo juon allon*) ----- ☐⁴

A3 When you drink alcohol, on average how many drinks do you have during one day?

(*Ne kwoj idaak dennin kadok, ewi jonan eo ekka am idaak ilo juon raan?*)

A4 During the past 7 days, how many standard drinks of any alcoholic beverage or combination of beverages did you have in a single day? (*Ilo wiik eo ej jemlok, ewi jonan jabrewot kain dennin kadok eo im kwar idaak ilo kajjojo raan kein?*)

a) Monday ----- ☐ drinks

b) Tuesday ----- ☐ drinks

c) Wednesday ----- ☐ drinks

d) Thursday ----- ☐ drinks

e) Friday ----- ☐ drinks

f) Saturday ----- ☐ drinks

g) Sunday ----- ☐ drinks

For men only: (*Nan emmaan ro wot*)

A5a In the past 12 months, on how many days did you have 5 or more alcoholic drinks in a single day?

(*Ilo allon ko 12 rej jemlok, jete raan im kwar idaak 5 im lonlok dennin kadok ilo juon raan?*)

For women only: (*Nan kora ro wot*)

A5b In the past 12 months, on how many days did you have 4 or more alcoholic drinks in a single day?
(Ilo allon ko 12 rej jemlok, jete raan im kwar idaak 4 im lonlok dennin kadok ilo juon raan?)

For everyone: (Nan aolep)

A6 In the past 12 months, what was the largest number of drinks you had on a single occasion, counting all types of alcoholic beverages combined? (Ilo allon ko 12 rej jemlok, ewi jonan eo elap tata im kwar idaak ilo juon iien?)

A7 How old were you when you started drinking alcohol?
(Jete am iio ke kwar jinoe idaak dennin kadok?)

A8 What influenced you to start drinking?
(Ta eo ear komman bwe kwon jinoe idaak dennin kadok?)

- a) My friends used (Ro motta rej kommane) ----- ☐
- b) Family members used (Ro nuku rej kommane) ----- ☐
- c) I just wanted to try it (Iar konaan kajjion) ----- ☐
- d) No one told me not to (Ejjelok en ear ba injab) ----- ☐
- e) Other – specify (Ebar wor ke) ----- ☐

Mark all relevant answers
(kalet aolep uaak ko rekkar)

A9 Where do you mostly get your alcoholic beverage from? (Ia eo ekka am ebbok dennin kadok jene?)
(choose one)

- Store (Mon wia) ----- ☐¹
- Friends and relatives (Ro motta im nuku) ----- ☐²
- Home brew (Ij make komman) ----- ☐³

A10 When you drink alcohol, which of the following are you likely to eat while drinking?
(Ne iien am idaak dennin kadok, mona rot ekka am mona?)

- | | <u>Yes</u> | <u>No</u> |
|-------------------------------------------------|---------------------------------------|---------------------------------------|
| a) Sashimi ----- | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² |
| b) Raw poultry parts (Iul, tu, bao) ----- | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² |
| c) Chips/pretzels/popcorn ----- | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² |
| d) Cooked meats/poultry (jalele ko romat) ----- | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² |
| e) Sweets (tonal ko) ----- | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² |
| f) Other (specify) | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² |
| g) Nothing at all (ejjelok) ----- | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² |

Mark all relevant answers
(kalet aolep uaak ko rekkar)

A11 When you drink alcohol, do you smoke tobacco products?
(Ne kwoj idaak dennin kadok, kwoj ke kobataat?)

- Yes ☐¹
No ☐²

Nutrition

Definition of serving size of fruit

(fresh, canned, frozen, excludes fruit juice) eaten with meals or as a snack:

- 1 cup diced
- 1 medium piece
- 2 small pieces

Example of fruit

fresh apple, orange, banana, grapes, watermelon, cantaloupe, kiwi, peaches, pears, pineapple, papaya, pandanus, lime, canned fruits, etc.

1.1.1 Definition of serving size of vegetable

(fresh, canned, frozen, excludes vegetable juice) eaten with meals or as a snack:

- 1 cup raw vegetables
- ½ cup cooked vegetables

Example of vegetables

corn, cucumber, cabbage, lettuce, carrots, bell peppers, broccoli, frozen vegetables, canned vegetables, breadfruit, taro, pumpkin, etc.

- N1a On how many days do you eat fruit in a typical week?
(*Jete raan ilo juon wiik im ekka am mona leen wojke ko jej ba fruit?*)
- N1b How many servings of fruit do you eat on one of these days?
(*Ilo raan ko kwoj mona leen wojke kein (fruit), jete serving kwoj mona?*)
- N2a On how many days do you eat vegetables (imported and local) in a typical week?
(*Jete raan ilo juon wiik im ekka am mona leen wojke ko jej ba vegetable?*)
- N2b How many servings of vegetables do you eat on one of these days?
(*Ilo raan ko kwoj mona leen wojke kein (vegetable), jete serving kwoj mona?*)
- N3a Do you usually prepare meals at home? Yes ☐¹
(*Kwoj ke komat im kopooj mona nan ri-mwiin?*) No ☐²
(if no, skip to N4)
- N3b What types of oil or fat is used most often for meal preparation at home?
(*Kurij rot ko ekkutkut tata in am kojerbale ilo iien am komat ilo mweo imom?*) (choose one)
- Coconut cream (*El*) ----- ☐¹
- Vegetable oil (*Kurij den*) ----- ☐²
- Shortening, lard, pig fat (*Kurij ben im kurij in piik*) ----- ☐³
- Butter or ghee (*Bata*) ----- ☐⁴
- Margarine ----- ☐⁵
- Other - specify (*Ebar wor ke*)----- ☐⁶
- Nothing in particular (*Ejelok*) ----- ☐⁷
- I don't use any oil or fat when preparing meals
(*Ijjab kojerbal kurij kein ilo iien ao komat mona*) ----- ☐⁸
- Don't know (*Ijaje*) ----- ☐⁹
- N3c What is the most common way you cook the following foods?
(*Ewi wawein eo ekka tata am kommati jalele kein?*)
- | | <u>Bake</u>
<i>Umum</i> | <u>Boil</u>
<i>Boil</i> | <u>Grill</u>
<i>Jinkadol</i> | <u>Fry</u>
<i>Burae</i> | <u>Steam</u>
<i>Stiim</i> | <u>Stew</u>
<i>Taketake</i> | <u>Raw</u>
<i>Amij</i> | <u>Don't Eat</u>
<i>Ijjab mona</i> |
|-----------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| a) Fish (<i>Ek</i>) | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² | <input type="checkbox"/> ³ | <input type="checkbox"/> ⁴ | <input type="checkbox"/> ⁵ | <input type="checkbox"/> ⁶ | <input type="checkbox"/> ⁷ | <input type="checkbox"/> ⁸ |
| b) Beef/meat (<i>Kao</i>) | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² | <input type="checkbox"/> ³ | <input type="checkbox"/> ⁴ | <input type="checkbox"/> ⁵ | <input type="checkbox"/> ⁶ | <input type="checkbox"/> ⁷ | <input type="checkbox"/> ⁸ |
| c) Chicken (<i>Bao</i>) | <input type="checkbox"/> ¹ | <input type="checkbox"/> ² | <input type="checkbox"/> ³ | <input type="checkbox"/> ⁴ | <input type="checkbox"/> ⁵ | <input type="checkbox"/> ⁶ | <input type="checkbox"/> ⁷ | <input type="checkbox"/> ⁸ |
- N3d How many days in one week do you cook the following foods with coconut cream?
(*Jete raan ilo juon wiik im kwoj kojerbal el nan komati mona kein?*)
- a) Breadfruit (*Ma*) ----- ☐ days
- b) Taro (*Iaraj*) ----- ☐ days
- c) Pumpkin (*Paanke*) ----- ☐ days
- d) Banana (*Binana*) ----- ☐ days
- e) Fish (*Ek*) ----- ☐ days
- f) Rice (*Raij*) ----- ☐ days
- N4 In the past 7 days, how many days did you eat any local food crops such as:
(*Ilo raan ko 7 rej jemlok, jete raan kwar mona mona in aelon kein ainwot?*)
- a) Breadfruit (*Ma*) ----- ☐ days
- b) Taro (*Iaraj*) ----- ☐ days
- c) Pumpkin (*Paanke*) ----- ☐ days
- d) Banana (*Binana*) ----- ☐ days
- e) Sweet potato (*Piteto tonal*) ----- ☐ days
- f) Other – specify (*Ebar wor ke*) ----- ☐ days
- N5 In the past 7 days, how many days did you eat fresh fish?
(*Ilo raan ko 7 rej jemlok, jete raan kwar mona ek kaal?*)

- N6 In the past 7 days, how many days did you eat canned meats or canned fish?
(Ilo raan ko 7 rej jemlok, jete raan kwar mona jalele ko ilo kuwat?) ☐ days
- N7 How many cups of caffeinated coffee do you drink each day on average?
(Jete kap in kobe (caffeine) ekka am idaak ilo kajjojo raan?) ☐ cups
- N8 When you drink coffee or tea, how many teaspoons of sugar do you use per cup?
(Ne kwoj idaak kobe ak tii, jete tijipuun in juka kwoj ilik ilo kajjojo kap?) ☐ tsp
- N9 In the past 7 days, how many cans of regular soft drink did you have?
(Ilo raan ko 7 rej jemlok, jete kuwat in kola (regular) im kwar idaak?)

Physical Activity

O. Occupational Physical Activity - paid or unpaid (Makitkit ko kwoj kommani ikijien jermal)

Reply to the following questions thinking about a typical week during the past 12 months.
(Uaaki kajitok kein ilo am lomnak kin makitkit ko ekka am kommani ilo juon wiik ilo allon ko 12 rej jemlok.)

- O1 Did you work mostly in the household?
(Ekka ke am kar jermal ilo mweo imom?) Yes ☐¹
No ☐²
- O2 How long is your typical workday?
(Jete awa ekka am jermal ilo juon raan?) ☐ hours
- O3 Does your work involve mostly sitting or standing still with walking for less than 10 minutes at a time? (Jermal eo kwoj kommane elap wot ke am jijjet ak jutak im kwoj etetal wot edik jen 10 minit ilo juon iien?) Yes ☐¹
No ☐²
(if yes, skip to T1a)
- O4a Does your work involve vigorous activity, like heavy lifting, digging, or construction work for at least 10 minutes at a time? (Jermal eo kwoj kommane elap ke am emmakitkit ainwot ekkotak, kob ron, kaamoto im kwojjab bojrak eto j en 10 minit ilo juon iien?) Yes ☐¹
No ☐²
(if no, skip to O5a)
- O4b If yes, on how many days in a typical week?
(Ne aet, jete raan ilo juon wiik?) ☐ days
- O4c How much time do you spend doing this on a typical day?
(Jete awa kwoj jolok nan kommane makitkit kein ilo juon raan?) ☐ h : ☐ m
- O5a Does your work involve moderate-intensity activities, like brisk walking or carrying light loads for at least 10 minutes at a time? (Ilo jermal eo am, kwoj ke etetal ilo emman jonan ak ekkotak mweik ko romera eto jen 10 minit ilo juon iien?) Yes ☐¹
No ☐²
(if no, skip to T1a)
- O5b If yes, on how many days in a typical week?
(Ne aet, jete raan ilo juon wiik?) ☐ days
- O5c How much time do you spend doing this on a typical day?
(Jete awa kwoj jolok nan kommane makitkit kein ilo juon raan?) ☐ h : ☐ m

T. Travel-related Physical Activity (Makitkit ko ilo iien am itoitak)

- T1a Do you walk or cycle (pedal bicycle) to and from places (to work, to the market, to church, etc) for at least 10 minutes at a time? (Kwoj ke etetal ak baijokol elap jen 10 minit nan jikin ko?) Yes ☐¹
No ☐²
(if no, skip to L1)
- T1b If yes, on how many days in a typical week?
(Ne aet, jete raan ilo juon wiik?) ☐ days
- T1c How much time do you spend traveling this way on a typical day?
(Jete awa kwoj itoitak rot in ilo juon raan?) ☐ h : ☐ m

L. Other Physical Activity – recreation/sport/leisure (*Makitkit ko kwoj kommani ilo iien am kakkije*)

This set of questions is about activities you do in your leisure-time for recreation, such as sport (that is, activities aside from your work or travel, and not the activities already mentioned). (*Kajjitok kein rej ikijjen makitkit ko kwoj kommani ilo iien am kakkije ak ikkure*).

- L1 Does your recreation, sport and leisure (RSL) time involve mostly sitting, reclining, or standing, with walking for less than 10 minutes at a time? (*Makitkit ko ekka am kommani ilo iien am kakkije ekka wot ke am jijjet, bed bajok ak jutak ilo juon wot jikin im eto jen 10 minit?*)

Yes ☐¹

No ☐²

- L2a Do you do vigorous activities like weight lifting, running, or strenuous sports in your RSL-time for at least 10 minutes at a time? (*Kwoj ke kommani makitkit kein im eto jen 10 minit ilo iien am kakkije ainwot ekkotak, ettor, im ikkure ko ainwot basketball, tennis, aonon?*)

Yes ☐¹

No ☐²

(if no, skip to L3a)

- L2b If yes, on how many days in a typical week?
(*Ne aet, jete raan ilo juon wiik?*)

days

- L2c How much time do you spend doing this on a typical day?
(*Jete awa kwoj jolok nan kommane makitkit kein ilo juon raan?*)

h : m

- L3a Do you do moderate-intensity activities, like brisk walking, cycling or swimming, in your RSL-time for at least 10 minutes at a time? (*Ilo iien am kakkije, kwoj ke etetal ilo emman jonan, baijokol, ao im eto jen 10 minit?*)

Yes ☐¹

No ☐²

(if no, skip to R1)

- L3b If yes, on how many days in a typical week?
(*Ne aet, jete raan ilo juon wiik?*)

days

- L3c How much time do you spend doing this on a typical day?
(*Jete awa kwoj jolok nan kommane makitkit kein ilo juon raan?*)

h : m

R. Sitting/reclining (*Sitting/reclining*)

This question is about sitting or reclining. Think back over the past 7 days to time spent at work, at home, or during recreation time, including time spent sitting at a desk, visiting friends, reading, or watching television - but not counting time spent sleeping. (*Kajjitok kein rej ikkijjen am jijjet im bed bajok. Kwon ememej lok raan ko 7 rej jemlok ikkijjen jonan eo kwar jolok ilo am jermal, ilo am bed mweo imom ak ilo iien am bed bajok botaab ejjab ilo iien am kiki.*)

- R1 How much time do you spend sitting or reclining on a typical day?
(*Jete awa kwoj jolok nan jijjet im bed bajok ilo juon raan?*)

h : m

Knowledge and Attitude on Diabetes

I will now ask you a few questions to help me understand your thoughts and beliefs about the disease we call **diabetes mellitus**. (*Kio inaa kajjitok jet kajjitok ko bwe in melele kin lomnak im tomak ko am ikkijjen naninmej in tonal.*)

- K1 Tell me of any factors that you know of that contribute to diabetes. (*Kwomaron ke kwalok jet un ko rej komman naninmej in tonal.*)

Note: Do NOT read out the following. Mark “yes” only for those factors that the participant mentions on their own without prompting.
(JAB kwalok waanjonok kein. Kane doulul eo an ‘yes’ ikkijjen uaak eo armej eo ej kwalok.)

- | | Yes |
|------------------------------------------------------------------------------|--------------------------|
| a) Doing little physical activity (<i>Ejjabwe emmakitkit</i>) ----- | <input type="checkbox"/> |
| b) Burdened with stress (<i>Elap am eddo kin inebata</i>) ----- | <input type="checkbox"/> |
| c) Overweight (<i>Killep</i>) ----- | <input type="checkbox"/> |
| d) Smoking/tobacco use (<i>Kobataat im Kojerbal tobacco</i>) ----- | <input type="checkbox"/> |
| e) Drinking alcohol (<i>Idaak dennin kadok</i>) ----- | <input type="checkbox"/> |
| f) Eating too much high fat foods (<i>Elap mona mona ko rekurij</i>) ----- | <input type="checkbox"/> |
| g) Eating too much during a meal (<i>Burokolep</i>) ----- | <input type="checkbox"/> |

- h) Eating little fruits, vegetables, local food crops (*Ejjabwe mona mona in leen wojke ko*) ----- ☐
i) Eating too much sugar and sweet foods (*Elap mona tonal im mona ko retonal*) ----- ☐
j) Eating too much white rice (*Elap mona rajj mouij*) ----- ☐
k) Older age (*Ilo iien ad lallap im lallap*) ----- ☐
l) Genetics/family inheritance (*Bodan*) ----- ☐
m) Pregnancy (*Bororo*) ----- ☐
n) Ethnicity (*Kwe ria*) ----- ☐
o) Nuclear contamination (*Baijin in bomb*) ----- ☐
p) Other – specify (*Ebar wor ke*) ----- ☐

K2 Tell me of any symptoms of diabetes that you know of. (*Kwalok kokolla ko an naninmej in tonal.*)

Note: Do NOT read out the following. Mark “yes” only for those symptoms that the participant mentions on their own without prompting.

(JAB kwalok waanjonok kein. Kane doulul eo an ‘yes’ ikkijen uaak eo armej eo ej kwalok)

- Yes
- a) Frequent urination (*Emmakijkij am kapojak den*) ----- ☐
b) Excess thirst (*Kwo emmaroro*) ----- ☐
c) Blurry vision (*Ettab am erre*) ----- ☐
d) Weakness (*Majno*) ----- ☐
e) Poor wound healing (*Eto an kinej ko mo*) ----- ☐
f) Other – specify (*Ebar wor ke*) ----- ☐

K3 Tell me what parts of the body are affected in diabetes if the blood sugar is poorly controlled. (*Kwalok ijoko ilo anbwim im naninmej in tonal emaron kakkuri.*)

Note: Do NOT read out the following. Mark “yes” only for those parts of the body that the participant mentions on their own without prompting.

(JAB kwalok waanjonok kein. Kane doulul eo an ‘yes’ ikkijen uaak eo armej eo ej kwalok.)

- Yes
- a) Feet/legs (*Neem*) ----- ☐
b) Hands/arms (*Peim*) ----- ☐
c) Eyes (*Mejam*) ----- ☐
d) Kidneys (*Dokein jibke*) ----- ☐
e) Heart (*Menono*) ----- ☐
f) Brain (*Komelij*) ----- ☐
g) Pancreas (*Aj en edik*) ----- ☐
h) Blood vessels (*Ialan botoktok*) ----- ☐
i) Other – specify (*Ebar wor ke*) ----- ☐

K4 In the last 12 months, have you received any information about diabetes from any of these people? (*Ilo allon ko 12 rej jemlok, kwar ke bok melele kin naninmej in tonal jen armej rein?*)

- (answer all)
Yes No
- a) Doctors/Health Assistant (*Takto ro*) ----- ☐ ☐
b) Nurses/Health Educators ----- ☐ ☐
c) Relatives (*Ro nukum*) ----- ☐ ☐
d) Friends/Neighbors (*Ro mottam*) ----- ☐ ☐
e) Traditional healer (*Ri-uno in Majol*) ----- ☐ ☐
f) Pastor/Priest (*Rikaki in kabun*) ----- ☐ ☐

K5 In the last 12 months, have you received any information about diabetes from any of these sources? (*Ilo allon ko 12 rej jemlok, kwar ke bok melele ko ikkijen naninmej in tonal jen wawein kein?*)

- (answer all)
Yes No
- a) TV program ----- ☐ ☐
b) Radio program ----- ☐ ☐
c) Pamphlets/leaflets/books (*Bok in riid ko*) ----- ☐ ☐
d) Posters ----- ☐ ☐
e) Newspaper/Newsletter ----- ☐ ☐
f) Internet ----- ☐ ☐
g) Workshops/Seminars/Lectures ----- ☐ ☐

K6 In the last 12 months, have you received any information about diabetes in any of these following locations? (*Ilo allon ko 12 rej jemlok, kwar ke bok melele ikkijen naninmej in tonal jen jokein?*)

		(answer all)	
		Yes	No
a)	Health clinic/hospital -----	<input type="checkbox"/>	<input type="checkbox"/>
b)	Work place (<i>Jikin jerbal</i>) -----	<input type="checkbox"/>	<input type="checkbox"/>
c)	Church (<i>Mon jar</i>) -----	<input type="checkbox"/>	<input type="checkbox"/>
d)	Supermarket/shopping centre (<i>Mon wia ko</i>) -----	<input type="checkbox"/>	<input type="checkbox"/>
e)	Hotel -----	<input type="checkbox"/>	<input type="checkbox"/>
f)	Schools (<i>Mon jikuul ko</i>) -----	<input type="checkbox"/>	<input type="checkbox"/>
g)	Health fairs/community fairs -----	<input type="checkbox"/>	<input type="checkbox"/>

History of Diabetes

H1 Have you had your blood sugar tested for diabetes in the last 12 months? Yes ☐¹
(Ilo allon ko 12 rej jemlok, kwananin ke kar jeek kin naninmej in tonal?) No ☐²
 Uncertain ☐³

H2 If yes, where did you have your blood sugar tested last? (*Ne aet, kwar jeek ia alik tata?*) (choose one)
 Health Center/hospital ----- ☐¹
 Community health fair ----- ☐²
 Zone nurse station (*Ibben Zone nurse ro*) ----- ☐³
 At home (*Ilo mweo imom*) ----- ☐⁴
 Workshop/seminar/training ----- ☐⁵
 Work place (*Jikin jerbal*) ----- ☐⁶
 Other – specify (*Ebar wor ke*) ----- ☐⁷

H3 Have you ever been told by a doctor or health worker that you have diabetes? (*Kwananin ke kar ron jen takto ak rijerbal ro an ejmour ke ewor am naninmej in tonal?*) Yes ☐¹
 No ☐²
 Uncertain ☐³
 (if no, skip to K7 in the next section)

H4 Are you currently receiving any of the following treatments for diabetes prescribed by a doctor or other health worker? (*Ilo torein, elon ke ian komadmod kein nan naninmej in tonal im kwoj boke jen takto eo am?*) (answer all)

	Yes	No	Uncertain
a) Insulin (<i>Wa in insulin</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
b) Oral drug – medication (<i>Uno batin ko</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
c) Special prescribed diet (<i>Kejparok am mona</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
d) Advice/treatment to lose weight (<i>Rojan im komadmod ko nan kaidikdik</i>)----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
e) Advice/treatment to stop smoking (<i>Rojan im komadmok ko nan bojrak kobataat</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
f) Advice to exercise (<i>Rojan nan kejjimourur</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
g) Advice on foot care (<i>Rojan nan kejparok neem</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³

H5 During the past 12 months have you seen a traditional healer for diabetes? Yes ☐¹
(Ilo allon ko 12 rej jemlok, kwar ke lolok juon ri-uno ikkijen naninmej in tonal?) No ☐²
 (if no, skip to K7 in the next section)

H6 If yes, are you currently taking any herbal or traditional remedy for your diabetes? Yes ☐¹
(Ne aet, kwoj ke kojerbal uno in Majol nan komadmod naninmej in tonal in am?) No ☐²

I will now ask you a few questions to help me understand your thoughts and beliefs about the disease we call **high blood pressure** or **hypertension**. (*Inaaj kio kajjitok jet kajjitok ko nan jipan eo melele kin lomnak im tomak ko am ikkijen naninmej in aibulat.*)

- K7 Tell me of any factors that you know of that contribute to high blood pressure. (*Kwomaron ke kwalok un ko im kwo melele kaki im rej komman bwe en wor naninmej in aibulat.*)

Note: Do NOT read out the following. Mark “yes” only for those factors that the participant mentions on their own without prompting.

(JAB kwalok waanjonok kein. Kane doulul eo an ‘yes’ ikkijen uaak eo armej eo ej kwalok.)

- | | Yes |
|---------------------------------------------------------------------------------------------------|--------------------------|
| a) Doing little physical activity (<i>Ejjabwe emmakitkit</i>) ----- | <input type="checkbox"/> |
| b) Burdened with stress (<i>Elap am eddo kin inebata</i>) ----- | <input type="checkbox"/> |
| c) Overweight (<i>Killep</i>) ----- | <input type="checkbox"/> |
| d) Smoking/tobacco use (<i>Kobataat im Kojerbal tobacco</i>) ----- | <input type="checkbox"/> |
| e) Drinking alcohol (<i>Idaak dennin kadok</i>) ----- | <input type="checkbox"/> |
| f) Eating too much high fat foods (<i>Elap mona mona ko rekuriij</i>) ----- | <input type="checkbox"/> |
| g) Eating too much during a meal (<i>Burokolep</i>) ----- | <input type="checkbox"/> |
| h) Eating little fruits, vegetables, local food crops (<i>Ejjabwe mona leen wojke ko</i>) ----- | <input type="checkbox"/> |
| i) Eating too much salt and salty foods (<i>Elap mona jol im mona ko rejol</i>) ----- | <input type="checkbox"/> |
| j) Eating too much white rice (<i>Elap mona raij mouij</i>) ----- | <input type="checkbox"/> |
| k) Older age (<i>Ilo iien ad lallap im lallap</i>) ----- | <input type="checkbox"/> |
| l) Genetics/family inheritance (<i>Bodan</i>) ----- | <input type="checkbox"/> |
| m) Pregnancy (<i>Bororo</i>) ----- | <input type="checkbox"/> |
| n) Diabetes (<i>Naninmej in tonal</i>) ----- | <input type="checkbox"/> |
| o) Nuclear contamination (<i>Baijin in bomb</i>) ----- | <input type="checkbox"/> |
| p) Other – specify (<i>Ebar wor ke</i>) ----- | <input type="checkbox"/> |

- K8 Tell me what complications might occur if high blood pressure is poorly controlled. (*Kwomaron ke kio kwalok jet apan ak utamwe ko remaron walok ne kwojjab keparok aibulat eo am.*)

Note: Do NOT read out the following. Mark “yes” only for those complications that the participant mentions on their own without prompting.

(JAB kwalok waanjonok kein. Kane doulul eo an ‘yes’ ikkijen uaak eo armej eo ej kwalok.)

- | | Yes |
|------------------------------------------------------------------------------------------|--------------------------|
| a) Brain/stroke ----- | <input type="checkbox"/> |
| b) Heart/Heart attack (<i>Metak ob</i>) ----- | <input type="checkbox"/> |
| c) Kidneys/Kidney failure (<i>Kutni</i>) ----- | <input type="checkbox"/> |
| d) Problem with blood vessels (<i>Ejoran ialan botoktok ko ilo anbwinnim</i>) ----- | <input type="checkbox"/> |
| e) Premature birth (<i>Ejibikbik ak jaun an ajri eo allon ilo iien an lotak</i>) ----- | <input type="checkbox"/> |
| f) Miscarriage (<i>Mej lojiem ilo iien am bororo</i>) ----- | <input type="checkbox"/> |
| g) Other – specify (<i>Ebar wor ke</i>) ----- | <input type="checkbox"/> |

- K9 In the last 12 months, have you received any information about high blood pressure from any of these people? (*Ilo allon ko 12 rej jemlok, kwar ke bok melele ikkijen naninmej in aibulat jen armej rein?*)

- | | (answer all) | |
|--------------------------------------------------------|--------------------------|--------------------------|
| | Yes | No |
| a) Doctors/Health Assistant (<i>Takto ro</i>) ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Nurses/Health Educators ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Relatives (<i>Ro nukum</i>) ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Friends/Neighbors (<i>Ro mottam</i>) ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Traditional healer (<i>Ri-uno in Majol</i>) ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Pastor/Priest (<i>Rikaki in kabun</i>) ----- | <input type="checkbox"/> | <input type="checkbox"/> |

- K10 In the last 12 months, have you received any information about high blood pressure from any of these sources? (*Ilo allon ko 12 rej jemlok kwar ke bok melele ikkijen naninmej in tonal jen wawein kein?*)

- | | (answer all) | |
|-------------------------------------------------------------|--------------------------|--------------------------|
| | Yes | No |
| a) TV program ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Radio program ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Pamphlets/leaflets/books (<i>Bok in riid ko</i>) ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Posters ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Newspaper/Newsletter ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Internet ----- | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Workshops/Seminars/Lectures ----- | <input type="checkbox"/> | <input type="checkbox"/> |

K11 In the last 12 months, have you received any information about high blood pressure in any of these following locations? (*Ilo allon ko 12 rej jemlok, kwar ke bok melele ikkijen naninmej in aibulat jen jikin kein?*)

	(answer all)	
	Yes	No
a) Health clinic/hospital -----	<input type="checkbox"/>	<input type="checkbox"/>
b) Work place (<i>Jikin jerbal</i>) -----	<input type="checkbox"/>	<input type="checkbox"/>
c) Church (<i>Mon jar</i>) -----	<input type="checkbox"/>	<input type="checkbox"/>
d) Supermarket/shopping centre (<i>Mon wia ko</i>) -----	<input type="checkbox"/>	<input type="checkbox"/>
e) Hotels -----	<input type="checkbox"/>	<input type="checkbox"/>
f) Schools (<i>Mon jikuul ko</i>) -----	<input type="checkbox"/>	<input type="checkbox"/>
g) Health fairs/community fairs -----	<input type="checkbox"/>	<input type="checkbox"/>

History of Hypertension

H7 When was your blood pressure last measured by a health professional?

(*Naat eo aliktata im kwar etale blood pressure eo am?*)

(choose one)

Within the last 12 months (*Ilo allon ko 12 rej mootlok*) ----- ☐ ¹

1-5 years ago (*Ilo iio ko 1-5 rej mootlok*) ----- ☐ ²

Not within the last 5 years (*Iar jab ilo iio ko 5 rej mootlok*) ----- ☐ ³

Never (*Ijjanin*) ----- ☐ ⁴

Uncertain (*Ijjab lukun jela*) ----- ☐ ⁵

(if "never" or "uncertain", skip to H9)

H8 If yes, where did you have your blood pressure tested last?

(*Ne aet, ia eo kwar etale blood pressure eo am alik tata?*)

(choose one)

Health Center/hospital ----- ☐ ¹

Community health fair ----- ☐ ²

Zone nurse station (*Ibben Zone nurse ro*) ----- ☐ ³

At home (*Ilo mweo imom*) ----- ☐ ⁴

Workshop/seminar/training ----- ☐ ⁵

Work place (*Jikin jerbal*) ----- ☐ ⁶

Other – specify (*Ebar wor ke*) ----- ☐ ⁷

H9 During the past 12 months have you been told by a doctor or other health worker that you have high blood pressure or hypertension? (*Ilo allon ko 12 rej jemlok, takto ak rijerbal ro jet an ejmour renanin ke kar ba ke ewor am naninmej in aibulat?*)

Yes ☐ ¹

No ☐ ²

Uncertain ☐ ³

(if no, skip to the next section)

H10 Are you currently receiving any of the following treatments for high blood pressure prescribed by a doctor or other health worker? (*Kwoj ke kojerbal wawein komadmod kein jen takto eo am ikkijen naninmej in aibulat?*)

	(answer all)		
	Yes	No	Uncertain
a) Drug(s) –(<i>Uno ko jen takto eo am</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
b) Special prescribed diet (<i>Kejparok am mona</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
c) Advice/treatment to lose weight (<i>Rojan im komadmod ko nan kaidikdik</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
d) Advice/treatment to stop smoking (<i>Rojan im komadmod ko nan bojrak kobataat</i>) -----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
e) Advice to exercise (<i>Rojan nan kejiimourur</i>)-----	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³

H11 During the past 12 months have you seen a traditional healer for high blood pressure or hypertension? (*Ilo allon ko 12 rej jemlok, kwar ke lolok juon ri-uno in Majol ikkijen aibulat?*)

Yes ☐ ¹

No ☐ ²

(if no, skip to the next section)

H12 If yes, are you currently taking any herbal or traditional remedy for your high blood pressure?

(*Ne aet, kwoj ke kojerbal uno in Majol ikkijen naninmej in aibulat?*)

Yes ☐ ¹

No ☐ ²

STEP 2: PHYSICAL MEASUREMENTS

PMa Date of measurements:

PMb Time of measurements: ☐ AM ☐¹ or PM ☐² (choose one)

Height, Weight and Waist Measurements

M1 Technician ID: ☐

M2 Measuring Board: ☐

M3 Scale: ☐

M4 Tape measure ☐

M5 Height: ☐ centimeters

M6 Weight: ☐ kilograms

M7 Participant currently pregnant (for women only) Yes ☐¹ (if "yes", skip to M9)
No ☐²
Uncertain ☐³

M8 Waist Girth (cm): ☐ centimeters

Use the following for unusual measurements:

Low value (out of range) ---- 777.7

Missing data ----- 888.8

High value (out of range) --- 999.9

Blood Pressure Measurement

M9 Technician ID: ☐

M10 BP Device: ☐

M11 Cuff size used: Small ☐¹ or
Medium ☐² or
Large ☐³ (choose one)

Use the following for unusual measurements:

Low value (out of range) ---- 777

Missing data ----- 888

High value (out of range) --- 999

M12 Systolic blood pressure (mmHg): ☐ Reading 1 Reading 2 Reading 3

M13 Diastolic blood pressure (mmHg): ☐

Note: Reading 3 needed only if readings 1 and 2 are 10mmHg or

STEP 3: BIOCHEMICAL MEASUREMENTS

Fasting status

B1 During the last 12 hours have you had anything to eat (including chewing gum) or to drink, other than water or unsweetened black tea or coffee? Yes ☐¹

No ☐²

Uncertain ☐³

(if "yes" or "uncertain", see Team Leader to reschedule for Step 3)

Blood glucose

B2 Technician ID: ☐

B3 Device: ☐

Use the following for unusual measurements:

Low value (out of range) ---- 77.7

Missing data ----- 88.8

High value (out of range) --- 99.9

B4 Time of blood specimen taken (Hours/minutes): AM ^o¹ **or** PM ^o² (choose one)
B5 Fasting blood glucose (mmol/l):

Comments

11.5 Appendix 5 - List of Forms Used

Form 1,	Recruitment form for STEPS 1 & 2 (translated)
Form 2,	Recruitment form for STEPS 1, 2 & 3 (translated and added on permission for Hepatitis B screening and storage of blood samples)
Form 3,	Individual Household Summary Form
Form 4,	Registration-check list
Form 5,	Checklist of supplies and equipment
Form 6,	List of EAs and code numbers
Form 7,	No one home form (English and Marshallese)
Form 8,	Blood collection list was incorporated into Form 12, lab results
Form 9,	Letter to employees
Form 10,	Results for men (translated)
Form 11,	Results for women (translated)
Form 12,	Biochemical laboratory results
Form 13,	Household tracking form

11.6 Appendix 6 - BUDGET SUMMARY

1.	STEPS Training in Fiji for Project Manager		\$4,840.60
2.	NCD STEPS Trainings		\$3,699.97
3.	Data collection		\$64,159.30
a)	Salary	\$14,176.50	
b)	Overtime compensation for MOH staff members:	\$6,972.00	
c)	Travel and Transportation	\$42,912.00	
d)	Meals	\$98.80	
4.	Printing		\$1,375.00
a)	Printing of questionnaires and forms:	\$465.00	
b)	Newspaper advertisements:	\$910.00	
5.	Equipment & supplies		\$21,049.96
	Step 1	\$7,631.28	
	Step 2	\$4,847.00	
	Step 3	\$8,571.68	
6.	Others		\$2,981.60
a)	Refreshments for STEP 3 participants:	\$2,118.17	
b)	Rental for generator	\$370.00	
c)	Fuel for generator.	\$20.00	
d)	Air freight costs	\$30.00	
e)	Unexpected expenses:	\$443.43	
TOTAL			<u>US\$98,106.43</u>
Budget sources			
WHO			US\$34,300
RMI MOH			US\$63,806.43

KEY CONTACTS

Marshall Islands Ministry of Health Contact:

Justina R. Langidrik, MPH
Secretary of Health
Ministry of Health
P.O.Box 16
Majuro, Marshall Islands 96960
Tel: (692) 625 – 7246/5660/5661
Fax: (692) 625 – 3432/4543/4372
Email: jusmohe@ntamar.nut
laibat23@hotmail.com

WHO Contact:

Dr Temo Waqanivalu
Nutrition and Physical Activity Officer
World Health Organisation
Office of the WHO Representative
Level 4, Provident Plaza 1
Downtown Boulevard
33 Ellery Street, P.O.Box 113
Suva, Fiji Islands
Tel: (679) 3234100 Fax: (679) 3234166
Email: waqanivalut@wpro.who.int