Nauru
NCD Risk Factors
STEPS Report

Contents

Acknowledgements

The Nauru NCD Risk Factors STEPS Report was successfully conducted with the support, hard work, participation and collaboration from the Nauru Ministry of Health, the World
Health Organization and the Centre for Physical Activity and Health, University of Sydney, supported by the Australian Agency for International Development.

This study would not be possible without the leadership of the Nauru Noncommunicable Disease Committee and the participation of the STEPS survey team, who managed and implemented all aspects of the survey activities, from participant recruitment to data collection and data entry.

We thank the Nauru Ministry of Health and the Republic of Nauru Hospital and the Nauru General Hospital for providing staffing, laboratory facilities and office space for the survey. Report compiled by: Dr Kieren Keke (MOH), Dr Philayrath Phongsavan (CPAH), Dr Li Dan (WHO), Ms Maree Bacigalupo (MOH), Dr Ben Smith (CPAH), Ms Ruby Thoma (MOH), Ms Leanne Riley (WHO), Dr Godfrey Waidubu (MOH), Dr Gauden Galea (WHO), Dr Jan Pryor (FSM), Mr Shalvindra Raj (WHO), Ms Tien Chey (CPAH).

We gratefully acknowledge the statistical support provided by Ms Tien Chey, Mr Lindsay Thoma (CPAH), Ms Leanne Riley, Ms Jacklynn Lippe (WHO Office in Geneva), Mr Shalvindra Raj (WHO Office in Suva) and Ms Elaine Chung (Australia) who made a substantial contribution to the timely completion of data analyses. We gratefully acknowledge Mr Andrew Fitzhardinge, Senior Hospital Scientist, and Dr Margaret Janu, Director of the Diagnostic Pathology Unit, Concord Repatriation General Hospital, Sydney, Australia, for their technical and infrastructure support provided for STEP 3 data collection and analyses. Mass media promotional materials for the Nauru-STEPS survey were produced by Professor Garry Egger and Mr Larry Gray.

Dr Godfrey Waidubu and Ms Vynka Raige co-ordinated in-country survey logistics. Local STEPS personnel staff as listed in the table on page 85. Dr Chen Ken (WHO Office in Suva), Dr Linda Milan and Dr Tommaso Cavalli-Sforza (WHO Office in Manila) have provided support to accelerate the finalization of the report. Dr Li Dan (WHO Office in Suva), Ms Leanne Riley, Professor Paul Zimmet (International Diabetes Institute), Mr Robert Hughes (WHO Office in Manila) and Dr Gauden Galea (WHO Office in Geneva) have conducted technical reviews of the report.

Dr Philayrath Phongsavan, Dr Jan Pryor, Dr Li Dan and Dr Ben J Smith were the final technical and editorial reviewers of the report through country consultation with Dr Kiki Thoma, Ms Maree Bacigalupo, Ms Ruby Thoma and Ms Eva Gadabu from Nauru.

Request from MOH, Nauru, WHO Office in Manila provided financial support for printing of the report, WHO Office in Suva arranged the printing.

List of Tables

List of Abbreviations

AusAID	Australian Agency for International Development
BMI	Body Mass Index
BP	Blood Pressure
CI	Confidence Interval
CPAH	Centre for Physical Activity and Health
DBP	Diastolic Blood Pressure
DPU	Diagnostic Pathology Unit
FCTC	Framework Convention on Tobacco Control
FSM	Fiji School of Medicine
HDL	High Density Lipoprotein
HPU	Health Promotion Unit
IATA	International Airline Transport Association
MET	Metabolic Equivalent
MOH	Ministry of Health
NCD	Noncommunicable Diseases
NGO	Non Governmental Organization
NPC	Nauru Phosphate Corporation
SBP	Systolic Blood Pressure
SPC	Secretariat of the Pacific Community
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization

Foreword

His Excellency the President of the Republic of Nauru Ludwig Scotty

With the changing lifestyles and dietary habits in Nauru, the health of this nation is now dominated by noncommunicable diseases (NCDs) such as diabetes, obesity, cardiovascular diseases and cancer. These NCDs are creating new challenges for our already stretched public health and curative services.

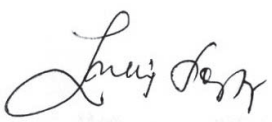
In this document, the NCD risk factors (tobacco, alcohol, diet, physical activity, body weight, blood pressure, blood glucose and lipids) profile of Nauru is presented. The results are based on a whole country survey of over 2,000 Nauruans. Conducted in 2004, the survey is part of a global effort - Stepwise Approach to Surveillance of Noncommunicable Diseases (STEPS) - to collect quality information for public health planning. Up until now, we have not had an up-to-date picture of the magnitude of the problems with respect to risk factors for NCDs at the population level.

This report recognizes the intertwined relationship between behaviour, the social, economic and physical environment in which we live, and our physical health. The report highlights that the risk for illnesses crosses age and gender boundaries. Our efforts to improve the health of this nation, therefore, need to adopt a whole country approach covering all ages and communities.

This report is the product of an invigorating collaboration between several agencies. The Ministry of Health was assigned national leadership and co-ordination responsibility. This initiative began as a request by the World Health Organization (WHO) for the Ministry of Health to monitor its current state of NCDs and related risk factors, a request which was fully endorsed at all levels of government. The WHO and the Australian Agency for International Development (AusAID), both provided financial support as well as a framework for the survey. The Centre for Physical Activity and Health (CPAH) at the University of Sydney provided the technical support and assistance with development of this report.

Over 30 enthusiastic health staff played a pivotal role in planning and implementing this study; your commitment is gratefully acknowledged. We were supported in this initiative by several hundred people, whose willingness to take part in the study is very much appreciated.

I hope that this document will encourage further collaborations in ensuring that quality information continues to be collected that will help inform health planning and services in Nauru today and for the future. I invite policy makers, health and medical staff and Nauru citizens to read this report so that we can - together - identify promising new ways to improve the health and well being of Nauruans.
The report lays down several challenges - and several recommendations - to our government and communities to take action and to translate the words in the report into achievable goals and positive health outcomes.



Ludwig Scotty
H. E. President
Republic of Nauru

Dr Chen Ken, World Health Organization Representative In the South Pacific

The World Health Organization (WHO) is proud to be a critical part of the collaborative efforts among Ministry of Health, Nauru, the Centre for Physical Activity and Health, University of Sydney and AusAID. The publishing of the NCD STEPS Report marks a milestone in Nauru as it provides scientific data that will assist the Ministry of Health and other related governmental organizations and non-governmental organizations in addressing the escalating issue of NCDs, and it will provide critical and updated data needed badly by the country.

WHO's response to the dramatic burden of chronic NCDs is therefore to give higher priority to NCD prevention, control and surveillance. The WHO STEPwise approach to surveillance (STEPS) is the WHO recommended surveillance tool for chronic disease risk factors and chronic disease-specific morbidity and mortality. It provides an entry point for low and middle income countries to get started on NCD surveillance activities. It is also designed to help countries build and strengthen their capacity to conduct surveillance.

STEPS survey follows a sequential process. It starts with gathering key information on risks factors with a questionnaire, then moves to simple physical measurements and then to more complex collection of blood samples for biochemical analysis. The STEPS tool used to collect data and measure NCD risk factors is called the STEPS Instrument.

STEPS risk factors is a sequential process, starting with gathering information on key risk factors by the use of interviewer administered questionnaires, then moving to simple physical measurements, and only then recommending the collection of blood samples for biochemical assessment. The baseline data provided by NCD risk factors STEPS survey 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, and physical inactivity.

Member states can use STEPS information not only for monitoring within country trends, but for making comparisons between and among countries as well. 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 gender group.

The results show that 48.2% of both genders reported smoking daily. The average number of manufactured cigarettes smoked per day was 19.8. About 93.7% of the population consumed fewer than 5 combined servings of fruit and/or vegetables per day. The majority of the surveyed population (82.2%) was overweight or obese, and the obesity rate was 58.1%.

WHO has recently developed "the summary of combined risk factors". We have selected five common and critical risk factors for NCDs: current daily smokers, overweight or obese (BMI?25kg/m2), raised blood pressure (SBP?140 and/or DBP?90 mmHg or currently on medication for raised blood pressure), less than 5 servings of fruit and vegetables per day and low level of physical activity (<600 METminutes). According to this comprehensive assessment, only 0.1% of the whole population in Nauru were low risk to NCDs (i.e., none of the 5 risk factors), compared with 80.8% of the population aged 45 to 64 years old with raised risk of at least three risk factors. More attention is required for those aged 25 to 44 years with 75.2 % classified with raised risk for NCDs. The overall prevalence of raised risk aged 25 to 64 years were 76.3%.

WHO is grateful to AusAID for their financial assistance, the Centre for Physical Activity and Health for their technical assistance, and the staff of Ministry of Health of Nauru who conducted the survey to collect the critical data.

Dr Chen Ken
World Health Organization Representative In the South Pacific

Executive Summary

The Nauru Stepwise Noncommunicable Diseases Prevalence and Risk Factor Survey (Nauru-STEPS) is part of a global endeavour to address major noncommunicable disease (NCD) risk factors in developing countries. The Nauru-STEPS survey was one of a series of STEPS surveys planned to obtain evidence to assist the effective delivery of prevention and control programs across the Pacific. The Nauru-STEPS was a nation-wide representative survey of 15 to 64 year olds with the following objectives:

- To document the national prevalence and patterns of tobacco use, alcohol consumption, dietary behaviours, physical activity, body mass index, elevated blood pressure, and biochemical markers such as blood glucose and blood lipids in Nauru.

- To provide reliable and up-to-date information on NCD risk factors for planning and evaluating public health initiatives, and for identifying future demands for health services in managing and treating NCDs.

The planning and implementation of the survey was a collaborative initiative between the Nauru Ministry of Health (MOH), the World Health Organization (WHO) and the New South Wales (NSW) Centre for Physical Activity and Health at the University of New South Wales in Australia. The study was supported by the Australian Agency for International Development (AusAID). Data collection was carried out from June to October 2004.

The Nauru-STEPS survey was a representative, population-wide cross-sectional survey and involved collecting data on levels of NCD risk factors among 15-64 year olds. Data collection moved along a sequential three-step process as follows:

STEP 1: Interview-based questionnaire on selected major health risk behaviours including smoking, alcohol con sumption, fruit and vegetable consumption, and physical activity. Additional issues deemed to be of importance in Nauru included history of high blood pressure, diabetes, self-rated general well-being, perceived susceptibility to diabetes and psychosocial and environmental factors related to health behaviours.

STEP 2: Physiological measures of health risks such as blood pressure, body mass and waist girth circumference.

STEP 3: Biochemical measures of health risks including fasting blood glucose and blood lipids. Assessment of albuminuria level was also undertaken in Nauru.

All aspects of the survey were managed by the Nauru MOH staff.

A representative sample of 2,272 participants aged between 15 and 64 years from across Nauru was surveyed, with a total response rate of 89.7%. Of the 2,272 respondents in the survey 1086 were males (47.8%) and 1186 were females (52.2%).

Tobacco use

- The overall prevalence of current smoking was 52.9%. The proportion was higher for females (56.0%) than males (49.7%).
- Among all respondents, 48.2% were daily smokers: 45.5% of males and 50.8% of females.
- The mean age at which daily smoking started was 15.9 years.
- Among current smokers, the average number of manufactured cigarettes smoked per day was very high 19.8); there was no marked difference in the mean number of cigarettes smoked between men and women.

Alcohol consumption

- The overall prevalence of current drinkers (have consumed alcohol in the past 12 months) was 46.2%: 60.7% of males and 32.1% of females.
- Among current drinkers, the average number of standard drinks per drinking day was 12.2: men drank an average of 13.1 standard drinks, women drank 10.3 standard drinks on average.
- Among current drinkers, 29.8% of males binge drink (5 or more drinks); 25.6% of females binge drink (4 or more drinks) on any day of the week preceding the survey.

Fruits and vegetables consumption

- The prevalence of those who report eating less than 5 servings of fruit and vegetables per day was 93.7%: 93.8% of males and 93.6% of females.

Physical activity

Respondents were asked to report on the frequency and duration of physical activity as part of their work, travel

and recreation time. The weekly duration of activity is reported below in metmins, which is a standard unit that adjusts for the higher metabolic intensity of vigorous compared with moderate activity.

- The median total time in physical activity was 1380 metmin/wk. This was highest among 15-24 year olds (1680 metmin/wk) and lowest among 55-64 year olds (480 metmin/wk), and markedly higher among males than females (1880 metmin/wk vs 960 metmin/wk).
- The greatest amount of activity reported was in the travel domain, with a median of 160 metmin/wk reported by the whole sample. 15-24 year olds reported the highest median amount of travel time (280 metmin/wk) with a trend towards reduced activity in this domain with age.
- Males reported a median of 80 metmin/wk of physical activity, of moderate intensity or higher for at least 10 minutes, at work, while females reported a median of 0 metmin/wk in this domain.
- Both males and females reported a median of 0 metmin/wk of recreational physical activity.
- 16.5% of people were inactive, that is, they reported no physical activity in work, travel or recreation time. The prevalence of physical inactivity increased with age, from 13.5% among 15-24 year olds to 28.9% among those aged 55-64 years, with females reporting a slightly higher prevalence than males (18.5% vs 14.3%).

Overweight and obesity

Body mass index (BMI) was computed as the weight in kilograms divided by the square of height in metres, and BMI categories classified as follows: underweight and normal weight (BMI: <25.0 kg/m2), overweight (BMI: 25.0 to <30.0 kg/m2), and obese (BMI: ?30.0 kg/m2).

- Overall mean BMI was relatively high for both women (32.5 kg/m2) and men (31.7 kg/m2).
- A significant proportion of the population was overweight or obese (82.2%). The proportions of overweight/obese were similar in women and men (82.1%).
- 58.1% of respondents were obese, with slightly more females (60.5%) than males (55.7%) classified in this high-risk category. For both genders, there was a marked increase in proportion of obese after age 24 years.

High blood pressure

- 17.2% of those surveyed had raised blood pressure (SBP≥140 or DBP≥90 or currently on anti-hypertensive medication). The proportion was significantly higher for males (23.1%) than females (11.5%).

Cholesterol

- Mean cholesterol (mmol/L) increased with age for both genders with levels plateauing by 55 years for females and declining for males during the same age period. Mean cholesterol levels were marginally higher across all age groups for females (4.5 mmol/L) than males (4.3 mmol/L).
- The overall prevalence of elevated cholesterol (≥5.2 mmol/L) was higher for females (20.8%) than males (14.9%). The prevalence of elevated cholesterol increased substantially until 45-54 years for men and women and appeared to plateau among those aged 55-64 years.

Prevalence of diabetes

There were 501 participants, aged 15-64 years, who provided venous blood samples; these were analysed in Sydney, Australia.

- The all-ages (15-64 years) prevalence of diabetes at the time of the survey, defined as a single fasting blood glucose reading of ?7.0 mmol1^{-1} or currently receiving treatment for diabetes was found to be 16.2%. Removing the youngest age group from the computation, the all-ages prevalence (25-64 years) of diabetes, also defined as a single fasting blood glucose reading of ≥7.0 mmol1^{-1} or currently receiving treatment for diabetes was 22.7%.
- Diabetes increased in prevalence with age and was found in 24.1% of those aged 35-44 years, 37.4% of 45-54 year olds and 45.0% of 55-64 year olds.
- By 55-64 years the prevalence of diabetes was 52.8% in women and 37.4% among men.

Raised risk for NCDs

WHO recently added a comprehensive assessment on STEPS NCD risk factors - raised risk. Five common and critical risk factors for NCDs were selected: current daily smokers, overweight or obese (BMI≥25.0kg/m2), raised blood pressure (SBP≥140 and/or DBP≥90 mmHg or currently on medication for raised blood pressure), consuming less than 5 servings of fruits and vegetables per day and low level of physical activity (<600 MET-minutes).

- Approximately 0.1% of the surveyed population were low risk to NCDs (ie., none of the 5 risk factors), compared with 80.8% of those aged 55-64 years who had raised risk (ie., at least 3 of the 5 risk factors): 81.8% of men and 80.0% of women in the same age group.
- By 25-44 years the prevalence of raise risk was 74.7% in men and 75.5% in women.
- The overall prevalence of raised risk aged 25 to 64 years were 76.3%.

Self-rated general health, beliefs about diabetes risk and perceived environmental support for a healthy lifestyle

Self-rated general health, beliefs about the risk of diabetes, the health benefits of physical activity and good nutrition, and the effect of the environment upon physical activity were measured in order to obtain data that might assist in health promotion strategies.

- About 44.8% of the respondents in the survey rated their health as 'good', with slightly more males (46.9%) than females (42.9%) rating their health in this way. For both genders, there was a clear pattern of self-rated health status getting worse as age increased, with more females rating their health as being 'fair or poor' as they aged compared to males.
- Most respondents (84.2%) agreed that developing Type 2 diabetes would be a bad thing to happen to them and a similar proportion (83.4%) reported that they were frightened about getting this disease, with both genders indicating similar levels of concern about developing Type 2 diabetes.
- Just under one-half (46.1%) rated their chances of developing diabetes as small: 48.9% of males and 43.4% of females.
- The vast majority of respondents in all age groups and from both genders believed that the risk of developing diabetes could be reduced by regular physical activity (86.2%) and a healthy diet (91.2%).
- High proportions of respondents recognised the health benefits of walking instead of using the car (95.9%), wading at the beach (87.2%), eating fruit and vegetables grown at home (96.5%) and eating foods low in fat (93.2%).
- While 70.2% of those surveyed believed that recreational facilities were available in their local area and considered their local pathways well-maintained (79.8%), at least one-half of the respondents believed that there were a number of environmental factors that discouraged physical activity: 58.2% reported that the presence of dogs in their area was a barrier to walking; 50.9% believed that flooding and puddles in their area made it difficult to go walking, and; 45.9% considered that crime in their area made it unsafe to go walking at night.

Conclusions

The STEPS study in Nauru has provided clear evidence that chronic diseases and the physical and behavioural risk factors related to these are at very high levels in Nauru. These are the primary threat to health and well-being that the country faces and need to be addressed through strategic and sustained actions that encompass primary prevention and immediate treatment and tertiary prevention for those with current disease. The STEPS study provides highly useful data that can be applied to setting priorities, directing strategies to those most in need and evaluating the impact of the chronic disease prevention initiatives that are carried out.

Recommendations

Public health and clinical interventions

- Build public awareness about the harmful consequences of tobacco use, physical inactivity, poor dietary habits and obesity
- Develop interventions to prevent the early initiation of smoking among young people across both genders
- Implement the WHO Framework Convention on Tobacco Control (FCTC)
- Implement adult smoking cessation programs
- Implement interventions to prevent/reduce smoking among adults, focusing on environmental (smoke-free places) and regulatory (advertising ban, taxes) measures
- Develop interventions to support moderate consumption of alcohol and reduce hazardous and harmful drinking, including strategies to reduce access to and driving under the influence of alcohol
- Build public awareness of the benefits of engaging in an active lifestyle and regular leisure time physical activity
- Develop and promote awareness of national physical activity guidelines for adolescent and adult populations
- Implement strategies to improve physical environments to support increased leisure time physical activity across all population populations
- Implement strategies to support increased access and availability of fruit and vegetable for all population groups
- Increase the capacity of health workers and the health system to identify, monitor and treat individuals with hypertension and impaired glucose tolerance
- Prioritise diabetes management as a an entry point for NCD public health prevention and control efforts
- Public health strategies to emphasize the prevention and control of the 5 common and critical risk factors for NCDs, including current daily smoking, overweight and obesity, raised blood pressure, consuming less than 5 servings of fruit and vegetables per day and low level of activity

Infrastructure

- Integrate prevention and control of NCD risk factors into health worker training programs to increase availability of health workers skilled in providing lifestyle counselling and in managing population health programs
- Ensure sustainable funding mechanism to support NCD strategy implementation and monitoring
- Build coalitions, networks and partnerships in advocacy and action for preventing and controlling NCD risk factors, such as coalitions between private, government and NGO sectors in tobacco control, and improving food and nutrition and physical activity
- Re-orient health services to support health promotion/public health initiatives to address NCDs

Surveillance

- Secure commitments at the highest level to a systematic framework of STEPS data collection (eg., workforce and infrastructure) on an ongoing basis as opposed to ad hoc surveys, e.g. conduct 3 STEPS surveys by 2020
- Expand and improve the Nauru-STEPS questionnaire with additional questions relevant to Nauru's need to build a comprehensive profile of psychosocial and biological risk factors for health problems, e.g. mental health, physical disabilities, intentional and non-intentional injury, oral health, attitudes and perceived barriers related to core and expanded STEPS items

Dissemination and utility of STEPS findings

- Wide dissemination of the Nauru-STEPS findings and recommendations to policy-makers and international agencies through various forums (eg., disseminate user-friendly documents of the main STEPS results, in brief pamphlet formats)
- Wide dissemination of the Nauru-STEPS findings and recommendations to the public through the media (including the world wide web) and community forums
- Wide dissemination of the Nauru-STEPS findings to the scientific community through presentations at key national and international scientific meetings and through peer-reviewed publications
- Continue a collaborative and consultative process between key stakeholders to encourage optimal use of the STEPS results for identifying priority areas for programming, monitoring trends and evaluating effectiveness of public health programs
- Engage with regional and international agencies (ie. WHO, SPC etc) in developing NCD plan for Nauru
- Ensure that the Nauru-STEPS data inform national NCD plan and are applied in the evaluation of NCD related policies and programs

1.0 Introduction

1.1 Rationale for a global surveillance of NCDs

The increasing burden of noncommunicable diseases (NCDs) (cardiovascular disease, diabetes, cancer, and respiratory conditions), particularly in low- and middle-income countries, represents a major challenge to health services and economic development. Primary prevention has been identified as the most cost-effective approach to controlling the rise in risk factors contributing to the NCD increase.

In recognition of the increased burden of NCDs, the World Health Assembly has passed a resolution to support Member States in their efforts to implement a NCD prevention, control and surveillance system. The World Health Organization (WHO) was given the responsibility of assisting countries with developing a comprehensive NCD surveillance approach, regarded as a necessary tool in designing prevention and control programs with measurable outcomes. In order to set quantifiable goals and priorities, countries are required to collect data on risk factors to assist with developing targeted programs and monitoring interventions on NCDs.

The WHO STEPwise Approach to Surveillance of risk factors for NCDs outlines the process and strategy needed to build the capacity of a country to implement a minimum surveillance framework. Fundamental to the prevention of NCDs is the identification of the magnitude and patterns of major risk factors in countries. The underlying principle of the WHO STEPwise framework (Bonita et al., 2001) is that all countries undertaking surveillance activities collect the same core measures on a limited number of known risk factors for NCDs. Countries also have the option of including additional items of local relevance. The standardized approach of the WHO STEPS surveillance program allows for the country-specific data to be comparable within- and between-countries. In addition, STEPS implementation at the country level is designed to be strategic, coordinated, capacity building, cost-efficient and sustainable.

Table 1: Risk factors common to major non communicale conditions

Risk factor	Condition			
	Cardio-vascular disease^	Diabetes	Cancer	Respiratory conditions^^
Smoking	✓	✓	✓	✓
Alcohol	✓		✓	
Nutrition	✓	✓	✓	✓
Physical inactivity	✓	✓	✓	
Obesity	✓	✓	✓	✓
Raised blood pressure	✓	✓		
Blood glucose	✓	✓	✓	
Blood lipids	✓	✓		

^ Including heart disease, stroke, hypertension
^^ Including chronic-obstructive pulmonary disease and asthma
Source: Bonita et al., 2001.

1.2 Major risk factors for NCDs

The scientific rationale for the prevention and control of major risk factors for NCDs is well documented. A risk factor refers to any behavioural or biological characteristics of an individual, which increases the likelihood of developing a chronic disease. The risk factors for a NCD are also likely to affect one or more of the other NCDs (see Table 1). In addition some of the major NCD risk factors may 'cluster' in individuals (i.e. physical inactivity often clustering with obesity, high blood pressure and poor diet).

The rapidly changing global socio-economic environment and the westernization of traditional communities over the last three decades have had significant detrimental effects on the risk factors and health profile of the Pacific island populations. The Republic of Nauru, formerly one of the Pacific's richest and smallest island nations, has one of the poorest health indicators for NCDs in the region. Poor diet and physical inactivity have been exacerbated by the western affluence enjoyed by Nauruans over several decades. In response to the continuing burden of NCDs and the need for a systematic and comprehensive long-term approach to minimizing major risk factors in the population, the Ministry of Health (MOH) agreed to initiate the WHO STEPwise framework for surveillance of NCD risk factors.

Republic of Nauru

1.3 Nauru national data and demographic profile

Nauru is a single coral island located in the Central Pacific, 60 kilometres south of the equator. While being part of the sub-region of Micronesia, its nearest neighbour is Banaba (Ocean Island) in the Republic of Kiribati. Nauru is a small island with a total land area of 21.1km2; 6km in length,

4km in width, with a circumference of 19km.

Nauru is an urbanized country with a high population growth rate (2.5%). Information from the latest population census recorded 10,065 inhabitants, with 79% of the population comprising indigenous Nauruans of predominantly Micronesian origin (Census 2002). The remaining populations include mostly I-Kiribati, Tuvaluan and Chinese (18%), and small numbers of other Pacific islanders, New Zealanders and Australians. Approximately 38.2% of the population is less than 15 years of age, 60% aged 15-64 years and 1.9% aged 65 years and over.

1.4 History and culture

There is little known of the traditional Nauruan life before it was reached in 1798 by a British whaling ship. Throughout the 19th Century, the inhabitants of Nauru were exposed to other cultures through trading, predominantly with European seafarers and traders. In 1899, the massive phosphate resources on Nauru were discovered, which lead to the establishment of the island first phosphate mining company in 1906. Phosphate mining continued throughout the two world wars and during the occupying and liberating forces. The Nauruan traditional way of life was further influenced during this period.

The traditional practices of fishing and gardening for foods have largely been replaced by purchases of imported western foods. This situation has been exacerbated by Nauru enjoying very high prosperity for several decades.

1.5 Economy

The main source of revenue for Nauru has come mostly from mining and exports of phosphate, which made Nauru the richest nation on a per capita basis in the Pacific in the mid to late 20th Century. However, most of the country has been mined and deposits have now been exhausted with production anticipated to be gradually phased out by 2015. In anticipation of the exhaustion of Nauru's phosphate deposits substantial amounts of income were invested in trust funds to help cushion the decline in revenue and provide for Nauru's economic future. However, financial management problems and national fiscal demands have seen the country lose most of its trust funds and property investments.

Some revenue is collected from sale of International Fishing Licenses and in the form of international aid[1]. The current Government of Nauru (President Ludwig Scotty) returned to power in 2004 and had initiated new budget reforms aimed at reversing the adverse economic climate experienced over the years to avoid bankruptcy. Major reforms include extreme reduction of Overseas Medical Referral Services and overseas education, increasing levies on tobacco, alcohol and imported cars. Further information not relevant to this report on the Economy of Nauru can be viewed on CenpacNet Inc: www.cenpac.net.nr.

1.6 Government

Nauru is the world's smallest republic island. It has a national parliament of 18 members, each elected by popular vote for a three-year term. The parliament is lead by a President who is also the head of state and chooses his cabinet of four or five ministers. In recent years the government has suffered significant instability from parliamentary motions of no-confidence. Since 1996, the country experienced at least thirteen changes in government, with four of those changes occurring in 2003. The main cause has been discontentment over poor financial management by parliament.

1.7 Health status

Nauru's health profile is typical of a low- to middle-income country, with a relatively low life expectancy at birth (males: 59.7 years; females: 66.5 years)[2], and an infant mortality rate of 11 per 1,000 live births (WHO 2004). Alcohol (drink and driving), smoking, obesity, and physical inactivity have been identified as the primary causes of premature mortality and morbidity related to health problems such as diabetes. Some of the health-compromising practices such as consumption of foods high in fat and low in nutritional value[3] have been acknowledge as contributing substantially to the growing burden of disease in the country.

The first scientific documentation of NCD and its impact in Nauru was obtained from a series of surveys conducted in 1975/1976, 1982 and 1987 (e.g. see Dowse et al. 1991). Nauru was considered to have one of the highest type 2 diabetes rates in the world and the burden of diabetes morbidity comprised the largest demand upon the health system. Blindness, end- stage renal failure leading to haemodialysis, chronic wounds, and limb amputations represent an estimated 75-80% of bed occupancy in the hospital wards at any time (WHO 1997).

The Public Health Department strategy so far has focused on community programs conducted through the Health Promotion Unit. Public health initiatives have included increasing awareness of the risk factors and individual management and treatment of patients with existing NCDs (diabetes, hypertension, nephropathy).

1.8 Noncommunicable disease services

[1] In 2001, Nauru accepted an arrangement with the Australian government to host and process asylum seekers. As part of the 'Pacific Solution' Nauru received significant financial support from the Australian government.
[2] These estimates span a wide period and depend on data of varying quality.
[3] The limited land mass available for agricultural activities means that the country has to import most of its food supplies.

The country NCD services emerged from the Diabetic Clinic, which was initially an outpatient service for diabetic patients for the management of diabetes (medical treatment) and complications (diabetes education). Nauru responded to the WHO 'Healthy Islands' framework and the Yanuca Island Declaration 1995 (Galea et al., 2000), and with the assistance of WHO consultancies, developed a short-term plan of action 'Towards Healthy Island of Nauru' and established the Nauru Health Promotion Unit (HPU). The HPU identified NCDs (and related risk factors), maternal and child health, injuries and accidents, and communicable diseases (HIVs/AIDs) as priority concerns. The Unit has a Director and operates within the National Health Council.

1.9 Developing WHO STEPS survey in Nauru

In 2002, Nauru began discussions with the WHO in developing the Nauru Stepwise Non-Communicable Diseases Prevalence and Risk Factor Survey (Nauru-STEPS). In late 2003, with the assistance of the WHO Director of NCD Surveillance, the technical services of the Centre for Physical Activity and Health (CPAH) at the University of New South Wales were secured to assist with the planning (methodology and sampling), training, data analyses and preparation of a scientific report.

The organisation of the Health Promotion Unit and concurrence of the Minister for Health provided a smooth integration of the Nauru-STEPS survey infrastructure into the public health system. This integration lessened the problems of lack of staff, office space and equipment. The Nauru-STEPS survey was implemented under the auspices of the Nauru NCD Steering Committee consisting of the Australian Agency for International Development (AusAID) Project Manager for Nauru, WHO and the Government of Nauru, represented by the (Acting) Director of Public Health. This Committee was not a working group but an advisory Committee.

The (Acting) Director of Public Health assumed the role of Project Leader for the NCDs STEPS sub-committee, which consisted of medical doctors, senior registered nurses, ethnic group leaders, church leaders and some members of the National Health Council. The primary responsibilities of this Committee included assessing the ethical implications of conducting the STEPS survey.

The comprehensive process of setting up the Nauru-STEPS survey involved a series of consultations between the MOH and CPAH over five months. During this planning period, two consultants were tasked with the responsibility of producing visual aid materials for advocating and promoting the Nauru-STEPS survey[4] . The Nauru-STEPS survey was sponsored by WHO, AusAID and the Government of Nauru.

1.10 Objectives

The Nauru-STEPS survey is part of a global WHO initiative to address the rapid rise of NCDs in developing countries. Nauru's participation in this global project is not merely to contribute to gathering information for the global surveillance of NCDs but also to re-examine and update the NCD status of the country. The MOH will use this information to address the acute burden of diseases associated with NCDs. The objectives of the Nauru-STEPS are fourfold:

1. To develop a measure for use in the Nauru- STEPS survey that will yield reliable self-reported and objective data relating to known risk factors for NCDs. This measure will be based on the WHO STEPwise Questionnaire.

2. To document the national prevalence and patterns of tobacco use, alcohol consumption, dietary behaviour, physical activity, body mass index, elevated blood pressure, and biochemical markers such as blood glucose and blood lipids among those aged 15-64 years.

3. To generate a scientific report that would document the process and methods of the survey, data management and data analysis, interpretation of results, and; recommendations for policy and planning.

4. To provide reliable and valid information for planning and evaluating public health initiatives, and for identifying future demands for health services in managing and treating NCDs.

[4]Professor Garry Egger and Mr Larry Gray, who are both experienced in developing mass media health promotion materials, provided technical assistance and produced the required materials for the study. Promotional audio-visual materials were aired by local radio and television stations in Nauru.

2.0 Methodology

2.1 Survey timeframe

Data collection for the Nauru-STEPS survey took place from June to October 2004. The preparation of the survey involved at least seven months of planning, and a 2-week training and piloting of the instruments and procedures. This was a collaborative effort between the Nauru MOH, WHO, and AusAID. Training and technical support in all aspects of the survey was provided by CPAH of the University of New South Wales. A survey team comprising a Project Manager, three Team Supervisors, community health nurses, laboratory technicians, data entry personnel and administrative staff was formed to co-ordinate planning and data collection.

2.2 Survey type

The Nauru-STEPS was modeled on the WHO STEPwise approach to surveillance for NCD risk factors. The survey protocol adhered to the concept that surveillance systems require standardized data collection as well as sufficient flexibility to be appropriate in a variety of country situations and settings. This allows for the development of an increasingly comprehensive surveillance system that would be sensitive to local needs. By adopting the same standardized core questions, all countries implementing STEPS can use the information for examining within-country trends and for between-country comparisons.

The basic STEPS approach was designed as a population-wide cross-sectional survey and involved a collection of data on levels of risk factors. Data collection moves along a sequential three-step process as follows:

STEP 1: Interview-based questionnaire on selected major health risk behaviours including smoking, alcohol consumption, fruit and vegetable consumption, and physical activity. Additional issues deemed to be of importance in Nauru include history of high blood pressure, diabetes, self-rated general health, perceived beliefs about diabetes and susceptibility to diabetes and perceived environmental support for a healthy lifestyle.

STEP 2: Physiological measures of health risks such as blood pressure, body mass and waist girth circumference.

STEP 3: Biochemical measures of health risks including fasting blood glucose and blood lipids.

All selected participants were invited to participate in all three steps of measurements.

2.3 Survey population and sampling frame

The survey population included non-institutionalised individuals in the 15-64 year-old age category living in Nauru during the survey period. Indigenous Nauruans, I-Kiribati and Tuvaluan residents comprised approximately 90% of the total population (Bureau of Statistics, 2004). The remaining population consisted of Asians (Chinese, Filipinos and other South East Asians), other Pacific islanders and expatriate residents (i.e. Australians, Europeans, New Zealanders). This latter group was excluded from the sampling frame as they were considered to be highly transient and relatively low users of health services in Nauru. Individuals with mental illness, physical or developmental disabilities were also excluded from the survey.

A sampling frame was created by triangulating information from the following sources:

1. Birth, Deaths and Marriages register for people aged 15 years and older
2. Hospital Medical Records register
3. Electoral Roll (for 2003) for persons over 20 years
4. Nauru Phosphate Corporation (NPC) database (for other Pacific Island residents and their spouses)

Information from these sources was entered into a database and details on age and gender carefully cross-checked (where possible) with original sources for accuracy.

2.4 Sampling strategy and sample size

Since there is no distinction between rural and urban areas in Nauru, and because closely-related families live in clusters (districts) around the island, cluster sampling would introduce potential bias to the survey. A simple random sampling of individuals within each age/sex stratum (with replacement) avoids this problem and was the strategy of choice for Nauru.

Thus, with the intention of using a simple random sampling method, stratified by age and sex, initial sample size calculations were performed assuming a prevalence of approximately 10% for major variables of interest (e.g. diabetes), an ability to ascertain an estimated prevalence within approximately 1% of the true prevalence with a 95% confidence level. These calculations suggested that a total sample size of approximately 2,584 in the target population of 15 to 64 year olds would be sufficient for the purposes of this study. The Nauru population Census data suggested that this sample size approximates a 45% sampling fraction of the target population in the 15 to

64 year age group.

Taking into account the recommended minimum sample size required in STEPS, budget, logistics and time constraints, the optimal number of people which could be measured per day (about 40 participants), it was agreed that approximately 2,500 randomly selected participants aged 15-64 years should be targeted for the survey. As required by the STEPS protocol, a target of 250 participants in each age/sex group was considered. However, according to the 2002 Census population data, there were a total of 295 people in Nauru aged 55-64 years, thus reducing the effective sample size to 2,232 individuals aged 15-64 years. With the exception of those in the 55-64 year age group, a reserve list of an additional 250 participants was generated for each age/sex group to replace any of the original participants in that age/sex group who were ineligible to participate in the study (i.e. those not being in the country during the survey or those individuals with physical or mental disabilities or already deceased). All selected individuals were invited to participate in all three STEPS.

2.5 STEPS questionnaire

The core questions in the STEPS 1-3 instrument remained unchanged (Bonita et al., 2001). The survey team agreed for additional social and or environmental items relating to NCD control and prevention to be included in the STEPS 1 questionnaire. Examples of some optional items include self-reported health status, perceived susceptability to diabetes, perceived barriers or factors that would enhance adoption of a health lifestyle. A full copy of the STEPS questionnaire is reproduced in Appendix 8.1.

To investigate the prevalence of kidney disease in Nauru, items measuring the Albuminuria level were added to STEP 3 measures, but the results for this are not presented in this report. Survey participants were requested to bring their urine sample in a collection jar provided by the staff when they presented for STEP 3. For those who forgot to bring in their sample, their urine was collected on the day of the visit.

2.6 Training and pilot study

STEPS staff participated in an intensive 2-day training program followed by a 7-day pilot survey conducted as part of the training activity. All staff received a detailed briefing on the overall goal and rationale of STEPS, and a detailed familiarisation with STEPS protocols, forms and procedures (WHO 2003a). Training sessions were carried out separately for staff designated to STEPS 1, 2 and 3 to ensure that each team was exposed to all of the procedural information relevant to that particular team. For example, members of STEP 1 team received several training sessions to develop thorough knowledge of the instrument format.

Through demonstrations and role-plays, participants practised interview techniques and engaged in intensive discussions to clarify issues surrounding items such as diet, physical activity, and alcohol consumption. STEP 2 staff received training in height, weight, waist and blood pressure measurement, while STEP 3 staff, although already familiar with the medical and technical requirements for blood collection, received training in standardised methods of blood collection as per the STEPS protocol. Staff selected for data entry also received relevant training on the STEPS data entry protocol.

Approximately 100 participants were randomly drawn from the sampling frame and invited to participate in the pilot survey. All aspects of the survey procedure were tested during the pilot, including the population receptivity to yet another survey, questionnaire comprehension, the recruitment process, and the ordering of the STEPS measurements.

A one-day refresher training was carried out with both field and data entry staff before the main survey began in June. The Nauru NCD Committee approved the ethical clearance for the survey.

2.7 Data collection procedure

Substantial consideration was given to the ordering of the three stages of measurement. It was agreed that all participants must be provided with the results of their physical assessments and blood tests. The final three-step process required participants to present for the STEP 3 and 2 measurements on one day and then return on the following day or another convenient time to complete STEP 1 and receive the STEP 3 results. This direct benefit from participation was considered very important in Nauru because it is widely felt that previous risk factor studies in the country have had no demonstrable benefit for the population. The reverse ordering of STEPS 3, 2 and 1 proved to be acceptable to participants and an efficient way for staff to conduct the assessments while providing timely feedback to participants of the results of their blood tests and physical assessments. The ordering of the three-step process is graphically presented in Appendix 8.2.

Survey staff visited the randomly selected participants at their homes to invite them to participate, and if possible, to attend the health clinic (usually on the following day) for the STEPS 3 and 2 measurements. During this home visit, staff provided a verbal description of the STEPS study, together with the written information sheet. Participants were requested to sign a consent form if they wished to take part in the study. The staff then made an appointment time with the participants to present for the STEPS 2 and 3 measurements, explained the fasting protocol (written fasting instructions were also provided) and the importance of fasting properly. Participants were also briefed on clothing requirements for STEP 2 measurements and given a jar for the collection of the urine sample.
Nauru General Hospital Community Health Clinic was used as a base for the survey where stations were set up for registration, biochemical measurements, physical measurements, refreshments, interviews, results feedback

and health counseling, and checkout. An average of 40 participants a day attended the STEP 2 and 3 stations. Between 20-30 participants a day engaged in the STEP 1 interview; the number in attendance depended on the availability of interview staff.

2.7.1 STEP 1 - Behavioural risk factors

Data for behavioral risk factors were collected using a face-to-face structured interview (Appendix 8.1) with questions on selected health risk behaviors including smoking, alcohol consumption, fruit and vegetable consumption, and physical activity. While the interview form was in English, the actual interview was conducted in English, Nauruan, I-Kiribati or Tuvaluan depending upon the wishes of the participant. Interviews in Nauruan followed a standardized translation of the questionnaire from the original English version[5]. Interviews in I-Kiribati or Tuvaluan were conducted through interpreters who were specifically trained in the STEP 1 interview protocol[6]. All interviews were conducted individually and in private with interview time ranging from 30 to 50 minutes.

2.7.2 STEP 2 - Physical measurements

Height, weight, blood pressure and waist circumference were the targeted measures of health risks for NCDs in STEP 2. Select community health personnel were trained in conducting these measurements through the use of specific protocols. Quality control for each measurement was monitored through periodic checks conducted by the STEP 2 Team Supervisor and the CPAH personnel during field monitoring visits.

Height was measured once with a Portable Height Scale to the nearest 0.1 cm. Weight was measured once to the nearest 0.1 kg with the Seca Scale, which was checked for accuracy against standard weights at the beginning and end of each day. Height and weight measurements were taken in light clothing, with shoes, socks, and head gear removed[7]. 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 reported they were pregnant.

Blood pressure (BP) and heart rates were measured with the Omron T5 Automatic Blood Pressure Monitor. Both BP and heart rates were measured three times, and the mean value of the second and third readings was used in the analysis.

2.7.3 STEP 3 - Biochemical risk factor measurements

Fasting blood glucose and total cholesterol comprised the targeted biochemical measures of health risks for NCDs. The MOH laboratory personnel who were already experienced in conducting these measurements were familiarized with the STEP 3 protocols to ensure quality control through standardized measurements. A whole blood sample was collected into separate vacutainer collection tubes for blood lipid analysis. Venous whole plasma blood lipids were tested on site within 2 hours of collection using a Reflotron biochemical analyzer. For albuminuria analysis, female participants who reported that they were menstruating were noted in the survey[8].

Due to some irregular fasting blood glucose results documented in the 2004 survey which may have resulted from flawed procedures or a malfunction in the measurement equipment, additional fasting blood glucose samples were collected from a sub-sample (n=501, response rate=84%) of the original survey participants in 2006. The data collection protocol of the 2006 survey mirrored the 2004 survey protocol. The demographic distribution of the sample and the survey response rates are detailed in Appendix 7.

At the time of initial registration and then later, when presenting at the blood collection laboratory, all participants were asked about their fasting status. Participants who had not fasted for at least 8 hours were asked to return the next day after fasting.

A venipuncture was performed with the whole blood being transferred to a BD Vacutainer gel tube (SST™ 11 Advance). All blood samples were centrifuged (10 minutes @3000 rpm), the serum separated and appropriately labeled (time and date of collection and unique identification number), stored and frozen within 30-45 minutes. Minimum and maximum freezer refrigerator temperatures were recorded each day then the device was reset, each morning.

The serum samples were later packed, with min-max thermometers, in ice in two batches of 125 samples each and carried, according to IATA (International Airline Transport Association) regulations, to Sydney, Australia, in two trips one week apart. Both packages were unpacked and stored frozen in the Diagnostic Pathology Unit (DPU), Concord Repatriation General Hospital, within 12 hours of leaving Nauru.

Before analysis, the serum specimens were thawed in batches, mixed and centrifuged. All specimens were then

[5]Although Nauruan is widely spoken in the country it is not a written language, thus making any written translations difficult. Efforts to 'translate' the English version of the question included developing a standardized script of Nauruan expressions around phrases such as 'vigorous' or 'moderate' physical activity, etc, and training STEP 1 staff in the intended meanings of each question.
[6]All survey staff were provided with a STEPS Operations Manual and Field Guidelines with clear instructions on how to respond to queries from participants during the interview. The standardized script of STEP 1 questions ensured that similar verbal explanations are provided to all participants.
[7]Refreshments were served to participants only after blood samples collection and physical measurements were completed.
[8]Albuminuria results are not presented in this report.

analysed without delay, at 37 degree Celsius, on the Roche Modular PE clinical analyser for glucose (hexokinase method), cholesterol (enzymatic), HDL Cholesterol (non-separation/PEG modified enzymes) and triglyceride (GPO-PAP/no free glycerol correction). Roche reagent and calibrators were used for the analyses.

Ethics approval for the survey was granted by the University of Sydney Human Research Ethics Committee and the Nauru NCD Steering Committee, Nauru Ministry of Health.

2.8 Questionnaire processing and data entry

Two staff manually double-entered all survey data into EpiInfo 6.04d database. The double data entry process was preceded by a series of data cleaning activities by STEP 1 staff. These activities included identifying and investigating various issues related to ineligible handwriting, duplicate records, data values outside of preset ranges, and inconsistencies between answers to different but related questions. Any inconsistencies noted by the data entry staff were resolved with the STEPS personnel or Team Supervisors before data entry was completed. Data entry was conducted concurrently with data collection.

2.9 Methods of analysis

2.9.1 Weighting of data

The primary purpose of weighting the survey data was to allow the analysis to produce estimates that would have been obtained if the entire population of Nauru had been surveyed. Post-stratification weighting was computed for Nauru-STEPS to bring the sample data to the 2002 Census estimates of the Nauru population aged 15 to 64 years. This weighting also adjusted for certain age/sex stratum being over- or under-represented in the survey data. Post-stratification adjustment also helps to reduce the bias that might arise due to inadequacies in the sampling frame resulting from age/sex misclassification or the omissions of individuals.

2.9.2 Data analysis

Data analyses were conducted using EpiInfo and the SAS Version 9.1.3 statistical program (SAS Institute, 2003). Weighted frequency estimates with 95% confidence intervals were calculated for all categorical variables, by 10-year age groups and gender. Descriptive statistics including weighted sample means with 95% confidence intervals were calculated for all continuous variables. Statistically significant differences between groups were identified by non-overlapping 95% confidence intervals (1.96 * standard error) for either weighted proportions or weighted means. A more detailed explanation of how derived variables are computed is provided in respective result sections. All numbers in Tables are presented as weighted values, rounded to whole numbers.

Analyses of fasting blood glucose data were performed on a sub-sample of 501 participants. Post-stratification weighting was computed for the sub-sample providing useable glucose data to bring the sample to the 2002 Nauru census estimates for those aged 15 to 64 years.

3.0 Results

3.1 Response rates

Overall, usable data for STEPS 1-3 were obtained from 2,272 participants, with a total response rate of 89.7%. Of the 2,272 respondents, 1086 were men and 1186 were women. The detailed breakdown of the response rates by age and gender is presented in Table 2.

Table 2: STEPS survey response rate percentages by gender

Age	Men			Women			Overall		
(years)	Eligible	Participated		Eligible	Participated		Eligible	Participated	
	N	n**	%	N	n**	%	N	n**	%
15-24	287	277	96.5	298	269	90.3	585	546	93.3
25-34	293	242	82.6	285	281	98.6	578	523	90.5
35-44	306	289	94.4	297	291	98.0	603	580	96.2
45-54	273	212	77.7	339	283	83.5	612	495	80.9
55-64	82	66	80.5	74	62	83.8	156	128	82.1
15-64	**1241**	**1086**	**87.5**	**1293**	**1186**	**91.7**	**2534**	**2272**	**89.7**

* Response rates were calculated as follows: completed Steps 1-3/completed Steps 1-3 + refusals (eligible). Excluded from the calculation were those who were not in the country during the survey, those with physical and mental disabilities. These individuals were replaced using the reserved lists.
** Un-weighted numbers.

3.2 Distribution of the sample

Table 3 compares the age and gender distributions of both the unweighted and weighted survey sample using the Nauru 2002 population census data (Bureau of Statistics, 2004). While no marked differences were noted in the total proportions of males and females surveyed as compared to the population distributions, results by age group show some variability. That is, a substantially lower proportion of respondents aged 15-24 years participated in the survey while a relatively higher proportion of those aged 45-64 years responded to the survey. Post-stratification weighting adjustment for this under- and over-representation in the sample data helped bring the estimates to reflect the population characteristics as measured by the Census.

Table 3: Demographic distributions of survey and country population*

Demographic Characteristic	Survey Sample				Nauru Census 2002^	
	Actual sample number#	Unweighted Proportion	Weighted Proportion	95% Confidence Interval	Number	Proportion
Gender						
Male	1086	47.8	49.3	47.2-51.5	2545	49.3
Female	1186	52.2	50.7	48.5-52.8	2615	50.7
Total	2272				5160	
Age group						
15-24 years	546	24.0	35.7	33.6-37.7	1840	35.7
25-34 years	523	23.0	24.6	22.8-26.5	1270	24.6
35-44 years	580	25.5	21.7	20.0-23.5	1121	21.7
45-54 years	495	21.8	13.1	11.7-14.5	676	13.1
55-64 years	128	5.6	4.9	4.0-5.8	253	4.9
Total	2272	100.0	100.0	--	5160	100.0

^ This population includes those aged 15-64 years of ethnic Nauruan or other Pacific island background (mainly, I-Kiribati or Tuvaluan). Together these three groups comprised 93% of the total population (Bureau of Statistics, 2004); # Actual survey sample number after data cleaning.

3.3 Education

To ascertain educational levels, all respondents were asked the total number of years spent at school or in full-time study (excluding pre-school years). Note that all numbers (e.g. notations N and n) in the following Tables and for the rest of Section 4 of the report are presented as weighted values, rounded to whole numbers. There was marginal difference between the mean number of years spent in school by males (9.8 years ±0.13) and females (10.0 years ±0.12) (Table 4).

3.4 Tobacco use

Table 4: Mean years in school by gender and age group

Age	Men (N=1086)*			Women (N=1186)*			Total Population (N=2272)*		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	262	9.2	±0.26	256	9.7	±0.25	518	9.4	±0.18
25-34	241	9.9	±0.24	280	10.2	±0.25	521	10.0	±0.18
35-44	283	10.0	±0.24	284	10.2	±0.22	567	10.1	±0.16
45-54	204	9.9	±0.31	270	10.0	±0.23	474	10.0	±0.19
55-64	63	10.4	±0.78	60	10.1	±0.62	123	10.2	±0.50
Total	1053	9.8	±0.13	1150	10.0	±0.12	2203	9.9	±0.09

* n/N is weighted value rounded to a whole number; * Sample size

To assess tobacco use respondents were asked if they currently smoke any tobacco products such as cigarettes, cigars or pipes, and if they smoke on a daily basis. Among all respondents, the proportion of current smokers (daily and non-daily smokers) was 52.9% ±2.4; the proportion of daily smokers was 48.2% ±2.4. A greater proportion of females (56.0% ±3.3) than males (49.7% ±3.5) reported currently smoking a tobacco product (Table 5).

Also among all respondents, there was a higher proportion of daily smokers among females (50.8% ±3.3) than among males (45.5% ±3.5), although this difference was not statistically significant (Table 5). This pattern was evident in all age groups.

Table 5: Smoking status of all respondents by gender and age group

Age	Men (N=1085)*											
	Daily smokers			Non-daily smokers			Daily and non-daily smokers			Non-smokers		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	126	45.5	± 5.9	14	5.1	± 2.6	140	50.5	± 5.9	137	49.5	± 5.9
25-34	119	49.2	± 6.3	7	2.9	± 2.1	126	52.1	± 6.3	116	47.9	± 6.3
35-44	122	42.4	± 5.7	13	4.5	± 2.4	135	46.9	± 5.8	153	53.1	± 5.8
45-54	93	43.9	± 6.7	7	3.3	± 2.4	100	47.2	± 6.7	112	52.8	± 6.7
55-64	26	39.4	± 11.8	2	3.0	± 4.1	28	42.4	± 11.9	38	57.6	± 11.9
Total	486	45.5	± 3.5	43	4.3	± 1.4	529	49.7	± 3.5	556	50.3	± 3.5
Age	Women (N=1186)*											
	Daily smokers			Non-daily smokers			Daily and non-daily smokers			Non-smokers		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	129	48.0	± 6.0	16	5.9	± 2.8	145	53.9	± 6.0	124	46.1	± 6.0
25-34	150	53.4	± 5.8	10	3.6	± 2.2	160	56.9	± 5.8	121	43.1	± 5.8
35-44	155	53.3	± 5.7	16	5.5	± 2.6	171	58.8	± 5.7	120	41.2	± 5.7
45-54	158	55.8	± 5.8	15	5.3	± 2.6	173	61.1	± 5.7	110	38.9	± 5.7
55-64	26	41.9	± 12.3	1	1.6	± 3.1	27	43.5	± 12.3	35	56.5	± 12.3
Total	618	50.8	± 3.3	58	5.2	± 1.5	676	56.0	± 3.3	510	44.0	± 3.3
Age	Total Population (N=2271)*											
	Daily smokers			Non-daily smokers			Daily and non-daily smokers			Non-smokers		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	255	46.7	± 4.2	30	5.5	± 1.9	285	52.2	± 4.2	261	47.8	± 4.2
25-34	269	51.2	± 4.3	17	3.2	± 1.5	286	54.4	± 4.3	237	45.6	± 4.3
35-44	277	48.4	± 4.1	29	5.1	± 1.8	306	53.5	± 4.1	273	46.5	± 4.1
45-54	251	51.2	± 4.4	22	4.5	± 1.9	273	55.7	± 4.4	222	44.3	± 4.4
55-64	52	40.4	± 8.6	3	2.5	± 2.8	55	42.9	± 8.7	73	57.1	± 8.7
Total	1104	48.2	± 2.4	101	4.7	± 1.0	1205	52.9	± 2.4	1066	47.1	± 2.4

* N and n are weighted values rounded to whole numbers; * Sample size

3.4.1 Age of first smoking daily

Table 6 shows that among current smokers (daily and non-daily smoking) the overall mean age of commencing daily smoking was similar for males and females. The gradual decrease in mean age of commencing daily smoking as the age groups become younger is notable. For example, the age of first daily smoking was lower among males and females aged 15-24 years (males: 15.7 years ±0.4 and females: 15.0 years ±0.4), aged 45-54 years (males: 16.4 years ±1.3 and females: 16.8 years ±1.0), compared to the older age group of 55-64 years (males: 17.7 ±2.0; females: 17.4 ±1.3). This indicates a general trend that both males and females in younger age groups may have commenced smoking daily earlier than older respondents. This is as expected because the older people have lived across more age periods and hence the range of starting ages of daily smoker is wider.

Table 6: Age started smoking for current smokers by gender and age group

Age	Men (N=486)*			Women (N=618)*			Total Population (N=1104)*		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	122	15.7	±0.4	126	15.0	±0.4	248	15.4	±0.3
25-34	113	17.0	±0.7	145	16.1	±0.6	258	16.5	±0.5
35-44	113	16.4	±0.8	148	15.8	±0.6	261	16.0	±0.5
45-54	83	16.4	±1.3	151	16.8	±1.0	234	16.7	±0.8
55-64	24	17.7	±2.0	23	17.4	±1.3	47	17.6	±1.3
Total	455	16.2	±0.3	593	15.7	±0.3	1048	15.9	±0.2

*Sample size

3.4.2 Years of daily smoking (smoking duration)

Table 7 presents the mean years of daily smoking among current smokers (daily and non-daily smoking) by age group. Among current smokers, the mean number of years of daily smoking was marginally higher among females (14.4 years ±0.9) than males (12.1 years ±1.0). As expected, the average years of daily smoking increases with age for both genders.

Table 7: Age started smoking for current smokers by gender and age group

Age	Men (N=486)*			Women (N=618)*			Total Population (N=1104)*		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	122	4.3	± 0.5	126	5.2	± 0.5	248	4.8	± 0.4
25-34	113	12.5	± 1.0	145	13.2	± 0.8	258	12.9	± 0.6
35-44	113	23.1	± 1.0	148	23.5	± 0.8	261	23.4	± 0.6
45-54	83	32.6	± 1.4	151	32.0	± 1.0	234	32.2	± 0.8
55-64	24	40.5	± 2.6	23	39.4	± 1.4	47	40.0	± 1.6
Total	455	12.1	± 1.0	593	14.4	± 0.9	1048	13.3	± 0.7

*Sample size

3.4.3 Types and quantity of tobacco products

Current smokers were asked the average number of different types of tobacco products smoked daily. Table 8 shows that the mean number of manufactured cigarettes smoked per day by current male smokers was 19.5 ±1.4, compared with 20.1 ±1.3 for females. There is a clear trend of the mean number of manufactured cigarettes smoked increasing with age for both men and women. Among current smokers, the average number of hand-rolled cigarettes smoked per day was 3.6 ±2.1 for males, and 2.6 ±1.0 for females. There was no age-related trend in the mean number of hand-rolled cigarettes smoked across both genders.

Table 8: Number of manufactured and hand-rolled cigarettes smoked per day among current smokers by gender and age group

Manufactured cigarettes									
Age	Men (N=486)[a]			Women (N=618)[a]			Total Population (N=1104)[a]		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	124	13.8	± 1.9	128	15.4	± 2.1	252	14.6	± 1.4
25-34	115	21.6	± 2.5	149	20.5	± 2.6	264	21.0	± 1.8
35-44	122	27.9	± 2.9	152	23.2	± 2.4	274	25.0	± 1.9
45-54	93	29.1	± 3.5	156	28.9	± 2.7	249	29.0	± 2.2
55-64	26	29.4	± 5.7	26	35.0	± 6.2	52	31.7	± 4.3
Total	480	19.5	± 1.4	611	20.1	± 1.3	1091	19.8	± 1.0
Hand-rolled cigarettes									
Age	Men (N=486)[a]			Women (N=618)[a]			Total Population (N=1104)[a]		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	3	1.3	± 0.6	2	1.5	± 0.7	5	1.4	± 0.4
25-34	9	5.6	± 4.9	6	3.0	± 2.9	15	4.7	± 3.3
35-44	14	1.7	± 0.4	6	3.3	± 1.3	20	2.3	± 0.6
45-54	11	7.4	± 8.5	10	2.2	± 1.2	21	4.7	± 4.2
55-64	1	3.0	—	1	2.0	—	2	2.6	± 0.7
Total	38	3.6	± 2.1	25	2.6	± 1.0	63	3.2	± 1.3

[a] Sample size

3.5 Alcohol consumption

The second section of the questionnaire focussed on whether the respondents ever consumed alcohol and, if so, the frequency and quantity consumed. Respondents who reported having consumed alcohol within the past 12 months were defined in the survey as current drinkers. Overall, just under half of the sample population (46.2% ±2.4) were current drinkers; 60.7% ±3.4 of males and 32.1% ±3.1 of females. This substantial difference in proportions of current consumption by gender is notable, with proportions almost doubled across all age groups among males as compared to females. Table 9 also shows that the highest proportion of current male drinkers was in the 25-34 year age group (68.2% ±5.9), whereas the highest proportion of current female drinkers was among those aged 15-24 years (34.9% ± 5.7).

Table 9: Alcohol consumption status of all respondents in the past 12 months by genger and age group

Age	Men (N=1086)					
	Abstainers			Current drinkers		
	n	%	CI	n	%	CI
15-24	115	41.5	± 5.8	162	58.5	± 5.8
25-34	77	31.8	± 5.9	165	68.2	± 5.9
35-44	113	39.1	± 5.6	176	60.9	± 5.6
45-54	104	49.1	± 6.7	108	50.9	± 6.7
55-64	27	40.9	± 11.9	39	59.1	± 11.9
Total	436	39.3	± 3.4	650	60.7	± 3.4
Age	Women (N=1186)					
	Abstainers			Current drinkers		
	n	%	CI	n	%	CI
15-24	175	65.1	± 5.7	94	34.9	± 5.7
25-34	194	69.0	± 5.4	87	31.0	± 5.4
35-44	205	70.4	± 5.2	86	29.6	± 5.2
45-54	201	71.0	± 5.3	82	29.0	± 5.3
55-64	48	77.4	± 10.4	14	22.6	± 10.4
Total	823	67.9	± 3.1	363	32.1	± 3.1
Age	Total Population (N=2272)					
	Abstainers			Current drinkers		
	n	%	CI	n	%	CI
15-24	290	53.0	± 4.2	256	47.0	± 4.2
25-34	271	50.0	± 4.3	252	50.0	± 4.3
35-44	318	56.6	± 4.0	262	43.4	± 4.0
45-54	305	62.5	± 4.3	190	37.5	± 4.3
55-64	75	55.5	± 8.8	53	44.5	± 8.8
Total	1259	53.8	± 2.4	1013	46.2	± 2.4

Table 10: Frequency of drinking days in the past 12 months among current drinkers by gender and age group

Age	Men (N=649)											
	Less than once a month			1-3 days a month			1-4 days a week			5-7 days a week		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	68	42.0	± 7.6	46	28.4	± 7.0	41	25.3	± 6.7	7	4.3	± 3.1
25-34	69	41.8	± 7.5	48	29.1	± 6.9	42	25.5	± 6.7	6	3.6	± 2.9
35-44	84	48.0	± 7.4	46	26.3	± 6.5	39	22.3	± 6.2	6	3.4	± 2.7
45-54	35	32.4	± 8.9	23	21.3	± 7.7	45	41.7	± 9.3	5	4.6	± 4.0
55-64	16	41.0	± 15.5	11	28.2	± 14.2	9	23.1	± 13.3	3	7.7	± 8.4
Total	272	42.5	± 4.4	174	27.8	± 4.0	176	25.6	± 3.9	27	4.1	± 1.8
Age	Women (N=362)											
	Less than once a month			1-3 days a month			1-4 days a week			5-7 days a week		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	45	47.9	± 10.1	19	20.2	± 8.2	28	29.8	± 9.3	2	2.1	±2.9
25-34	52	59.8	± 10.4	21	24.1	± 9.0	10	11.5	± 6.7	4	4.6	±4.4
35-44	62	72.9	± 9.5	12	14.1	± 7.4	9	10.6	± 6.6	2	2.4	±3.2
45-54	47	57.3	± 10.8	18	22.0	± 9.0	11	13.4	± 7.4	6	7.3	±5.7
55-64	11	78.6	± 21.6	2	14.3	± 18.4	1	7.1	± 13.6	0	----	----
Total	217	56.5	± 6.0	72	19.9	± 4.8	59	20.5	± 5.2	14	3.1	±1.9
Age	Total Population (N=1011)											
	Less than once a month			1-3 days a month			1-4 days a week			5-7 days a week		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	113	44.1	± 6.1	65	25.4	± 5.3	69	26.9	± 5.4	9	3.5	± 2.3
25-34	121	47.3	± 6.2	69	27.6	± 5.6	52	21.2	± 5.1	10	3.9	± 2.4
35-44	146	57.4	± 6.0	58	21.7	± 5.0	48	17.9	± 4.6	8	3.0	± 2.1
45-54	82	44.2	± 7.1	41	21.6	± 5.9	56	28.2	± 6.3	11	5.9	± 3.4
55-64	27	48.6	± 13.6	13	25.4	± 11.9	10	19.9	± 11.0	3	6.1	± 6.7
Total	489	47.4	± 3.5	246	25.0	± 3.1	235	23.8	± 3.1	41	3.8	± 1.3

Table 11: Frequency of drinks per drinking day in the past 12 months among current drinkers by gender and age group

Age	Men (N=506)											
	1 drink			2-3 drinks			4-5 drinks			6+ drinks		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	8	7.5	± 5.0	7	6.5	± 4.7	3	2.8	± 3.1	89	83.2	± 7.1
25-34	10	7.8	± 4.7	4	3.1	± 3.0	3	2.3	± 2.6	111	86.7	± 5.9
35-44	1	0.7	± 1.3	3	2.0	± 2.3	2	1.4	± 1.9	141	95.9	± 3.2
45-54	4	4.5	± 4.4	3	3.4	± 3.8	3	3.4	± 3.8	78	88.6	± 6.7
55-64	2	5.6	± 7.5	1	2.8	± 5.4	3	8.3	± 9.1	30	83.3	± 12.2
Total	25	6.0	± 2.5	18	4.4	± 2.2	14	2.7	± 1.6	449	87.0	± 3.6
Age	Women (N=251)											
	1 drink			2-3 drinks			4-5 drinks			6+ drinks		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	5	8.5	± 7.2	7	11.9	± 8.3	9	15.3	± 9.2	38	64.4	± 12.3
25-34	1	1.7	± 3.3	1	1.7	± 3.3	6	10.0	± 7.6	52	86.7	± 8.7
35-44	5	7.5	± 6.3	6	9.0	± 6.9	3	4.5	± 5.0	53	79.1	± 9.8
45-54	1	1.8	± 3.5	5	8.9	± 7.5	4	7.1	± 6.8	46	82.1	± 10.1
55-64	0	----	----	1	11.1	± 20.7	2	22.2	± 27.3	6	66.7	± 31.0
Total	12	6.1	± 3.7	20	8.8	± 4.3	24	11.1	± 4.8	195	74.0	± 6.6
Age	Total Population (N=757)											
	1 drink			2-3 drinks			4-5 drinks			6+ drinks		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	13	7.8	± 4.1	14	8.4	± 4.2	12	7.2	± 3.9	127	76.6	± 6.4
25-34	11	6.1	± 3.5	5	2.7	± 2.4	9	4.5	± 2.9	163	86.7	± 4.9
35-44	6	3.1	± 2.5	9	4.6	± 2.9	5	2.5	± 2.2	194	89.8	± 4.2
45-54	5	3.4	± 2.9	8	5.8	± 3.9	7	5.0	± 3.6	124	85.8	± 5.8
55-64	2	4.7	± 6.4	2	4.0	± 5.6	5	10.4	± 8.8	36	80.8	± 11.5
Total	37	6.0	± 2.1	38	5.8	± 2.1	38	5.5	± 2.0	644	82.6	± 3.3

Table 12: Mean number of standard drinks per drinking day among current drinkers by gender and age group

Age	Men (N=506)			Women (N=251)			Total Population (N=757)		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	107	12.1	± 1.4	59	9.0	± 1.7	166	11.0	± 1.1
25-34	128	14.4	± 1.3	60	12.6	± 1.9	188	13.9	± 1.1
35-44	147	14.1	± 1.0	67	10.7	± 1.8	214	12.9	± 0.9
45-54	88	13.2	± 1.5	56	11.3	± 2.0	144	12.3	± 1.2
55-64	36	10.6	± 2.1	9	7.9	± 4.1	45	10.2	± 1.9
Total	506	13.1	± 0.7	251	10.3	± 1.0	757	12.2	± 0.6

Table 13: Proportion of current drinkers who binge drink on any day in the week preceding the survey by gender and age group

Age	Men (N=649)			Women (N=363)		
	5 or more drinks			4 or more drinks		
	n	%	CI	n	%	CI
15-24	46	28.4	± 7.0	30	31.9	± 9.5
25-34	47	28.7	± 6.9	14	16.1	± 7.8
35-44	52	29.5	± 6.8	17	19.8	± 8.5
45-54	44	40.7	± 9.3	20	24.4	± 9.3
55-64	16	41.0	± 15.5	4	28.6	± 23.8
Total	205	29.8	± 4.0	85	25.6	± 5.4

3.5.1 Quantity of alcohol consumption

Among current drinkers, 23.8% ± 3.1 reported spending 1-4 days a week drinking alcohol; 25,6% ±3.9 of men and 20.5% ± 5.2 of women (Table 10). This frequency of drinking was most common among women in the youngest age group (15-24 years, 29.8% ±9.3), and among men aged 45-54 years (41.7% ±9.3). The proportions of those drinking 5-7 days per week were generally low for both men and women.

On drinking days, approximately 82.6% ±3.3 of current drinkers reported drinking 6+ drinks; 87.0% ±3.6 of men and 74.0% ±6.6 of women. The proportions of those consuming six or more drinks peaked in the 35-44 year olds for men and in the 25-34 year olds for women, and decreased with age among men.

Among current drinkers, the mean number of standard drinks[9] consumed per day by males (13.1 ±0.7) was significantly higher than that consumed by females (10.3 ±1.0) (Table 12). Both males and females between 25 and 34 years reported relatively higher average number of alcoholic drinks consumed per day than the younger or older age groups (Table 12).

3.5.2 Binge drinking

Binge drinking among current drinkers was defined as those who consumed 4 or more drinks for men and 3 or more drinks for women on any day in the week preceding the survey.
Table 13 indicates that among current drinkers binge drinking in the past week was generally more common among men than women, except for those aged 15-24 years where higher proportion of women binge drink (31.9% ±9.5) compared to men in the same age group (28.4% ±7.0).

[9]See WHO STEPS Field Manual. Guidelines for Field Staff. WHO/NMH/CCS/03.05 for a definition of a standard drink. A picture show card showing alcohol equivalents for standard drinks was developed for Nauru to assist staff to identify as accurately as accurately as possible standard drinks consumed.

3.6 Fruits and vegetables consumption

Table 14: Mean number of servings of fruits and vegetables consumed per day by gender and age group

Age	Men								
	Fruits			Vegetables			Fruits and Vegetables		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	270	0.9	±0.2	240	1.1	±0.2	271	1.8	±0.3
25-34	236	0.8	±0.2	217	1.1	±0.2	238	1.8	±0.2
35-44	277	1.0	±0.2	233	1.1	±0.1	281	1.9	±0.2
45-54	200	0.7	±0.1	181	1.0	±0.2	205	1.5	±0.2
55-64	65	0.6	±0.2	61	1.1	±0.3	66	1.6	±0.4
Total	1048	0.8	±0.1	932	1.1	±0.1	1061	1.8	±0.1
Age	Women								
	Fruits			Vegetables			Fruits and Vegetables		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	266	1.0	±0.2	242	1.1	±0.2	266	2.0	±0.3
25-34	275	1.0	±0.2	260	1.3	±0.2	278	2.2	±0.3
35-44	288	0.9	±0.2	262	1.3	±0.2	289	2.1	±0.2
45-54	281	0.9	±0.2	261	1.3	±0.2	283	2.1	±0.3
55-64	60	1.2	±0.4	59	1.1	±0.3	61	2.2	±0.6
Total	1170	1.0	±0.1	1084	1.2	±0.1	1177	2.1	±0.1
Age	Total Population								
	Fruits			Vegetables			Fruits and Vegetables		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	536	0.9	±0.1	482	1.1	±0.1	537	1.9	±0.2
25-34	511	0.9	±0.1	477	1.2	±0.1	516	2.0	±0.2
35-44	565	1.0	±0.1	495	1.2	±0.1	570	2.0	±0.2
45-54	481	0.8	±0.1	442	1.2	±0.1	488	1.9	±0.2
55-64	125	0.8	±0.2	120	1.1	±0.2	127	1.8	±0.4
Total	2218	0.9	±0.1	2016	1.2	±0.1	2238	1.9	±0.1

* Excludes "Missing"

To assess dietary behaviours, respondents were asked how often they consumed fruit and vegetables in a typical week in the past year. Respondents were shown flash cards with definitions of fruits, vegetables and serving sizes. For fruit consumption, the results show that the mean number of daily servings was 0.8 serves for men and 1.0 serves for women (Table 14). For vegetable consumption, the mean number of daily servings was 1.1 serves for men and 1.2 serves for women, Although there were slight fluctuations in mean servings of fruits and vegetables reported, no substantial differences were noted across age groups. Overall, women consumed slighter higher mean number of fruits and vegetables servings than men (2.1 vs. 1.8 serves, respectively).

Table 15 indicates that 93.7% ±1.2 of those surveyed consumed less than five servings of fruits or vegetables per day. The prevalence of low consumption of fruits and vegetables per day was similar between males (93.8% ±1.8) and females (93.6% ±1.6). Although there were slight fluctuations in proportions consuming less than 5 servings of fruits and vegetables per day, no substantial differences were noted across age groups, for both genders.

Table 15: Consuming <5 servings of combined fruits and vegetables per day

Age	Men (N=311)			Women (N=434)			Total Population (N=745)		
	n	%	CI	n	%	CI	n	%	CI
15-24	65	87.8	7.5	81	92.0	5.7	146	90.1	4.6
25-34	62	93.9	5.8	97	89.8	5.7	159	91.6	4.1
35-44	86	97.7	3.1	105	90.5	5.4	191	93.2	3.6
45-54	59	100.0	0.0	89	91.8	5.5	148	94.5	3.7
55-64	23	95.8	8.0	23	92.0	10.7	46	94.2	6.5
Total	295	92.2	3.9	395	91.1	3.0	690	91.6	2.4

3.7 Physical activity

Survey participants were asked to report on the frequency and duration of physical activity as part of their work, travel and leisure-time. In the work and leisure domains respondents were asked to report separately on participation in moderate- and vigorous-intensity activity, whereas in the travel domain it was assumed that the activity was of moderate intensity. Total time spent in activity in each domain was calculated by multiplying the number of days this was carried out by the usual duration that was reported. In order to take account of the levels of energy expenditure entailed in activities of different intensities the weekly duration of activity was converted into METmins. To clarify, METmins (Metabolic Equivalent) is the: ratio of the activity metabolic rate to the resting metabolic rate; and it is used to indicate the intensity of an activity. For example, the energy cost of sitting quietly is equivalent to one MET which is defined as 1 kcal/kg/hour. In this analysis, minutes of moderate and vigorous activity was weighted by met values reflecting a level of exertion relative to the resting state (4.0 mets for moderate activity and 8.0 mets for vigorous activity).

The following section presents physical activity levels in terms of median metmins, 25th and 75th percentile values. Table16 shows that the greatest amount of activity reported was in the travel domain, with a median of 180 metmins/wk reported by the whole sample (equal to 45 mins/wk unweighted). Those reporting the highest median metmins of travel activity were 15-24 year olds (280 metmins/wk) with a trend towards reduced activity in this domain with increased age. The medians of 0 metmins for work and leisure time activity show that at least half of respondents did not undertake any of these types of physical activity. The lower inter-quartile ranges (25th, 75th) for leisure metmins indicate that this was least common activity undertaken overall, with at least 75% of respondents not undertaking any of this type of activity.

Table 16: Physical activity undertaken in work, travel and leisure by gender and age group

	Total Population								
	Work metmins			Travel metmins			Leisure metmins		
Age	Median	25th, 75th	N	Median	25th, 75th	N	Median	25th, 75th	N
15-24	0	0, 2520	805	280	0, 840	808	0	0, 0	811
25-34	0	0, 3600	540	120	0, 600	536	0	0, 0	542
35-44	0	0, 3600	518	120	0, 560	517	0	0, 0	524
45-54	0	0, 2400	290	120	0, 600	290	0	0, 0	292
55-64	0	0, 1440	97	0	0, 280	99	0	0, 0	101
Total	0	0, 3360	2251	180	0, 720	2251	0	0, 0	2269
	Men								
	Work metmins			Travel metmins			Leisure metmins		
Age	Median	25th, 75th	N	Median	25th, 75th	N	Median	25th, 75th	N
15-24	120	0, 3600	414	280	0, 840	416	0	0, 1440	417
25-34	320	0, 5200	260	200	0, 720	258	0	0, 360	261
35-44	180	0, 4320	242	120	0, 720	242	0	0, 0	244
45-54	0	0, 2520	120	20	0, 480	120	0	0, 0	121
55-64	0	0, 1880	54	0	0, 360	55	0	0, 0	56
Total	80	0, 3840	1090	200	0, 800	1091	0	0, 0	1098
	Women								
	Work metmins			Travel metmins			Leisure metmins		
Age	Median	25th, 75th	N	Median	25th, 75th	N	Median	25th, 75th	N
15-24	0	0, 1680	391	280	0, 840	392	0	0, 0	394
25-34	0	0, 2520	280	120	0, 560	278	0	0, 0	281
35-44	0	0, 3360	276	160	0, 480	275	0	0, 0	280
45-54	0	0, 2400	170	160	0, 720	170	0	0, 0	171
55-64	0	0, 960	43	0	0, 180	44	0	0, 0	45
Total	0	0, 2400	1160	180	0, 700	1160	0	0, 0	1170

Comparison between the genders in the duration of physical activity in each domain showed that males spent more time in physical activity at work than females (80 metmins/wk vs 0 metmins/wk). Among males the median time spent in work-related physical activity was highest among 25-34 year olds (320 metmins), dropping to 0 metmins/wk in older males. There was little difference between the genders in the time spent in travel related physical activity. In the leisure-time domain the median duration of activity was 0 metmins/wk for both males and females, although the higher 75th percentile for males aged 15-24 years (1440 metmins/wk vs 0 metmins/wk for females) indicated a slightly higher participation in this type of activity by younger males (15-24 years and 25-34 years) than younger females.

Table 17: Participation in moderate, vigorous and total physical activity across all domains by gender and age group

	Total Population								
	Moderate metmins			Vigorous metmins			Total metmins		
Age	Median	25th, 75th	N	Median	25th, 75th	N	Median	25th, 75th	N
15-24	960	240, 3360	802	0	0, 480	809	1680	360, 5200	802
25-34	960	120, 3720	535	0	0, 0	541	1560	240, 5520	534
35-44	960	120, 3840	513	0	0, 0	522	1260	180, 5040	512
45-54	840	0, 3360	289	0	0, 0	292	1040	0, 4140	289
55-64	400	0, 1960	96	0	0, 0	100	480	0, 2560	96
Total	924	160, 3440	2235	0	0, 0	2264	1380	240, 5040	2233
	Men								
	Moderate metmins			Vigorous metmins			Total metmins		
Age	Median	25th, 75th	N	Median	25th, 75th	N	Median	25th, 75th	N
15-24	1080	360, 3600	413	0	0, 2880	416	2610	560, 7200	413
25-34	1440	360, 3840	258	0	0, 2160	260	2580	560, 7720	258
35-44	1060	120, 3960	241	0	0, 0	243	1680	170, 5760	241
45-54	720	0, 3180	120	0	0, 0	121	800	0, 3960	120
55-64	480	0, 2520	53	0	0, 0	56	720	0, 4080	53
Total	1040	240, 3600	1095	0	0, 1680	1095	1880	360, 6600	1085
	Women								
	Moderate metmins			Vigorous metmins			Total metmins		
Age	Median	25th, 75th	N	Median	25th, 75th	N	Median	25th, 75th	N
15-24	840	180, 2400	389	0	0, 0	394	960	180, 3360	389
25-34	720	0, 3360	277	0	0, 0	281	840	0, 3840	276
35-44	924	160, 3780	272	0	0, 0	279	1060	180, 4800	271
45-54	960	0, 3600	169	0	0, 0	171	1080	40, 4200	169
55-64	360	0, 1520	43	0	0, 0	44	400	0, 1800	43
Total	840	120, 3360	1150	0	0, 0	1169	960	120, 3840	1148

Table 17 shows the median time spent in moderate and vigorous intensity activities across all domains, and the median duration of total physical activity. The median total time in physical activity was 1380 metmins/wk, with the highest time reported among 15-24 year olds (1680 metmins/wk) and the lowest among 55-64 year olds (480 metmins/wk). The vast majority of physical activity reported was of moderate intensity, with a median of 924 metmins/wk, compared with 0 metmins/wk for vigorous intensity activity. The interquartile range for the duration of vigorous activity showed that at least 75% of the sample did not report any activity of this intensity.

The median duration of total physical activity reported by males was markedly higher than that of females (1880 metmin/wk vs 960 metmin/wk). In males there was a clearer trend of declining total physical activity with increased age than there was among females. Greater moderate intensity activity appeared to contribute most to the higher total physical activity reported by males compared with females. Both genders reported a median 0 metmins/wk of vigorous activity, although the higher 75th percentile values of vigorous intensity activity among males indicated that they were more likely to be undertaking this type of activity, particularly in the age groups younger than 35 years.

Table 18: Prevalence of physical inactivity by gender and age group

	Total Population				Men				Women			
Age	N	%	CI	n	N	%	CI	n	N	%	CI	n
15-24	811	13.5	± 2.4	110	417	10.8	± 3.0	45	394	16.4	± 3.7	64
25-34	544	16.1	± 3.1	87	261	10.7	± 3.8	28	283	21.0	± 4.7	59
35-44	525	16.7	± 3.2	88	245	17.3	± 4.7	42	280	16.2	± 4.3	45
45-54	292	20.6	± 4.6	60	121	20.8	± 7.2	25	171	20.5	± 6.0	35
55-64	101	28.9	± 8.9	29	56	28.8	± 11.9	16	45	29.0	± 13.3	13
Total	2272	16.5	± 1.5	374	1099	14.3	± 2.1	157	1173	18.5	± 2.2	217

Overall, 16.5% of the total sample were classified as physically inactive, that is, they reported no work, travel or leisure time physical activity (Table 18). The prevalence of physical inactivity increased with age from 13.5% among 15-24 years to 28.9% among those aged 55-64 years, with the greatest increase between the 45-54 years and 55-64 years age groups. Although females showed a somewhat higher prevalence of inactivity than males (18.5% ±2.2 vs 14.3% ±2.1), this difference was not significant, and the apparent age related trend in inactivity was less marked in females than males.

Table 19: Time spent sitting by gender and age group

	Total Population			Men			Women		
Age	Median	25th, 75th	N	Median	25th, 75th	N	Median	25th, 75th	N
15-24	1260	840, 2100	802	1260	840 2100	411	1260	840 2100	391
25-34	1260	840, 2310	536	1260	840 2520	260	1260	840 2100	276
35-44	1260	840, 2100	516	1260	840 2520	241	1260	840 2100	274
45-54	1260	455, 2520	287	1260	840 2520	120	1260	420 2100	168
55-64	1260	840, 2520	100	1680	840 2520	56	840	630 2100	44
Total	1260	840, 2100	2240	1260	840 2520	1088	1260	840 2100	1153

Time spent sitting was measured as an additional indicator of sedentariness. Table 19 shows that the median time spent sitting was 1260 minutes in the total sample and this did not differ by gender. There was no clear age-related trend in sitting time.

Table 20: Mean height (cm), weight (kg) and body mass index (kg/m^2) by gender and age group

Men									
Age	BMI			Height			Weight		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	277	28.7	± 0.7	277	167.9	± 0.7	277	81.2	± 2.3
25-34	242	34.6	± 0.9	242	168.5	± 0.7	242	98.3	± 2.8
35-44	284	35.3	± 0.8	288	169.0	± 0.7	287	102.1	± 2.7
45-54	209	33.8	± 1.0	210	168.2	± 0.8	210	96.1	± 3.0
55-64	66	32.2	± 1.6	66	165.7	± 1.5	66	88.5	± 4.5
Total	1078	31.7	± 0.5	1083	168.1	± 0.4	1082	90.0	± 1.5
Age	Women								
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	267	29.0	± 0.8	269	156.4	± 0.6	268	71.3	± 2.1
25-34	278	34.7	± 0.9	281	157.0	± 0.6	280	86.0	± 2.3
35-44	288	36.5	± 0.8	291	156.7	± 0.6	290	90.3	± 2.3
45-54	282	35.5	± 0.8	283	157.2	± 0.6	283	87.8	± 2.2
55-64	61	34.7	± 2.1	62	155.3	± 1.4	62	85.2	± 5.7
Total	1176	32.5	± 0.5	1186	156.6	± 0.3	1183	80.4	± 1.3
Age	Total Population								
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	544	28.8	± 0.5	546	162.3	± 0.7	545	76.4	± 1.6
25-34	520	34.6	± 0.6	523	162.9	± 0.7	522	92.3	± 1.9
35-44	572	36.0	± 0.6	579	162.1	± 0.7	577	95.5	± 1.8
45-54	491	34.8	± 0.6	493	161.4	± 0.7	493	91.0	± 1.8
55-64	127	33.2	± 1.3	128	161.5	± 1.4	128	87.2	± 3.6
Total	2254	32.1	± 0.4	2269	162.3	± 0.4	2265	85.1	± 1.0

3.8 Height, weight and waist measurements

This section presents data on weight and height measured in all respondents participating in STEP 2. Waist measurement was also taken as a measure of central obesity, which is considered to be a risk factor for cardiovascular disease. Data from female respondents who indicated that they were pregnant during the survey were removed from the analyses.

3.8.1 Height, weight and body mass index

Table 20 summarizes the distribution of mean height, weight and body mass index (BMI) by gender and age group. Body mass index was computed as the weight in kilograms divided by the square of height in metres.

Table 21: Distribution of BMI risk categories by gender and age group

Men (N=1078)															
Age	Underweight			Normal			Overweight			Obese			Overweight and Obese		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	3	1.1	± 1.2	77	27.8	± 5.3	90	32.5	± 5.5	107	38.6	± 5.7	197	71.1	± 5.3
25-34	0	—-	——	18	7.4	± 3.3	47	19.4	± 5.0	177	73.1	± 5.6	224	92.6	± 3.3
35-44	1	0.4	± 0.7	15	5.3	± 2.6	55	19.4	± 4.6	213	75.0	± 5.0	268	94.4	± 2.7
45-54	2	1.0	± 1.3	17	8.1	± 3.7	42	20.1	± 5.4	148	70.8	± 6.2	190	90.9	± 3.9
55-64	0	—-	——	5	7.6	± 6.4	22	33.3	± 11.4	39	59.1	± 11.9	61	92.4	± 6.4
Total	6	0.7	± 0.6	132	17.2	± 2.9	256	26.5	± 3.2	684	55.7	± 3.5	940	82.1	± 2.9
Women (N=1176)															
Age	Underweight			Normal			Overweight			Obese			Overweight and Obese		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	1	0.4	± 0.7	83	31.1	± 5.6	75	28.1	± 5.4	108	40.4	± 5.9	183	68.5	± 5.6
25-34	2	0.7	± 1.0	20	7.2	± 3.0	61	21.9	± 4.9	195	70.1	± 5.4	256	92.1	± 3.2
35-44	0	—-	——	15	5.2	± 2.6	27	9.4	± 3.4	246	85.4	± 4.1	273	94.8	± 2.6
45-54	1	0.4	± 0.7	14	5.0	± 2.5	50	17.7	± 4.5	217	77.0	± 4.9	267	94.7	± 2.6
55-64	0	—-	——	4	6.6	± 6.2	15	24.6	± 10.8	42	68.9	± 11.6	57	93.4	± 6.2
Total	4	0.4	± 0.4	136	17.4	± 2.8	228	21.8	± 2.8	808	60.5	± 3.4	1036	82.2	± 2.8
Total Population (N=2254)															
Age	Underweight			Normal			Overweight			Obese			Overweight and Obese		
	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI
15-24	4	0.7	0.7	160	29.4	3.8	165	30.4	3.9	215	39.5	4.1	380	69.9	3.9
25-34	2	0.4	0.5	38	7.3	2.3	108	20.6	3.5	372	71.7	3.9	480	92.3	2.3
35-44	1	0.2	0.3	30	5.2	1.8	82	13.8	2.8	459	80.8	3.2	541	94.6	1.9
45-54	3	0.6	0.7	31	6.2	2.1	92	18.6	3.5	365	74.6	3.9	457	93.2	2.2
55-64	0	—-	0.0	9	7.2	4.6	37	29.9	8.1	81	63.0	8.6	118	92.8	4.6
Total	10	0.5	0.4	268	17.3	2.0	484	24.1	2.1	1492	58.1	2.4	1976	82.2	2.0

† Pregnant females excluded

Females in the survey had a mean height of 156.6cm (±0.3) and a mean weight of 80.4kg (±1.3). Males were significantly taller and heavier with a mean height of 168.1cm (±0.4) and a mean weight of 90.0kg (±1.5).

Table 20 also shows that female respondents had a higher total mean BMI than male participants (32.5 kg/m2 ± 0.5 vs 31.7 kg/m2 ± 0.5, respectively). For both genders, the greatest mean BMI increase was between the 15-24 years and 25-34 years age groups. The mean BMI peaked in the 35-44 years age group for both males (35.3 kg/m2 ± 0.8) and females (36.5 kg/m2 ± 0.8), with a clear trend of declining BMI thereafter in both genders. Although females indicated higher mean BMI across all age groups compared to males, this difference was minimal.

For body mass index, respondents were classified into four mutually exclusive categories of underweight (BMI <18.50 kg/m2), normal weight (BMI 18.50 - 24.99 kg/m2), overweight (BMI 25.0 to <30.0 kg/m2) or obese (BMI 30.0 kg/m2), following WHO criteria. Table 21 shows the distribution of these BMI categories by gender and age group. Overall, the prevalence of obesity tended to be higher among females than males (60.5% ±3.4 vs 55.7% ±3.5) although this difference was not significant. Comparison between the age groups on the prevalence of obesity showed a striking increase from age 15-24 to 25-34 years for both genders, with the highest percentage of obesity recorded in 34-44 years age group for both men and women.

Table 21 also shows a substantial proportion of the total population was overweight or obese (82.2% ±2.0). The prevalence of overweight or obesity was similar between women (82.2% ±2.8) and men (82.1% ±2.9). The Table also clearly shows a rapid rise in the prevalence of overweight and obesity in both genders by age 25 years, with the greatest increase occurring among women in the 35-44 years age group. While the proportion of overweight or obese males decreased slightly after age 35-44 years from 94.4% ±2.7 to 92.4% ±6.4 among the 55-64 years group, the decline among females around this age period tended to be less marked, with the proportions of overweight or obese remaining higher relative to males after 35 years.

3.8.2 Waist circumference

Table 22 shows that the overall mean waist circumference was 96.1cm (±1.2) for males and 93.6cm (±1.1) for females. While females had an increasing waist circumference with increasing age, the largest rise in waist circumference was observed among men from 87.4cm (±1.7) at 15-24 years to 102.2cm (±1.9) at 25-34 years.

Table 22: Mean waist circumference (cm) by gender and age group

Table 4.8.2.1 Mean waist circumference (cm) by gender and age group

Age	Men (N=1081)			Women (N=1151)			Total Population (N=2232)		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	277	87.4	± 1.7	256	85.2	± 1.7	533	86.4	± 1.2
25-34	242	102.2	± 1.9	264	97.9	± 1.8	506	100.2	± 1.3
35-44	285	107.2	± 1.7	286	101.8	± 1.5	571	104.2	± 1.1
45-54	211	106.3	± 2.1	283	102.6	± 1.5	494	104.0	± 1.2
55-64	66	104.3	± 3.3	62	104.2	± 3.9	128	104.2	± 2.5
15-64	1081	96.1	± 1.2	1151	93.6	± 1.1	2232	94.9	± 0.8

* Pregnant females excluded

Table 23: Mean resting blood presssure (mmHg) by gender and age group

	Men					
Age	SBP			DBP		
	n	Mean	CI	n	Mean	CI
15-24	276	126.6	± 1.4	276	72.6	± 1.1
25-34	234	126.6	± 1.6	235	79.3	± 1.3
35-44	279	130.3	± 1.9	280	83.4	± 1.3
45-54	190	134.9	± 2.9	188	84.3	± 1.7
55-64	52	141.0	± 7.1	52	83.6	± 3.5
15-64	1031	128.2	± 0.9	1031	77.0	± 0.8
	Women					
Age	SBP			DBP		
	n	Mean	CI	n	Mean	CI
15-24	268	112.8	± 1.2	266	71.6	± 1.1
25-34	271	114.6	± 1.4	274	75.3	± 1.2
35-44	273	120.2	± 1.9	273	78.7	± 1.2
45-54	251	130.3	± 2.8	248	82.2	± 1.5
55-64	52	141.8	± 7.3	52	82.4	± 3.5
15-64	1115	116.8	± 0.9	1113	75.0	± 0.7
	Total Population					
Age	SBP			DBP		
	n	Mean	CI	n	Mean	CI
15-24	544	119.8	± 1.1	542	72.1	± 0.8
25-34	505	120.8	± 1.2	509	77.3	± 0.9
35-44	552	124.8	± 1.4	553	80.8	± 0.9
45-54	441	132.1	± 2.1	436	83.0	± 1.1
55-64	104	141.4	± 5.1	104	83.1	± 2.5
Total	2146	122.4	± 0.7	2144	76.0	± 0.5

3.9 Medical history and biochemical risk factors

3.9.1 Prevalence of raised blood pressure

The prevalence of hypertension was identified in STEP 3 based on systolic and diastolic measurements. As noted in the Methodology section, blood pressure was measured three times, and the mean value of the second and third readings was used in the analysis. If not all measurements were recorded then the mean values were calculated on the two readings that were recorded.Thresholds for hypertension were computed according to the WHO international guidelines (WHO/ISH 1999a; 2003b).

Table 23 summarises the distribution of mean systolic blood pressure (SBP) diastolic blood pressure (DBP) by gender and age group. Across all age groups, men had higher mean systolic blood pressure and higher mean diastolic blood pressure than women. For both genders, the mean blood pressure increased with age.

The prevalence of high blood pressure for cardiovascular diseases was calculated to include those with:

- A mean systolic pressure ≥140mmHg, whether or not they had previously been told by a health worker that they had elevated blood pressure, OR
- A mean diastolic pressure ≥90mmHg, whether or not they had previously been told by a health worker that they had elevated blood pressure, OR
- Self-reported current use of anti-hypertensive medication, whether or not they had previously been told by a health worker that they had elevated blood pressure.

A significantly higher proportion of males (23.1% ±2.7) than females (11.5% ±1.8) were found to have raised blood pressure based on either measured blood pressure or currently receiving anti-hypertensive medication (Table 24). With the exception of those aged 55-64 years, the proportions with raised blood pressure were higher among males than females for all age groups. Across both genders, the prevalence of raised blood pressure increased markedly with increasing age.

Table 24: Proportion with raised blood pressure (SBP?140mmHG and/or DBP ?90mmHG or currently on anti-hypertensitive medication) by gender and age group

Men

Age	Previously Diagnosed			SBP>=140 and/or DBP>=90 and NOT on Medication			Total Prevalence		
	n	%	CI	n	%	CI	n	%	CI
15-24	0	--	0.0	41	14.9	4.2	41	14.9	4.2
25-34	4	1.7	1.6	47	19.8	5.1	50	21.1	5.2
35-44	7	2.4	1.8	96	33.6	5.5	99	34.6	5.5
45-54	21	10.1	4.1	80	38.5	6.6	95	45.7	6.8
55-64	14	21.2	9.9	25	37.9	11.7	35	53.0	12.0
Total	46	2.3	0.7	289	21.6	2.7	320	23.1	2.7

Women

Age	Previously Diagnosed			SBP>=140 and/or DBP>=90 and NOT on Medication			Total Prevalence		
	n	%	CI	n	%	CI	n	%	CI
15-24	1	0.4	0.7	10	3.7	2.3	10	3.7	2.3
25-34	3	1.1	1.2	22	8.1	3.2	22	8.1	3.2
35-44	8	2.9	2.0	44	15.8	4.3	48	17.3	4.4
45-54	31	11.1	3.7	74	26.5	5.2	92	33.0	5.5
55-64	9	14.8	8.9	27	44.3	12.5	33	54.1	12.5
Total	52	2.4	0.7	177	10.3	1.7	205	11.5	1.8

Total Population

Age	Previously Diagnosed			SBP>=140 and/or DBP>=90 and NOT on Medication			Total Prevalence		
	n	%	CI	n	%	CI	n	%	CI
15-24	1	0.2	0.4	51	9.5	2.5	51	9.5	2.5
25-34	7	1.4	1.0	69	14.1	3.1	72	14.8	3.1
35-44	15	2.7	1.3	140	23.8	3.5	147	25.1	3.6
45-54	52	10.7	2.8	154	31.1	4.1	187	37.9	4.3
55-64	23	18.7	6.9	52	40.4	8.6	68	53.5	8.8
Total	98	2.3	0.5	466	15.9	1.6	525	17.2	1.6

3.9.2 Cholesterol

Table 25 shows that the mean fasting blood cholesterol for males was 4.3mmol/L ±0.1 and for females was 4.5mmol/L ±0.1. There was a clear trend of increasing mean total cholesterol with age, with levels plateauing around 45-54 years for females and declining marginally for males beyond this age level. At all age levels, except for 35-44 years, the mean cholesterol levels were higher among females than males.

Table 25: Mean total cholestrol (mmol/L) by gender and age group

Age	Men (N=1086)			Women (N=1186)			Total Population (N=2272)		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	277	3.9	± 0.1	269	4.2	± 0.1	546	4.0	± 0.1
25-34	242	4.5	± 0.1	281	4.6	± 0.1	523	4.5	± 0.1
35-44	289	4.8	± 0.1	291	4.8	± 0.1	580	4.8	± 0.1
45-54	212	4.9	± 0.1	283	5.4	± 0.1	495	5.2	± 0.1
55-64	66	4.7	± 0.2	62	5.4	± 0.3	128	5.0	± 0.2
Total	1086	4.3	± 0.1	1186	4.5	± 0.1	2272	4.4	± 0.0

Table 26: Proportion with fasting elevated total cholesterol ?5.2 mmol/Land age group

Age	Men (N=1086)			Women (N=1186)			Total Population (N=2272)		
	n	%	CI	n	%	CI	n	%	CI
15-24	21	7.6	± 3.1	29	10.8	± 3.7	50	9.1	± 2.4
25-34	38	15.7	± 4.6	60	21.4	± 4.8	98	18.5	± 3.3
35-44	75	26.0	± 5.1	77	26.5	± 5.1	152	26.2	± 3.6
45-54	69	32.5	± 6.3	138	48.8	± 5.8	207	42.5	± 4.4
55-64	18	27.3	± 10.7	29	46.8	± 12.4	47	35.1	± 8.3
Total	221	14.9	± 2.2	333	20.8	± 2.4	554	17.9	± 1.6

Elevated cholesterol levels were classified as exceeding ≥5.2 mmol/L (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001). Table 26 shows that one in five women (20.8% ±2.4) surveyed were in the high-risk cholesterol group, compared with 14.9% ±2.2 of men. A marked increase in the prevalence of high-risk cholesterol among women was notable among those age 45 years and older, with a prevalence of 48.8% ±5.8 at this age group.

3.9.3 Prevalence of diabetes

Current diabetes mellitus was defined in this study as having a fasting blood sugar level ≥7.0mmol 1^{-1} in the venous plasma sample that was collected, as recommended in WHO guidelines for the diagnosis for this disease (WHO 1999b) or reporting current use of insulin, oral drugs or a prescribed diet to manage diabetes. There were 501 participants who provided venous blood samples; these were transported to Sydney, Australia and analysed in the Diagnostic Pathology Unit (DPU), Concord Repatriation General Hospital.

Overall, the all-ages prevalence of diabetes in the sample was 16.2% (Table 27). The prevalence increased markedly with age, ranging from 3.8% among 15-24 year olds to 45.0% among those aged 55-64 years. There were no significant differences in the prevalence of diabetes between men and women. However, while diabetes was more common among men in the 25-34 and 35-44 years age groups, in the 55-64 years age group it was more common among women (52.8% in women; 37.4% in men).

For the purposes of cross-country comparisons with other STEPS surveys, the prevalence of diabetes for those aged 25 to 64 years was also computed. After removing the youngest age group from the analysis, the all-ages prevalence was 22.7% (See Appendix 7).

Table 27: Prevalence of diabetes by gender and age group (2006 survey)*

Age	N	Men			Women			Total Population		
		%	CI	n	%	CI	n	%	CI	n
15-24	173	2.0	±2.7	2	5.7	±4.5	5	3.8	±2.6	7
25-34	136	15.4	±7.5	11	8.2	±5.9	5	11.9	±4.9	16
35-44	110	26.1	±10.4	13	22.4	±9.3	13	24.1	±6.9	27
45-54	63	37.1	±13.4	10	37.7	±12.7	13	37.4	±9.2	24
55-64	17	37.4	±18.4	3	52.8	±21.4	5	45.0	±14.2	8
Total	501	16.1	±4.0	40	16.3	±4.0	41	16.2	±2.8	81

* Data weighted to ethnic Nauruans aged 15-64 years (Bureau of Statistics, 2004);
[0]N/n=weighted estimates subject to rounding-off error

3.10 Raised risk for NCDs

WHO recently added a comprehensive assessment on STEPS NCD risk factors - raised risk. Five common and critical risk factors for NCDs were selected, including current daily smokers, overweight or obese (BMI≥25.0kg/m2), raised blood pressure (SBP≥140 and/or DBP≥90 mmHg or currently on medication for raised blood pressure), less than 5 servings of fruits and vegetables per day and low level of activity (<600 MET-minutes).

The results in Table 28 show that only 0.1% of those aged 25-64 years were classified as having low risk for NCDs (ie., none of the 5 risk factors). Among those aged 45 to 64 years, 80.8% were classified as having raised risk (ie. at least three of the risk factors) for NCDs, compared to 75.2% for those aged 25-44 years. The overall prevalence of raised risk aged 25 to 64 years were 76.3%.

Table 28: Distribution of raised risk for NCDs by gender and age group

Age	Low risk (no risk factors)			1-2 risk factors			Raised risk (at least 3 risk factors)		
	n	%	CI	n	%	CI	n	%	CI
25-44	1	0.2	± 0.3	123	25.1	± 3.9	375	74.7	± 3.9
45-64	0	--	--	50	18.2	± 4.9	213	81.8	± 4.9
Total	1	0.1	± 0.2	173	23.7	± 3.3	588	76.2	± 3.3
Women (N=1119)									
Age	Low risk (no risk factors)			1-2 risk factors			Raised risk (at least 3 risk factors)		
	n	%	CI	n	%	CI	n	%	CI
25-44	0	--	--	130	24.5	± 3.7	404	75.5	± 3.7
45-64	1	0.3	± 0.6	65	19.7	± 4.3	262	80.0	± 4.3
Total	1	0.1	± 0.1	195	23.4	± 3.0	666	76.5	± 3.0
Total Population (N=2147)									
Age	Low risk (no risk factors)			1-2 risk factors			Raised risk (at least 3 risk factors)		
	n	%	CI	n	%	CI	n	%	CI
25-44	1	0.1	± 0.1	253	24.8	± 2.7	779	75.2	± 2.7
45-64	1	0.2	± 0.3	115	19.0	± 3.2	475	80.8	± 3.2
Total	2	0.1	± 0.1	368	23.6	± 2.2	1254	76.3	± 2.2

3.11 Self-rated general health, beliefs about diabetes risk and perceived environmental support for a healthy lifestyle

3.11.1 Self-rated general health

This section examines the findings from the additional questions about perceived personal health and beliefs related to health behaviours that were asked in the STEP 1 survey. Measuring self-rated health and health beliefs are a useful strategy for monitoring health and wellbeing in the population, and identifying potentially modifiable factors to address in health interventions. Self-rated health was assessed in the Nauru-STEPS survey using a single item. Survey respondents were asked: 'In general, would you rate your health as excellent, very good, good, fair or poor?' This item has been used in population-wide surveys across multiple countries and varying cultural environments. The item is believed to reflect physical health (principally chronic conditions and physical functioning) and to a lesser extent mental health problems (Krause & Jay, 1994). Self-rated health has also been shown to be strongly and independently related to ill-health and premature mortality.

Table 29: Self-rated general health by gender and age group

Age	N	Excellent/Very good %	Excellent/Very good CI	Excellent/Very good n	Good %	Good CI	Good n	Fair/Poor %	Fair/Poor CI
Total Population									
15-24	811	22.8	±2.9	185	48.9	±3.4	397	28.3	±3.1
25-34	544	13.2	±2.8	72	44.1	±4.2	240	42.7	±4.2
35-44	524	14.3	±3.0	75	44.3	±4.3	232	41.5	±4.2
45-54	292	12.3	±3.8	36	39.2	±5.6	114	48.6	±5.7
55-64	101	16.4	±7.2	17	34.9	±9.3	35	48.7	±9.8
Total	2271	16.9	±1.5	384	44.8	±2.0	1018	38.3	±2.0
Men									
15-24	417	26.0	±4.2	108	50.9	±4.8	212	23.1	±4.0
25-34	261	14.5	±4.3	38	47.1	±6.1	123	38.4	±5.9
35-44	244	15.3	±4.5	37	46.5	±6.3	114	38.2	±6.1
45-54	121	14.2	±6.2	17	40.1	±8.7	48	45.8	±8.9
55-64	56	16.7	±9.8	9	31.8	±12.2	18	51.5	±13.1
Total	1098	19.1	±2.3	210	46.9	±3.0	515	34.0	±2.8
Women									
15-24	394	19.3	±3.9	76	46.8	±4.9	184	33.8	±4.7
25-34	283	12.1	±3.8	34	41.3	±5.7	117	46.6	±5.8
35-44	280	13.4	±4.0	38	42.3	±5.8	118	44.3	±5.8
45-54	171	11.0	±4.7	19	38.5	±7.3	66	50.5	±7.5
55-64	45	16.1	±10.8	7	38.7	±14.3	17	45.2	±14.6
Total	1173	14.8	±2.0	174	42.9	±2.8	503	42.3	±2.8

Table 29 summarises the distribution of different self-ratings of health by age group and gender. Only 16.9% ±1.5 of those surveyed rated their health as being 'Excellent or very good'. Just under one half of those surveyed rated their health as being 'good' (44.8% ±2.0) with slightly more males (46.9% ±3.0) than females (42.9% ±2.8) considering themselves as having generally 'good' health. For both males and females, there was a clear trend of reported health status getting worse as age increased. It was notable that more females than males in the 15-24 years age group rated their health as being 'fair or poor' (33.8% ±4.7 vs. 23.1% ±4.0).

3.11.2 Health beliefs related to Type 2 Diabetes Mellitus (T2DM)

Effective health interventions to control NCDs require a better understanding of beliefs about personal susceptibility and the severity of these diseases. In the Nauru-STEPS survey respondents who had not been diagnosed with diabetes were asked to respond to five statements about developing Type 2 Diabetes Mellitus (T2DM). For example, respondents rated on a 5-point likert scale how strongly they disagreed or agreed that 'My chances of getting Type 2 diabetes are small' (see STEPS questionnaire in Appendix 7 for the full list of statements).

Table 30 presents a summary distribution of the health beliefs related to T2DM by gender and age group. More than three quarters of all those surveyed (84.2% ±1.6) believed that 'Getting T2DM would be a bad thing to happen to me', with more males (86.3% ±2.1) than females (82.2% ±2.3) indicating this belief.

Table 30 also shows that the proportions of those who strongly agreed or agreed with the statement: 'I am frightened about getting T2DM' to be similar to the belief that getting T2DM would be a bad thing. Among all those surveyed, 83.4% ±1.6 reported that they were frightened about getting T2DM, with little difference between males (84.0%) and females (82.9%). While the proportions of females who were concerned about developing T2DM remained relatively stable across age groups, for males the proportions of those concerned about T2DM peaked to 88.0% ±4.0 in the 25-34 years age group and declined to 72.1% ±14.6 in the oldest age group.

The third statement asked respondents about their perceived chances of getting T2DM. Interestingly, despite the relatively high concern about developing T2DM Table 4.11.2.1 shows that almost one half (46.1% ±2.2) of all those surveyed believed that their chances of getting T2DM were small. A higher proportion of males (48.9% ±3.1) than females (43.4% ±3.0) believed that their risk of developing T2DM is low, with this concern remaining relatively stable across age.

Table 30 also shows that the majority of respondents believed that regular exercise (86.2%) and a healthy diet (91.4%) could reduce their risk of developing T2DM. For both males and females and across all age groups there were relatively higher proportions of respondents who believed that 'A healthy diet may reduce my risk of T2DM' compared to the belief that 'Regular exercise may reduce my risk of T2DM'.

3.11.3 Beliefs about the benefits of physical activity and healthy eating

All respondents, including those diagnosed with diabetes, were asked to indicate their level of agreement with four statements about the benefits of physical activity and healthy eating: 'Walking instead of using the car is a good way to improve my health', 'Wading in the water at the beach is a good way to exercise', 'Eating the fruits and vegetables grown at home will improve my health' and 'Eating foods that are low in fat will improve my health'. The vast majority of respondents believed that either walking instead of using the car (95.9%) or wading at the beach (87.2%) is beneficial to improving health (Table 31). The results also highlight that eating foods low in fat (93.2%) or eating home grown vegetables and fruits (96.5%) are considered to be important factors for improving health by most respondents. These patterns were similar across both genders and for all age groups and suggest high levels of awareness of the benefits of regular physical activity and healthy eating habits for health improvement.

3.11.4 Perceptions about environmental supports for physical activity

When asked to consider a number of environmental factors that may affect regular physical activity, just under half (45.9%) of al those surveyed believed that 'The crime in my local area makes it unsafe to go on walks at night', while 50.9% believed that 'Puddles and flooding in my local area make it difficult to go walking', and 58.2% considered that 'The large number of dogs in the local streets make it unsafe to go walking'. There were no significant differences between males and females in their perceptions about the presence of dogs and criminal activities in local streets. Significantly more males, however, believed that flooding in local areas make it more difficult to go walking compared with females.

Table 32 further shows that the majority (70.2%) of respondents believed that 'My local area has several free recreation facilities, such as parks, walking trails, bike paths, playgrounds and recreation centres', with no significant difference in this belief reported between males (71.1% ±2.7) and females (69.5% ±2.6). The majority (79.8%) also believed that 'The pathways in my neighbourhood are well maintained and not obstructed', with no significant gender differences (males: 78.9% ±2.49; females: 80.7% ±2.3). Although some fluctuations in belief levels were noted across age groups, overall the majority of respondents indicated favourable perceptions of the infrastructure for physical activity in their local area.

Table 30: Health beliefs related to Type 2 Diabetes Mellitus by gender and age group

Total Population																
Age	N	Getting T2DM would be a bad thing to happen to me			I am frightened about getting T2DM			My chances of getting T2DM are small			Regular exercise may reduce my risk of T2DM			A healthy diet may reduce my risk of T2DM		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	801	83.3	±2.6	667	84.8	±2.5	679	46.8	±3.5	375	87.2	±2.3	698	91.1	±2.0	729
25-34	517	85.3	±3.1	441	86.6	±2.9	447	45.5	±4.3	235	86.8	±2.9	448	92.7	±2.2	479
35-44	446	85.0	±3.3	379	81.3	±3.6	362	43.8	±4.6	195	85.7	±3.3	382	91.0	±2.7	406
45-54	200	83.4	±5.2	167	76.9	±5.8	154	48.3	±6.9	97	84.0	±5.1	168	91.4	±3.9	183
55-64	60	83.4	±9.4	50	76.0	±10.8	46	51.9	±12.6	31	80.8	±10.0	49	88.4	±8.1	53
Total	2023	84.2	±1.6	1704	83.4	±1.6	1688	46.1	±2.2	933	86.2	±1.5	1745	91.4	±1.2	1850
Men																
Age	N	Getting T2DM would be a bad thing to happen to me			I am frightened about getting T2DM			My chances of getting T2DM are small			Regular exercise may reduce my risk of T2DM			A healthy diet may reduce my risk of T2DM		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	414	85.5	±3.4	354	84.4	±3.5	349	51.6	±4.8	214	88.0	±3.1	364	90.9	±2.8	376
25-34	251	85.4	±4.4	214	88.0	±4.0	221	45.9	±6.2	115	88.4	±4.0	222	92.3	±3.3	232
35-44	209	88.3	±4.4	185	82.2	±5.2	172	44.1	±6.7	92	87.9	±4.4	184	92.3	±3.6	193
45-54	84	87.2	±7.1	74	79.7	±8.6	67	52.7	±10.7	44	88.5	±6.8	75	93.9	±5.1	79
55-64	36	88.4	±10.4	32	72.1	±14.6	26	58.1	±16.1	21	86.0	±11.3	31	90.7	±9.5	33
Total	995	86.3	±2.1	859	84.0	±2.3	836	48.9	±3.1	487	88.0	±2.0	876	91.8	±1.7	913
Women																
Age	N	Getting T2DM would be a bad thing to happen to me			I am frightened about getting T2DM			My chances of getting T2DM are small			Regular exercise may reduce my risk of T2DM			A healthy diet may reduce my risk of T2DM		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	386	81.1	±3.9	313	85.2	±3.5	329	41.7	±4.9	161	86.4	±3.4	334	91.3	±2.8	353
25-34	266	85.2	±4.3	227	85.2	±4.3	227	45.1	±6.0	120	85.2	±4.3	227	93.2	±3.0	248
35-44	237	82.1	±4.9	194	80.5	±5.0	190	43.5	±6.3	103	83.7	±4.7	198	89.8	±3.8	213
45-54	116	80.6	±7.2	93	74.9	±7.9	87	45.0	±9.1	52	80.6	±7.2	93	89.5	±5.6	103
55-64	24	75.8	±17.2	18	81.8	±15.5	20	42.4	±19.8	10	72.7	±17.9	17	84.8	±14.4	20
Total	1028	82.2	±2.3	845	82.9	±2.3	853	43.4	±3.0	446	84.5	±2.2	869	91.1	±1.7	937

* Respondents diagnosed with diabetes excluded from analyses

Table 31: Belief s about the benefits of physical activity and healthy eating by gender and age group

Total Population												
Age	N	Walking instead of using the car will improve my health			Wading at the beach is a good way to exercise			Fruit and vegetable grown at home will improve my health			Eating foods low in fat will improve my health		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	811	95.8	±1.4	777	87.8	±2.3	712	96.7	±1.2	784	94.0	±1.6	762
25-34	544	96.7	±1.5	526	89.6	±2.6	487	96.7	±1.5	526	93.3	±2.1	507
35-44	525	96.2	±1.6	505	86.4	±2.9	453	95.4	±1.8	501	93.6	±2.1	491
45-54	292	95.0	±2.5	277	83.5	±4.3	244	96.6	±2.1	282	91.4	±3.2	267
55-64	101	92.3	±5.2	93	84.8	±7.0	85	98.3	±2.5	99	89.6	±6.0	90
Total	2272	95.9	±0.8	2178	87.2	±1.4	1981	96.5	±0.8	2192	93.2	±1.0	2117
Men													
Age	N	Walking instead of using the car will improve my health			Wading at the beach is a good way to exercise			Fruit and vegetable grown at home will improve my health			Eating foods low in fat will improve my health		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	417	96.8	±1.7	404	89.9	±2.9	375	96.4	±1.8	402	94.9	±2.1	396
25-34	261	96.3	±2.3	251	92.6	±3.2	241	95.9	±2.4	250	93.0	±3.1	242
35-44	245	96.5	±2.3	236	92.4	±3.3	226	96.9	±2.2	237	93.8	±3.0	230
45-54	121	93.9	±4.3	113	88.7	±5.6	107	97.2	±3.0	117	89.2	±5.5	108
55-64	56	93.9	±6.3	52	89.4	±8.1	50	97.0	±4.5	54	86.4	±9.0	48
Total	1099	96.1	±1.1	1057	90.9	±1.7	999	96.5	±1.1	1061	93.1	±1.5	1024
Women													
Age	N	Walking instead of using the car will improve my health			Wading at the beach is a good way to exercise			Fruit and vegetable grown at home will improve my health			Eating foods low in fat will improve my health		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	394	94.8	±2.2	373	85.5	±3.5	337	97.0	±1.7	382	92.9	±2.5	366
25-34	283	97.2	±1.9	275	86.8	±3.9	246	97.5	±1.8	276	93.6	±2.9	265
35-44	280	95.9	±2.3	268	81.1	±4.6	227	94.2	±2.7	264	93.5	±2.9	262
45-54	171	95.8	±3.0	164	79.9	±6.0	137	96.1	±2.9	165	92.9	±3.8	159
55-64	45	90.3	±8.7	41	79.0	±11.9	35	100.0	±0.0	45	93.5	±7.2	42
Total	1173	95.6	±1.2	1121	83.7	±2.1	982	96.4	±1.1	1131	93.2	±1.4	1094

Table 32: Perceptions about environmental supports for physical activity by gender and age group

Total Population															
Age	N	Recreation facilities are available in my local area			Pathways in my local area are well maintained			The dogs in my area make it unsafe to walk			The crime in my area makes it unsafe to walk at night			Puddles and flooding in my area make it difficult to walk		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	811	74.6	±3.0	605	81.8	±2.7	664	55.1	±3.4	447	49.4	±3.4	401	49.7	±3.4	403
25-34	544	69.1	±3.9	376	76.3	±3.6	415	55.2	±4.2	300	44.9	±4.2	244	52.9	±4.2	287
35-44	525	70.5	±3.9	370	81.7	±3.3	429	60.5	±4.2	318	44.7	±4.3	234	51.1	±4.3	268
45-54	292	62.5	±5.6	183	79.1	±4.7	231	67.2	±5.4	196	42.9	±5.7	125	52.2	±5.7	153
55-64	101	62.7	±9.5	63	74.7	±8.5	75	62.0	±9.5	62	37.5	±9.5	38	45.3	±9.7	46
Total	2272	70.2	±1.9	1596	79.8	±1.7	1813	58.2	±2.0	1323	45.9	±2.0	1043	50.9	±2.1	1157
Men																
Age	N	Recreation facilities are available in my local area			Pathways in my local area are well maintained			The dogs in my area make it unsafe to walk			The crime in my area makes it unsafe to walk at night			Puddles and flooding in my area make it difficult to walk		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	417	75.1	±4.2	313	80.1	±3.8	334	53.8	±4.8	224	48.7	±4.8	203	56.3	±4.8	235
25-34	261	71.9	±5.5	187	76.9	±5.1	200	55.0	±6.0	143	44.6	±6.0	116	55.8	±6.0	145
35-44	245	70.2	±5.7	172	82.0	±4.8	201	63.3	±6.0	155	44.6	±6.2	109	52.2	±6.3	128
45-54	121	59.9	±8.7	72	76.4	±7.6	92	71.2	±8.1	86	48.6	±8.9	59	64.6	±8.5	78
55-64	56	65.2	±12.5	36	71.2	±11.9	40	65.2	±12.5	36	37.9	±12.7	21	45.5	±13.1	25
Total	1099	71.1	±2.7	781	78.9	±2.4	867	58.7	±2.9	645	46.3	±2.9	509	55.6	±2.9	612
Women																
Age	N	Recreation facilities are available in my local area			Pathways in my local area are well maintained			The dogs in my area make it unsafe to walk			The crime in my area makes it unsafe to walk at night			Puddles and flooding in my area make it difficult to walk		
		%	CI	n	%	CI	n	%	CI	n	%	CI	n	%	CI	n
15-24	394	74.0	±4.3	291	83.6	±3.7	329	56.5	±4.9	223	50.2	±4.9	198	42.8	±4.9	168
25-34	283	66.5	±5.5	188	75.8	±5.0	215	55.5	±5.8	157	45.2	±5.8	128	50.2	±5.8	142
35-44	280	70.8	±5.3	198	81.4	±4.6	228	58.1	±5.8	163	44.7	±5.8	125	50.2	±5.9	140
45-54	171	64.3	±7.2	110	80.9	±5.9	139	64.3	±7.2	110	38.9	±7.3	67	43.5	±7.4	74
55-64	45	59.7	±14.4	27	79.0	±11.9	35	58.1	±14.4	26	37.1	±14.1	17	45.2	±14.6	20
Total	1173	69.5	±2.6	815	80.7	±2.3	946	57.8	±2.8	678	45.5	±2.9	534	46.5	±2.9	545

4.0 Discussion

4.1 Health status

The Nauru-STEPS survey has provided clear, up-to-date evidence that NCDs and related behavioural and physical risk factors are critical threats to the health and well-being of the people of Nauru. The data highlight factors that need to be targeted in prevention programs in order to achieve long-term health improvements in this country and provide a baseline against which these initiatives can be evaluated. In addition, the findings have shown that there are a number of people in the population who have undiagnosed disease and are in need of treatment and disease management interventions.

Smoking is clearly a major threat in Nauru, given that almost one half of the population smoke on a daily basis. Unlike many other nations, it is notable in Nauru that the prevalence of smoking is higher among women than among men. Smoking is generally being initiated in the mid-to-late teenage years and manufactured cigarettes are by far the most common tobacco product used. These findings reflect the lack of regulation of cigarette sales to young people in Nauru and the low price that cigarettes have historically been sold for (less than $A3.00 per packet or $A0.25 per cigarette). Strategies to lower the rates of smoking initiation during adolescence and to reduce the demand for manufactured cigarettes (e.g. advertising restrictions, excises) are therefore important to consider. Additional efforts to promote smoking cessation are also needed to lower the risk of disease among people who have adopted this behaviour.

The data concerning alcohol consumption showed that men were more likely than women to have been drinkers in the last 12 months, although it should be recognised that more than half of the total population had not consumed alcohol in this time period. A notable finding was that the average amount of alcohol consumed on each occasion by drinkers was very high; more than twice the levels which represent 'binge' drinking for men (13.1 drinks per occasion) or women (10.3 drinks per occasion). Among women in Nauru this drinking pattern is likely to take place as part of organized functions whereas for men it is more common for drinking to occur in secluded locations where alcohol is shared among friends. Becoming intoxicated is reported to be the primary objective for many who drink and it has been observed during the recent economic difficulties in Nauru that spirits are being increasingly preferred over beer because they can produce intoxication more quickly. This pattern of binge drinking, which creates severe risks of injury and for chronic health problems, needs to be addressed in alcohol misuse interventions in Nauru. These could include community wide education, the introduction of excises on alcohol, and legislative and policing strategies to discourage intoxication when driving or in public places.

The majority of Nauruans reported eating less than five serves of fruit and vegetables per day. Key obstacles that need to be overcome to increase fruit and vegetable consumption in Nauru are the limited availability and high costs of these foods on the island. Almost all of the fresh foods that are shipped to the island are purchased by local shop-owners and on-sold to the community at higher prices. Strategies that could be considered to increase the supply of these foods include local cultivation in home and community gardens, the establishment of a fruit and vegetable co-operative so that the prices of imported fresh products can be minimized, and community education about the high nutritional value of snap frozen vegetables (which are cheaper and less perishable).

The data collected about physical activity showed that most activity was of moderate intensity; undertaken as part of traveling from place to place and, to a lesser extent, work. The lowest amount of physical activity was reported in the recreation domain which reflects limited availability or organized sports and physical activity programs, particularly for older people. While a median of 1320 metmins of total activity was reported, it needs to be recognized that a minimum of 60 minutes of light to moderate intensity activity per day (equal to about 1386 metmins over 7 days) is usually considered to be necessary to fulfill basic daily functions, and it is the activity over and above this which has protective health benefits. This indicates that the majority of Nauruans, especially women and older people, are not achieving a level of physical activity that is beneficial to their health. Furthermore, there is a significant segment of the population, one in six people, who are at greatly elevated risk because they are completely inactive.

The health beliefs and environmental perceptions related to physical activity revealed that, while a high proportion of people were concerned about the risk of diabetes and believed that physical activity helped to prevent this disease, there were several environmental factors that may be discouraging participation. Almost 60% of respondents reported that dogs in their area made it unsafe to go walking, with older people more likely to identify this as a barrier, and just over half considered that puddles and flooding in their area made it difficult to walk. Increasing physical activity in the Nauruan population will require the development of strategies that are suitable for different population segments and the establishment of partnerships between various sectors (e.g. health, education, roads, planning, recreation etc) in order to ensure that these are effectively delivered. Removal of environmental barriers to physical activity will play an important enabling role which will complement strategies such as community-wide education and the development of recreation programs.

Data obtained from the physical and biochemical measures confirmed that the high prevalence of behavioural risk factors in Nauru is being translated into physical risk factors and markers of chronic disease in the population. Consistent with the findings related to physical activity and nutrition, almost two-thirds of the population were obese, with the prevalence increasing markedly after the age of 24 years and being slightly higher among females

than males. In Nauru it is reported that obesity is not widely considered to be a health risk factor, and in fact the converse, that losing weight is an indicator of illness, is more likely to be believed. Furthermore, obesity may be believed by sections of the society to be a positive attribute, an indicator of a person's 'quality'. This indicates that raising public awareness about the harmful consequences of obesity needs to take place and, where possible, opinion leaders need to be engaged in order to influence social norms concerning body size.

High blood cholesterol was found in one-fifth of women and about one in six men. The prevalence of this problem increased with age and was evident in almost half of women age 45 years and over. The STEPS survey, therefore, identified significant numbers of people with physical risk factors for cardiovascular disease that require immediate treatment and longer term monitoring. This is an important part of the disease control strategies that need to be initiated in this nation.

The results from the blood glucose analyses revealed a weighted all-ages prevalence of diabetes in the total population of 16.2% and a prevalence of over one-third among people aged over 45 years of age. Previous studies in Nauru between 1975 and 1987 reported a prevalence of diabetes among those aged 20 years and over of 24-28%, which at that time was considered to be the second highest in the world after that of the Pima Indians. Among those aged 20 years and over in the STEPS study the prevalence of diabetes was found to be 18.7% (additional analysis, results table not shown in report). While the reason for this difference is not readily apparent some possible explanations can be put forward. One of these concerns the measurement of blood glucose levels in these different studies. The STEPS study used a single fasting blood glucose test which, compared with the 2-hour oral glucose tolerance test which was used in the earlier studies in Nauru, has been considered to produce lower population estimates of the prevalence of diabetes (Taylor and Zimmet, 1981). Another possible explanation is that the prevalence of diabetes has in fact declined in recent decades in Nauru. Earlier research indicated a 14% decline in the incidence rate of diabetes between 1982 and 1987 compared with the 1975-1982 period, which appeared to be largely due to a reduction in the rate of conversion from normal to impaired glucose tolerance in the population (Dowse et al., 1991). The researchers postulated that this decline may have been caused by exhaustion of a cohort of people susceptible to diabetes, or who had been exposed to an environmental influence which increased the risk of this disease. An explanation which is not supported by the findings of the STEPS study is that the decline in diabetes observed is due to reduction in the prevalence of lifestyle risk factors in the population; the prevalence of obesity remains high while the levels of physical activity and fruit and vegetable consumption are low.

It is important to recognize that, even allowing for a possible decline in the prevalence of diabetes in Nauru, the levels of this disease are still at high levels, especially among those aged 35 years and over. Indeed, the Nauru-STEPS study has confirmed that chronic diseases continue to be the most pressing health need in Nauru and are at such a high level that they may also be impacting negatively on the country's social and economic development.

4.2 The value of Nauru-STEPS survey

There are several significant aspects of how the Nauru-STEPS study was carried out that have increased its potential value to the people of Nauru. First among these is that the study was managed by staff of the Nauru MOH. As a result, there is commitment to seeing that the results are used immediately to guide strategies to address the needs that have been identified. Secondly, considerable attention was paid to building the capacity of staff within the Nauruan health system to implement all aspects of the study. This has imparted knowledge and skills to over 30 Nauruans who could contribute to the future implementation of a study of this nature. Thirdly, the Nauru STEPS study was a 'survey with a service'. The results of the physical and biochemical measures were available to participants, with accompanying advice about health behaviours and referral to treatment for those who needed this. Based on the results of the biochemical assessments, approximately 10% of participants were identified with high risk factors and were referred for further medical attention related to hypertension and early stage renal problems.

Follow-up interviews conducted with staff after the STEPS study revealed that satisfaction with the implementation process was generally high. There was also a perception that participants in the STEPS survey were satisfied with how it was conducted. The immediate availability of results from the physical and biochemical measures was valued by the participants and acted as an incentive for recruitment to the study.

The funding and planning assistance provided by WHO and AusAID was considered essential for the study implementation, with the support provided in the form of equipment (laboratory equipment, computers, photocopiers) identified as particularly important. Similarly, the technical assistance provided by consultants from the Centre for Physical Activity and Health at the Universities of New South Wales and Sydney in the areas of planning, preparation of measurement instruments, training, data analyses and reporting, was also regarded as integral to the success of the study. All of this support was particularly important given the economic difficulties that have been faced in Nauru in recent years, stemming from the declining returns from phosphate mining.

The experience gained through the implementation of the Nauru-STEPS study has also provided valuable lessons that can be applied in future population health studies in Nauru. It was beneficial to train a large team to carry out recruitment and measurements; this eased the time burden upon individual staff and made it easier to avoid participants being measured by someone they know. Conducting a pilot study immediately after the training provided very useful practice and an opportunity to become aware of any potential measurement difficulties that

needed to be addressed prior to the main study. Training members of the STEP 2 team (physical measures) to assist the STEP 1 team in the challenging task of carrying out lengthy interviews to measure behavioural risk factors was regarded as helpful. Feedback from the STEP 1 team also indicated that they could have been further assisted by: more trial runs of the survey during the training; more detailed guidance about how to deal with responses that were obtained on the dietary and physical activity questions; more training to equip them for behavioural counseling in the exit interviews, and; availability of a shorter, ready reference version of the training manual. A perspective concerning the training of all of the STEPS teams added by the Project Director was that it would be useful in future to give more attention to increasing the knowledge of team members about the nature and significance of the health issues that are being measured. This would assist them in their communication with study participants and be useful for their future work in the health system.

The response rate achieved in the study indicated that the recruitment process was successful. Staff who carried out recruitment suggested that their task could have been further eased by more extensive public awareness raising about the STEPS study before its commencement. Underpinning the recruitment efforts were several months of work compiling a sampling frame for the study using data from the Births, Deaths and Marriages Registry and the Nauru Phosphate Corporation. This demanded much more time than was originally envisaged and needed to draw upon local knowledge to identify those who were no longer in the country. The investment of time in compiling this sampling frame will benefit future population health studies in this country.

The methods used to implement the STEPS study in Nauru have produced benefits for participants, members of the STEPS teams and the health system in this country. The pressing task now is to use the data collected to set priorities and implement sustained programs to tackle the enormous chronic disease burden that the country is carrying. Set out below is an outline of recommendations for action based on the findings of the Nauru-STEPS survey.

5.0 Recommendations for action

5.1 Public health and clinical interventions

- Build public awareness about the harmful consequences of tobacco use, physical inactivity, poor dietary habits and obesity
- Develop interventions to prevent the early initiation of smoking among young people across both genders
- Implement the WHO Framework Convention on Tobacco Control (FCTC)
- Implement adult smoking cessation programs
- Implement interventions to prevent/reduce smoking among adults, focusing on environmental (smoke-free places) and regulatory (advertising ban, taxes) measures
- Develop interventions to support moderate consumption of alcohol and reduce hazardous and harmful drinking, including strategies to reduce access to and driving under the influence of alcohol
- Build public awareness of the benefits of engaging in an active lifestyle and regular leisure time physical activity
- Develop and promote awareness of national physical activity guidelines for adolescent and adult populations
- Implement strategies to improve physical environments to support increased leisure time physical activity across all population populations
- Implement strategies to support increased access and availability of fruit and vegetable for all population groups
- Increase the capacity of health workers and the health system to identify, monitor and treat individuals with hypertension and impaired glucose tolerance
- Prioritise diabetes management as a an entry point for NCD public health prevention and control efforts
- Public health strategies to emphasize the prevention and control of the 5 common and critical risk factors for NCDs, including current daily smoking, overweight and obesity, raised blood pressure, consuming less than 5 servings of fruit and vegetables per day and low level of activity

5.2 Infrastructure

- Integrate prevention and control of NCD risk factors into health worker training programs to increase availability of health workers skilled in providing lifestyle counselling and in managing population health programs
- Ensure sustainable funding mechanism to support NCD strategy implementation and monitoring
- Build coalitions, networks and partnerships in advocacy and action for preventing and controlling NCD risk factors, such as coalitions between private, government and NGO sectors in tobacco control, and improving food and nutrition and physical activity
- Re-orient health services to support health promotion/public health initiatives to address NCDs

5.3 Surveillance

- Secure commitments at the highest level to a systematic framework of STEPS data collection (eg., workforce and infrastructure) on an ongoing basis as opposed to ad hoc surveys, e.g. conduct 3 STEPS surveys by 2020
- Expand and improve the Nauru-STEPS questionnaire with additional questions relevant to Nauru's need to build a comprehensive profile of psychosocial and biological risk factors for health problems, e.g., mental health, physical disabilities, intentional and non-intentional injury, oral health, attitudes and perceived barriers related to core and expanded STEPS items

5.4 Dissemination and utility of STEPS findings

- Wide dissemination of the Nauru-STEPS findings and recommendations to policy-makers and international agencies through various forums (eg., disseminate user-friendly documents of the main STEPS results, in brief pamphlet formats)
- Wide dissemination of the Nauru-STEPS findings and recommendations to the public through the media (including the world wide web) and community forums
- Wide dissemination of the Nauru-STEPS findings to the scientific community through presentations at key national and international scientific meetings and through peer-reviewed publications
- Continue a collaborative and consultative process between key stakeholders to encourage optimal use of the STEPS results for identifying priority areas for programming, monitoring trends and evaluating effectiveness of public health programs
- Engage with regional and international agencies (ie. WHO, SPC etc) in developing NCD plan for Nauru
- Ensure that the Nauru-STEPS data inform national NCD plan and are applied in the evaluation of NCD related policies and programs

6.0 References

Bonita, R., de Courten, M., Dwyer, T., Jamrozik, K. and Winkelmann, R. (2001). *Surveillance of risk factors for noncommunicable diseases: The WHO STEPwise approach. Summary*. Geneva: World Health Organization.

Nauru Bureau of Statistics. (2004). *Nauru census 2002*. Nauru: Ministry of Finance, Government of Nauru.

Dowse, G.K., Zimmet, P.Z., Finch, C.F. and Collins, V.R. (1991). Decline in incidence of epidemic glucose intolerance in Nauruans: Implications for the 'Thrifty Genotype'. *American Journal of Epidemiology*, *133,* 1093-1104.

National Cholesterol Education Program (2001). Executive Summary, Third report of the expert panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult treatment III). *Journal of the American Medical Association*, *285(19),* 2486-2497.

Galea, G., Powis, B. and Tamplin, S.A. (2000). Healthy islands in the Western Pacific - International setting development. *Health Promotion International*, *15*, 169-178.

Krause, N.M. and Jay, G.M. (1994). What do global self-rated health items measure? Medical Care, 32, 930-942.

Taylor, R. and Zimmet, P. (1981). Limitation of fasting plasma glucose for the diagnosis of diabetes mellitus. *Diabetes Care, 4,* 556-558.

Word Health Organization/International Society of Hypertension, (1999a). Guidelines for the management of hypertension. *Journal of Hypertension, 17,* 151-183.

World Health Organization Department of Noncommunicable Disease Surveillance, (1999b). *Definition, diagnosis and classification of diabetes mellitus and its complications. Report of a WHO consultation, Part I: Diagnosis and classification of diabetes mellitus. WHO/NCD/NCS/99.2.* Geneva: World Health Organization.

World Health Organization Department of Noncommunicable Disease Surveillance. (2003). WHO STEPS field manual. G*uidelines for field staff. WHO/NMH/CCS/03.05.* Geneva: World Health Organization.

World Health Organization/International Society of Hypertension, (2003). Guidelines for the management of hypertension. *Journal of Hypertension, 21,* 1983-1992.

World Health Organization, (2004), *World Health Report 2004*, Geneva: World Health Organization.

7.0 Appendices

7.1 Additional results

7.1.1 Response rates for the 2006 follow-up survey (diabetes)

Table 33: STEPS survey response rate percentagesby gender*, 2006 survey

Age (years)	Men Eligible	Men Participated		Women Eligible	Women Participated		Overall Eligible	Overall Participated	
	N	n**	%	N	n**	%	N	n**	%
15-24	70	57	81.4	67	52	77.6	137	109	79.6
25-34	73	58	79.5	63	57	90.5	136	115	84.6
35-44	69	55	79.7	69	58	84.1	138	113	81.9
45-54	66	55	83.3	64	56	87.5	130	111	85.4
55-64	29	29	100	25	24	96.0	54	53	98.1
15-64	**307**	**254**	**77.4**	**288**	**247**	**85.8**	**595**	**501**	**84.2**

* Response rates were calculated as follows: completed Steps 1-3/completed Steps 1-3 + refusals (eligible). Excluded from the calculation were those who were not in the country during the survey, those with physical and mental disabilities. These individuals were replaced using the reserved lists.
** Un-weighted numbers.

7.1.2 Alcohol consumption

Table 34: Mean number of standard drinks per week among current drinkers by gender and age group

Age	Men (N=649)			Women (N=363)			Total Population (N=1012)		
	n	Mean	CI	n	Mean	CI	n	Mean	CI
15-24	142	1.1	± 0.4	85	1.1	± 0.5	227	1.1	± 0.3
25-34	148	1.3	± 0.5	82	0.5	± 0.3	230	1.0	± 0.3
35-44	165	0.9	± 0.3	79	0.4	± 0.2	244	0.7	± 0.2
45-54	101	1.6	± 0.6	75	0.9	± 0.5	176	1.3	± 0.4
55-64	38	0.9	± 0.4	14	0.5	± 0.5	52	0.8	± 0.3
Total	594	1.1	± 0.2	335	0.8	± 0.2	929	1.0	± 0.2

Table 35: Proportion of current drinkers who binge drink on any day of the week preceding the survey by gender and age group

Men (N=649)						
Age	5 or more drinks			More than 4 days		
	n	%	CI	n	%	CI
15-24	46	28.4	± 7.0	0	---	---
25-34	47	28.7	± 6.9	1	0.6	± 1.2
35-44	52	29.5	± 6.8	0	---	---
45-54	44	40.7	± 9.3	1	0.9	± 1.8
55-64	16	41.0	± 15.5	0	---	---
Total	205	29.8	± 4.0	2	0.2	± 0.3
Women (N=363)						
Age	4 or more drinks			More than 4 days		
	n	%	CI	n	%	CI
15-24	30	31.9	± 9.5	0	---	---
25-34	14	16.1	± 7.8	1	1.1	± 2.3
35-44	17	19.8	± 8.5	0	---	---
45-54	20	24.4	± 9.3	0	---	---
55-64	4	28.6	± 23.8	0	---	---
Total	85	25.6	± 5.4	1	0.2	± 0.5

7.1.3 Diabetes

Table 36: Prevalence of diabetes by gender and age group, 25-64 years (2006 survey)*

Age	N	Men			Women			Total		
		%	CI	N	%	CI	n	%	CI	n
25-34	136	15.4	±7.5	11	8.2	±5.9	5	11.9	±4.9	16
35-44	110	26.1	±10.4	13	22.4	±9.3	13	24.1	±6.9	27
45-54	63	37.1	±13.4	10	37.7	±12.7	13	37.4	±9.2	24
55-64	17	37.4	±18.4	3	52.8	±21.4	5	45.0	±14.2	8
Total	328	23.8	±5.7	38	21.7	±5.4	37	22.7	±4.0	74

* Data weighted to ethnic Nauruans aged 25-64 years (Bureau of Statistics, 2004);
#N/n=weighted estimates subject to rounding-off error

Key Contacts:

Nauru Ministry of Health contact:

Ms Maree Bacigalupo
Secretary of Health and Medical Services
Ministry of Health
Republic of Nauru
Tel: (674) 4443133
E-mail: mbaci@cenpac.net.nr

WHO contact:

Dr Li Dan
Medical Officer
Noncommunicable Diseases
WHO Office for the South Pacific
P. O. Box 113
Suva, Fiji
Tel: (679) 3304600
Fax: (679) 3311530
E-mail: LiD@sp.wpro.who.int

Centre for Physical Activity and Health contact:

Dr Philayrath Phongsavan
School of Public Health
Level 2, Medical Foundation Building K25
94 Parramatta Road
Camperdown NSW 2050
Sydney, Australia
Tel: (61 2) 9036 3248
Fax: (61 2) 9036 3184
E-mail: php@health.usyd.edu.au