American Samoa NCD Risk Factors

STEPS REPORT

AMERICAN SAMOA GOVERNMENT

World Health Organization
Western Pacific Region

American Samoa
NCD Risk Factors STEPS Report

A collaborative effort between the Department of Health, World Health Organization and Monash University, Australia, supported by the Australian Agency for International Development

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Foreword

In American Samoa, as in all other Pacific Island Countries and Territories, noncommunicable diseases (NCDs) or "lifestyle diseases" are responsible for a high proportion of death and disability. These common diseases include mainly diabetes, heart disease, stroke and cancer. Throughout the Pacific, the burden of NCDs is increasing rapidly with significant social, economic and health consequences.

If we are going to effectively address this growing problem, we must have accurate information regarding the risk factors that contribute to the development of NCDs. "Risk factors" refer to any characteristic or exposure that increases a person's likelihood of developing a NCD, and include smoking, alcohol use, physical inactivity, obesity, high blood pressure, a raised level of blood glucose or cholesterol, and an unbalanced diet.

The American Samoa NCD STEPS survey, 2004 was specifically designed to assess the prevalence of the common NCDs and risk factors in our population. The information from this survey provides an important platform for the development and implementation of strategic plans and programs to address the growing epidemic of NCDs in American Samoa. Furthermore, the implementation of this important survey in American Samoa provides a firm foundation for an ongoing surveillance for NCDs and their various risk factors.

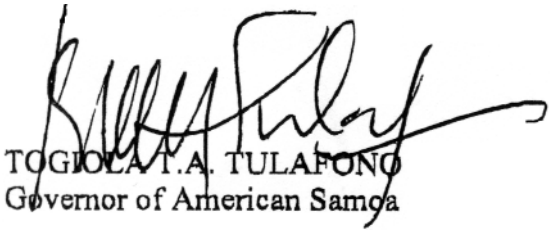
The Department of Health is sincerely grateful to the World Health Organization (WHO) and Monash University in Australia for the technical assistance provided that helped guide the survey from inception to implementation, analysis and interpretation. We are also most appreciative of the funding from AusAID and WHO that allowed us to complete this important activity.

While available data has clearly indicated an increasing burden of NCDs in American Samoa, there has been no population-based information on the prevalence of the NCD risk factors that are common to many of the NCDs affecting our population. It is this "risk approach" to NCD surveillance and control that is one of the most notable features of the STEPwise surveillance process with a shift in emphasis from individual to community health.

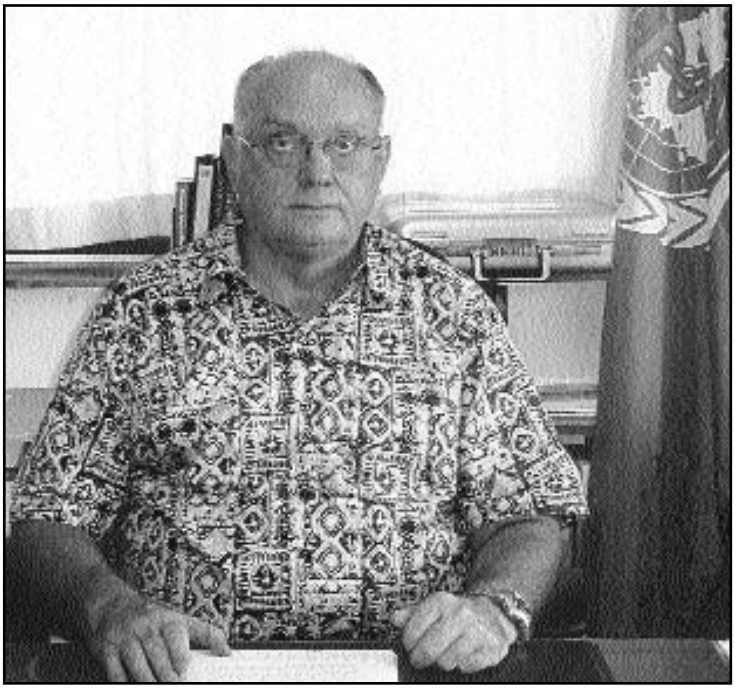
Implementing the American Samoa NCD STEPS survey required intensive work, long days, and persistence and dedication from the American Samoa team that undertook the survey. Indeed, it is the hard work of the STEPS team that allowed this vital activity to take place and we owe each of them our sincere appreciation.

The American Samoa NCD STEPS survey and this report is a landmark in our efforts to address the increasing NCD epidemic affecting our people. It marks an increased commitment by the American Samoa health system to tackle the NCD challenge and will serve us well in the further development, monitoring and evaluation of effective health policies and programs appropriate to our context, and to our ongoing efforts in NCD and NCD risk factor surveillance. Indeed, it is our hope that we will now move forward in the formulation of a comprehensive and feasible NCD strategic action plan in American Samoa.

Finally, I expect that this report will provide its readers with the opportunity to understand the magnitude of the NCD burden and the vital role of NCD risk factors in the epidemic. I also encourage you to participate in concrete actions to promoting healthier lifestyles within our communities as we work collectively to address the NCD challenge.



TOGIOLA T.A. TULAFONO
Governor of American Samoa



The publication of this report marks a milestone for American Samoa as it provides updated scientifically collected data that will assist the Department of Health and other stakeholders in addressing the escalating problem of noncommunicable chronic diseases (NCDs) in the Territory.

The STEPwise approach is a standardized method for collecting, analyzing and disseminating data on NCD risk factors. It has proven to be a valuable tool for monitoring national trends, and for making comparisons between and among countries and territories. The STEPS survey was carried out in American Samoa in 2004. The most significant findings were that:

1. 47.3% of the population are diabetic (one of the highest rates in the world);
2. 29.9% of the adult population are regular smokers;
3. 93.5% of the population are overweight or obese, and 74.6% are obese; and,
4. 86.7% of the population consumed less than 5 servings of fruit and vegetables per day.

Overall, 99.6% of the population were found to have one or more of the major risk factors for NCDs: they smoke regularly, are overweight or obese; have high blood pressure or currently are on medication for high blood pressure; do not include sufficient quantities of fruit and vegetables in their diet, and have low levels of physical activity. Of greatest concern was the finding that 69.2% of the population aged between 25 and 44 years of age had three or more of the risk factors putting them in the high risk category.

The figures show that there is an urgent need for interventions to reduce the risk of NCDs in American Samoa. WHO is committed to work with the Department of Health in addressing this problem.

We are grateful to the Australian Agency for International Development (AusAID) for their financial assistance, Monash University for their technical assistance, and the staff of the Department of Health in American Samoa who travelled the length and breadth of the territory to obtain the data for this report.

WHO congratulates all those that took part for your the tremendous efforts as we continue to work together to tackle the growing burden of NCDs that threatened the health and welfare of the people of the Pacific.

Dr Kevin Palmer
World Health Organization Representative for
American Samoa, Cook Islands, Niue, Samoa and Tokelau

Executive Summary

The American Samoa NCD STEPS survey was a population-based nation-wide cross-sectional assessment of key chronic diseases and their risk factors in adults aged 25 - 64 years. It was carried out from June to August 2004 using the WHO STEPS surveillance methodology and questionnaires. The main objectives were:

- To investigate the prevalence of key noncommunicable diseases (NCDs) in American Samoa.
- To determine the prevalence of the major risk factors for common NCDs in American Samoa.

Using stratified cluster sampling, data were obtained from 2072 individuals.

Summary prevalence data for behavioural measures

The percentage who currently smoke tobacco daily was 29.9% with a gender difference of 38.1% of American Samoan males and 21.6% of females. The overall prevalence of current alcohol consumption in the population was 63.5%, with 72.7% of males and 41.3% of females classified as current consumers of alcohol. There were 49.6% of current male consumers of alcohol in the study population and 33.9% of current female consumers of alcohol that had participated in binge drinking. Male binge drinkers had consumed 5 or more standard drinks on at least one day in the previous week while female binge drinkers had consumed 4 or more standard drinks on at least one day in the previous week.

The mean number of servings of fruit eaten per day was 1.5 for males and 1.7 for females. The mean number of servings of vegetables eaten per day was 2.4 for males and females. Overall, 86.7% of the study population consumed fewer than 5 of combined servings of fruit and vegetables per day. "Starchy vegetables" are not counted in this statistic.

Overall, 62.2% of the study population was classified to be physically inactive, or with low levels of physical activity (58.6% of males and 66.0% of females). The results suggest that males undertake the majority of their physical activity during work time (44.8 METminutes per day), and that females undertake the main physical activity during transport time (26.9 METminutes per day). The amount of physical activity undertaken during leisure time was smaller than that during work time for both males and females.

Summary prevalence data for physical measures

The overall proportion of those either overweight or obese (defined as BMI$\geq$25kg/m^2) in the survey population was 93.5% and the proportion of those with obesity (BMI$\geq$30kg/m^2) was 74.6%. For males, 92.7% were classified as either overweight or obese with 69.3% being obese. For females, 94.4% were classified as either overweight or obese with 80.2% being classified as obese.

Mean waist circumferences for males and females were 104.7cm (41 & 3/16th inches) and 104.8cm (41 & ¼ inches) respectively; both of these exceed the values of 94cm for males (37 inches) and 80cm for females (31 & ½ inches) that are considered to infer increased risk of cardiovascular disease.

The total prevalence of high blood pressure amongst males in the survey population was 40.9%. The total prevalence of high blood pressure amongst females was 27.5%. The mean systolic and diastolic blood pressure was 134.1 / 83.5 mmHg in males and 125.1 / 80.0 mmHg in females.

Summary prevalence data for biochemical measures

The mean fasting blood glucose level in the study population was 6.7 mmol/L, i.e., 120.3 mg/dL (6.8 mmol/L in males and 6.5 mmol/L in females). Overall, the total prevalence of diabetes in the study population was 47.3%. The total prevalence of diabetes was 52.3% for males and 42.4% for females. The total prevalence includes the known, or previously diagnosed diabetics, and newly diagnosed diabetics (those with capillary whole blood glucose levels greater or equal to 6.1 mmol/L or 110 mg/dL).

The mean total blood cholesterol level for the study population was 4.7 mmol/L, i.e., 183.6 mg/dL with no difference between males and females. Overall, 23.4% of the study population had cholesterol levels greater than 5.2 mmol/L or 200 mg/dL, which indicates a high risk of coronary artery disease.

Summary of combined risk factors

There are 5 common and critical risk factors for NCDs including current daily smokers, overweight or obese (BMI≥25kg/m^2), raised blood pressure (SBP≥140 and/or DBP≥90 mmHg or currently on medication for raised BP), less than 5 servings of fruit and vegetables per day and low level of activity (<600 METminutes per week).

Only 0.4% of the study population were at low risk for NCDs (i.e., with none of the 5 risk factors). 71.8% of the population aged 25 to 64 years old were at raised risk (i.e., with at least three of the risk factors included above). And notably 69.2% of the younger 25 to 44 years old group were also at a raised risk for NCDs with at least three of the key risk factors.

Opportunities for intervention and action

The survey data indicate that noncommunicable diseases such as diabetes and hypertension as well as their risk factors are very common in American Samoa. NCDs such as diabetes, cardiovascular disease and cancer are already leading the mortality statistics of American Samoa. But the high level of risk factors observed in the survey such as obesity, elevated blood pressure and blood lipids, physical inactivity and a lack of fresh fruit and vegetable intake together with widespread consumption of tobacco and alcohol can only result in more disability and reduced quality of life if preventive measures are not successful.

Therefore, interventions should be initiated at multiple levels in the American Samoan community. In particular, the American Samoan public need to be informed and educated about the major risk factors for NCDs, and should be given all possible support to prevent, reduce or eliminate individual risk factors. They should be made particularly aware that many of the adverse health consequences of these risk factors could be reduced or eliminated by adopting a healthier lifestyle.

Specific recommendations are:

To inform through educational means the American Samoan public about:

- the health risks associated with smoking and of the health benefits of smoking cessation.
- the adverse health effects of excessive alcohol consumption and the health benefits of decreasing alcohol consumption, particularly targeted towards younger males and females.
- the health benefits of increasing fruit and vegetable consumption and decreasing consumption of fatty foods.
- the contributions of overweight and obesity to chronic diseases such as type 2 diabetes, cardiovascular disease, stroke and some cancers.
- the health benefits of reducing and preventing overweight and obesity.
- ways of achieving weight reduction through modification of diet and physical activity.
- the health risks of hypertension, diabetes and cardiovascular disease and the health benefits of preventing or controlling them.
- lifestyle factors contributing to hypertension, diabetes and cardiovascular disease.
- the importance of appropriately monitoring and treating hypertension and diabetes, particularly amongst older age groups.

To develop, introduce and strengthen environmental, behavioural and policy strategies to decrease the prevalence of lifestyle risk factors among American Samoans, including measures to:

- prevent younger Samoans from taking up smoking.
- encourage and support current smokers to quit smoking.
- discourage younger Samoans from participating in binge drinking.
- encourage current consumers of alcohol to decrease their level of alcohol consumption.

To develop and introduce programs that support the prevention and control of hypertension, diabetes and cardiovascular disease including the following:

- an increase in efforts to encourage healthy eating habits across all age groups by promoting the availability and consumption of greater levels of fruit and vegetables.
- instigating strategies that support and promote weight reduction. This should include increased access to healthy foods and options for physical activity. Increasing levels of physical activity during leisure and transportation could be targeted specifically.
- ensuring that the health system adequately performs monitoring and treatment of hypertension, diabetes and cardiovascular disease.

Acknowledgments

We thank the American Samoa Department of Health for providing staffing, laboratory facilities and office space for the survey. This study would not be possible without the leadership of the American Samoa Department of Health team, the team from the Fiji School of Medicine 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.

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Dr Jan Pryor, Dr Philayrath Phongsavan and Dr Li Dan are the final technical and editorial reviewers of the report, through country consultation with Dr Uta Laloulu Tagoilelagi, Dr Ivan Tuliau, Dr Fanuatele T Vaiaga'e and Mr Asofa'afetai Maga in American Samoa. The fund for the final review came from New Zealand Ministry of Health.

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1. Introduction

1.1 Background to the NCD STEPS surveillance

Noncommunicable diseases (NCDs) are the major cause of death and disability globally and are of great concern to the World Health Organization (WHO) and countries alike. Recent trends indicate that NCDs are responsible for almost 60% of deaths and 43% of disease burden and predict that they will be responsible for 73% of deaths and 60% of the global burden of disease by 2020.

Recent WHO Western Pacific Regional office analyses of NCDs in the Western Pacific Region highlighted the very high mortality already noted in Pacific Islands[1] and associated economic burden[2]. WHO is assisting countries by implementing the WHO STEPwise approach[3] - a surveillance program that could help control and prevent growing NCDs. The 2003 meeting of the Ministers of Health in Tonga recommended the WHO STEPwise approach for NCD surveillance[4].

Surveillance is essential for guiding policy development; for effective allocation of health care resources; to improve capability of countries to respond to emerging disease trends; and to underpin the development of intervention programs and evaluating prevention programs.

The framework of STEPS is the distinction between the different levels of risk-factor assessment into: health risk behaviours; physical measurements; and blood samples. Key premises for implementing STEPS are to:

- establish a surveillance system that produces comparable, reliable, valid and timely risk factor prevalence estimates.
- utilize the modular approach leading to 'appropriate' STEPS according to country needs and resources, thereby focusing on essential information and ensuring enough statistical power to detect risk factor trends.
- contribute to comparable data.
  The local focus for implementing STEPS is to:
- build local capacity for surveillance
- understand 'surveillance' as information for public health policy
- strengthen baseline systems with plans for continuity
- link to existing systems where feasible.

The WHO global surveillance strategy contains provision of technical materials and tools to support the application of surveillance packages; effective communication strategies for providing data to policy and intervention program planners, decision-makers, potential funding sources, as well as to the general public; and the use of state-of-the-art technology to share information both between and within countries.

1.2 The National Context

1.2.1 Geography

American Samoa is a group of islands located in Oceania, in the South Pacific Ocean, about half way between Hawaii and New Zealand. Its total land area comprises 199 sq km. The climate is tropical marine, moderated by southeast trade winds with annual rainfall averages about 3 m. The rainy season is around November to April, and a dry season from May to October with little seasonal temperature variation. Its terrain comprises five volcanic islands with rugged peaks and limited coastal plains, and two coral atolls (Rose Island, Swains Island).

1.2.2 Population

In 2004, American Samoa had an estimated population of 62 600, with around 40% below 15 years of age. Almost 4% were above 65 years of age. The average age was estimated at 21.3 years. About one-half of the population resides in urban areas. American Samoans are US nationals and the 2000 census listed ethnic groups as 92.9% native Pacific islander, 2.9% Asian, 1.2% white, 2.8% mixed, and 0.2% other.

1.2.3 Economy

American Samoa is considered a small developing economy that depends on two main sources of income: the United States Government and tuna canning. Federal expenditures and the canning business together account for 93% of the economy. The remaining 7% results from a small tourism industry and service sector. Transfers from the United States Government add substantially to American Samoa's economy. The United States is the main trading partner. Gross domestic product (GDP) per capita (purchasing power parity) was estimated at US$8000 in 2000[5].

1.2.4 Government

The political entity of the Territory of American Samoa was defined in 1899 by a treaty between the United States of America, the United Kingdom of Great Britain and Northern Ireland, and Germany, which gave the United States of America control of American Samoa. American Samoa is a territory of the US, administered by the Office of Insular Affairs, US Department of the Interior. In 1978, the first popularly elected Samoan governor was inaugurated. There is a bicameral legislature (Fono), consisting of a senate (18 members chosen by county councils) and a house of representatives (20 members elected by popular vote, plus one non-voting member from Swains Island). There is also an independent judiciary.

1.2.5 Social Services and Health Status

As of the latest census in 2000, life expectancy at birth for men is 69 years, while for women it is 76 years. Based on 2004 estimates, there are 104 males for every 100 females. The crude birth rate was 26.70 per 1000 population in 2002, and the crude death rate was 3.9 per 1000 population in 2000. The infant mortality rate is estimated at 8.50 per 1000 live births, and the under-five mortality rate at 4.90 per 1000 live births. The total fertility rate for women aged 15-49 years is 4.50, and the maternal mortality ratio was 123 per 100 000 live births in 2002. In 2000, 33% of women in the reproductive age group were using modern contraceptive methods[6].

There has been considerable progress in primary health care in recent years. Water supplies and sanitation systems are well organized and maintained, and 99% of the population has access to safe water. Water is increasingly supplied from deep bores, with a smaller portion from reservoirs, and is chlorinated. Although 99% of the population have adequate excreta disposal facilities, solid waste disposal is still a problem. Waste collection systems have improved significantly, but adequate space for solid waste landfill operations is limited.

1.2.6 NCDs in American Samoa

The morbidity pattern has shifted significantly over the past three decades. Where infectious diseases were previously the major cause of morbidity, NCDs related to modernization and lifestyle changes now predominate. Enumerated data on the leading causes of morbidity are currently unavailable[7].

However, based on the observations of senior health officers, the following are assessed as the leading communicable diseases presently affecting the population: respiratory infectious diseases, filariasis, dengue, hepatitis, tuberculosis, leprosy and intestinal worm infestations. Among NCDs, obesity, diabetes and its complications (including hypertension, heart disease and stroke), chronic disabling conditions (including asthma, gout, osteoarthritis and osteoporosis), tobacco-related obstructive pulmonary disease, cancer and oral health are the leading causes of morbidity.

The most serious health issues are related to the increase in chronic diseases associated with lifestyle, with their roots in improper nutrition and physical inactivity. Significant increases in the prevalence of obesity, in both sexes and at increasingly younger ages, are associated with a number of these conditions. Hypertension, cardiovascular diseases, cerebrovascular diseases, Type 2 diabetes mellitus and its complications, arthritis, gout and some forms of cancer are among these important chronic diseases.

The ten leading causes of mortality also show a predominance of noncommunicable diseases7 (Table 1.1)

Table 1.1 Ten leading causes of mortality in American Samoa in 2001

Cause of mortality	Total number	Rate per 100 000 population
1. Heart disease	55	92
2. Neoplasms	36	60
3. Diabetes	20	33
4. Cerebrovascular disease	19	32
5. Accidents	15	25
6. Prenatal condition	10	17
7. Nephritis / nephrosis	9	15
8. Chronic obstructive pulm onary disease	8	13
9. Septicaemia	4	7
10. Pneumonia / influenza	4	7

1.2.7 National Health Plan and Priorities

Recognizing the burden of chronic diseases and the imperative for prevention, the territorial health priorities listed by the Department of Health are as follows:

1. Increase the capacity of the health system to meet the health challenges of the 21st century through:

    - improving health policy development mechanisms,
    - developing the health workforce,
    - improving management processes at all levels, and
    - strengthening long-range health planning and program planning.

2. Identify emerging and re-emerging diseases and implement effective interventions.

3. Implement effective interventions to decrease the burden of chronic diseases related to unhealthy lifestyles, especially cardiovascular disease, cancer and diabetes mellitus.

4. Actively implement the Healthy Islands concepts of health promotion, health protection and primary health care in priority settings, particularly through community health centres and school-linked programs.

5. Increase the effectiveness of public investment in health through development of decision-oriented information systems, applied research, effective deployment of the health workforce, application of appropriate technology, and increased allocation of funding for health promotion, health protection and primary health care.

2. Survey Methods and Operations

2.1 Survey rationale and objectives

The overall objective of the survey was to investigate the prevalence of key NCDs and their associated risk factors, which include smoking, alcohol consumption, physical inactivity, obesity, hypertension, raised blood glucose and lipids. As of mid 2006 STEPS surveys have been conducted in over 41 countries globally, ten of which are in the Pacific. Data collected from this survey will contribute to the Global Database on NCD risk factors[8].

This survey will help the government in improving the health of the people of American Samoa by:

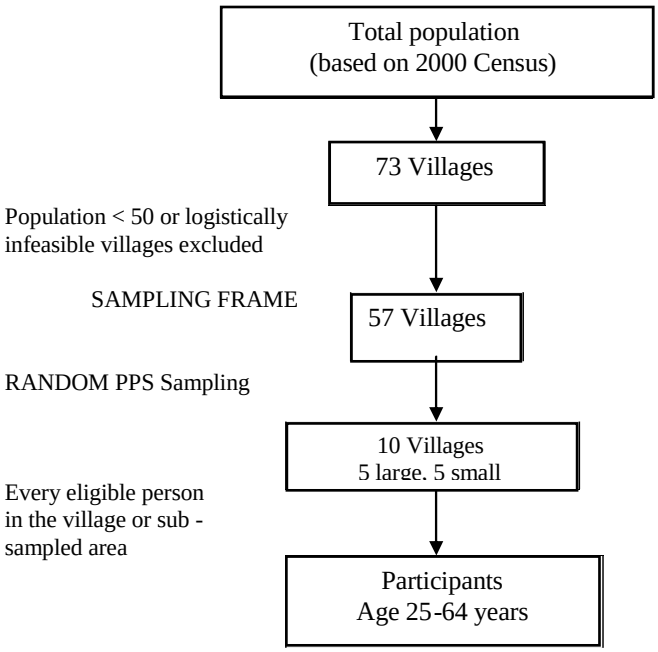
1. Keeping track of the magnitude and trends of NCD risk factors.
2. Assisting planning and evaluation of health promotion and preventative campaigns.
3. Predicting likely future demands for health services.

2.2 Survey Sampling Methodology

The American Samoa STEPS survey is a population-based nation-wide survey of adults aged 25 - 64. The survey employed a stratified cluster sampling design (stratified by cluster size i.e. large villages and small villages) to obtain a nationally representative sample of adults aged 25 - 64. Large villages were defined as those villages with a population greater than or equal to 350 in the target population (i.e. adults aged 25 - 64). Small villages were defined as those villages with a population of less than 350 in the target population. Villages with a target population of less than 50 were excluded from the survey. Tafuna, a village with a population of over 3000 was also excluded due to logistical reasons. Hence, the sampling frame consisted of 57 villages, covering 83.6 % (19,628 out of 23,479) of the total American Samoa adult population aged 25 to 64 years.

Five villages were randomly selected from the two stratums (i.e. Large villages and Small villages) using probability proportional to size (PPS) to village size. For selected villages in the Small Village stratum, everyone in each selected village between the ages of 25-64 was invited to participate in the survey. For selected villages with a population size of greater than or equal to 350, households were selected using simple random sampling until a target of 254 in the 25 - 64 year age group was reached.

Figure 2.1 Survey sampling methodology



2.2.1 Sample size

American Samoa adopted the STEPS guidelines, which require a minimum sample size of 2000 participants, with at least 250 participants in each of the 8 age-sex categories (25-34, 35-44, 45-54, 55-64 years for males and females).

After sample selection, the total targeted sample size was 2,188. This was designed so that if 80% participation in the 5 smaller villages and 100% of the sub-samples of the larger villages were achieved, this would provide a sample of 2000.

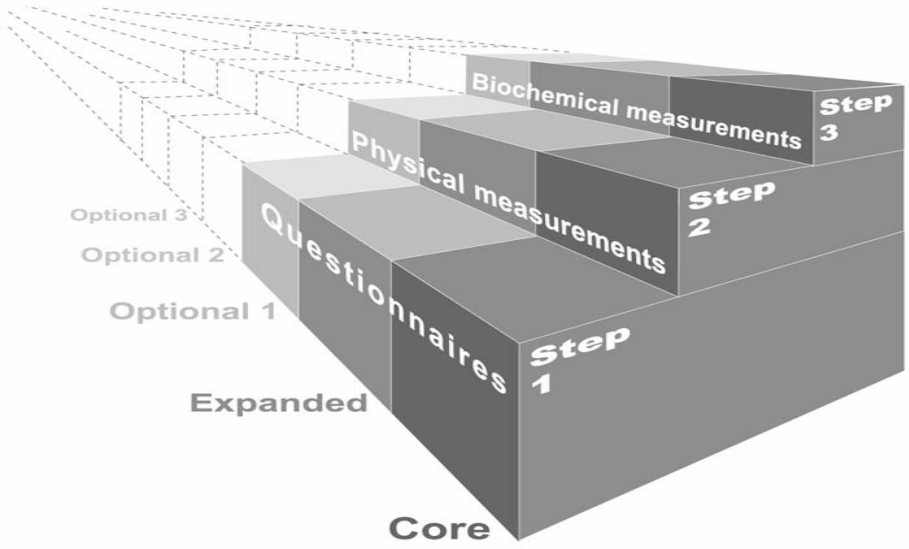
Table 2.1 List of Villages Selected

Villages	Target sample size (age 25-64)	Actual sample size (after data cleaning)
Large Villages		
Leone	254	305
Malaeimi	254	377
Pagopago	254	393
Malaeloa	254	269
Pavaiai	254	198
Small Villages		
Utulei	323	172
Olosega	76	54
Faganeanea	73	43
Fagasa	340	187
Asili	106	74
Total	**2188**	**2072**

2.2.2 Survey Structure

The STEPS approach moves along a sequential three-step process (Figure 2.2).
Figure 2.2 The WHO STEPwise approach to surveillance of NCDs.

Figure 2.2 The WHO STEPwise approach to surveillance of NCDs.



STEP 1: A simple questionnaire-based survey on selected major health risk behaviours (smoking, alcohol consumption, physical inactivity) plus additional issues deemed to be of importance in the individual country.

STEP 2: A basic field survey including additional basic physiological measures of health risks (blood pressure, height, weight, and waist).

STEP 3: A comprehensive field survey adding analysis of blood samples (total cholesterol, and fasting glucose).

2.3 Survey Administration

The survey was conducted from June 21, 2004 through August 14, 2004 after staff training was held by Dr. Jan Pryor, Fiji School of Medicine on June 14 - 17, 2004 and a pilot survey at the village of Aua on June 18, 2004.

The survey received an approval from the American Samoa IRB on June 15, 2004 after receiving an expedited review as specified in CFR 46.110. American Samoa used the same questionnaire used by Western Samoa with few changes that were translated in-house.

All equipment used for measurement of weight, height, waist, and blood pressure were the same recommended by WHO, and purchased through the WHO, Apia Office. Measurement of blood glucose and blood cholesterol was performed using an Accutrend GCT (Bayer Corp). Details on all equipment used can be found in the Appendix.

The results from the survey were reported to participants following completion of physical measurements and blood tests.

Processing of questionnaires:

At the end of each day of data collection, questionnaires were checked for completeness and accuracy. The questionnaires were then packed in a labeled envelope and given to data entry personnel. Team leaders tracked the number of completed questionnaires on a master log sheet.

Double data entry using a data entry protocol was done on computers that had EpiInfo™ and Epidata™ software[9] for double data entry installed. The database was saved daily in a different drive as backup so that data would not be lost. After each round of data entry, the data entry personnel indicated this accordingly on the front sheet of each questionnaire along with any indication of irregularities.

2.4 Data analysis

To take into account the complex design of the American Samoa STEPS Survey, a weighting factor was applied to each participant record to adjust for varying probabilities of selection and non-representativeness in the stratum 10-year age sex groups.

Data cleaning and data analyses were conducted by WHO Office in Geneva with assistance from the WHO Offices in Suva and Apia. Data analyses were conducted using EpiInfo™ for Windows[9]. Weighted percentages, means and 95% confidence intervals for these percentages and means were computed using statistics appropriate to the study's cluster sampling design.

3. Results

3.1 Description of the sample

The targeted sample size was 2188 from 10 villages. Data were obtained from 2072 individuals. There were 2072 individuals in the dataset. Details of the sample characteristics are outlined in Table 3.1 below.

Table 3.1 Demographic Description of Study Sample [10] and Sampling Frame

Demographic Characteristic	Study Sample				Sampling Frame	
	Number	Unweighted Proportion	Weighted Proportion	95% CI	Number	Proportion
Gender						
Males	966	46.6	50.6	±4.1	9,929	50.6
Females	1106	53.4	49.4	±4.1	9,705	49.4
Total	2072				19,634	
Age group						
25-34 years	621	30.0	36.7	±3.2	7,207	36.7
35-44 years	647	31.2	31.5	±3.9	6,188	31.5
45-54 years	500	24.1	20.2	±3.1	3,960	20.2
55-64 years	304	14.7	11.6	±1.9	2,279	11.6
Total	2072				19,634	

3.1.1 Survey sample characteristics

Table 3.1 describes the age and gender breakdown of the surveyed population and its relation to the overall sampling frame. Males were slightly over-sampled in the 45-54 and 55-64 year age groups and under sampled in the 25-34 and 35-44 year age groups. Females were slightly over-sampled in the 35-44, 45-54 and 55-64 year age groups and under sampled in the 25-34 year age group.

3.1.2 Level of Education

The survey indicated that American Samoa has a well-educated population with the mean number of years spent in school as 12.1 (Table 3.1.2 Appendix 1). There was no statistically significant difference in the mean number of years spent in school between males and females. As expected, the mean number of years spent in school was slightly reduced in the older age groups.

3.2 Behavioural measures

3.2.1 Tobacco Use

Tobacco use was assessed according to participant responses in the questionnaire. The following smoking status definitions were used:

Current smokers - those who have smoked any tobacco products (such as cigarettes, cigars or rolled tobacco) in the past 12 months. These are further subdivided into:

Daily smokers - those who smoked any tobacco product every day.

Non-daily smokers - those who have smoked any tobacco product in the past 12 months but not every day.

Table 3.2.1.1 Current smoking status of the study population

Men (N=948)

Age	Daily			Non-Daily			Daily and Non-Daily			Non-Smokers		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	110	42.1	4.1	31	10.1	5.9	141	52.2	6.6	129	47.8	6.6
35-44	95	34.5	9.0	31	13.1	6.7	126	47.6	11.9	149	52.4	11.9
45-54	99	40.9	4.7	23	10.7	3.8	122	51.5	4.5	124	48.5	4.5
55-64	44	30.3	6.7	14	8.0	4.6	58	38.3	8.5	99	61.7	8.5
25-64	348	38.1	4.6	99	10.9	3.8	447	49.0	6.7	501	51.0	6.7

Women (N=1096)

Age	Daily			Non-Daily			Daily and Non-Daily			Non-Smokers		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	74	24.5	4.3	29	8.4	2.9	103	32.9	5.5	227	67.1	5.5
35-44	66	19.4	3.1	29	8.5	4.5	95	27.9	7.4	276	72.1	7.4
45-54	58	23.7	5.4	21	7.6	3.1	79	31.2	7.9	174	68.8	7.9
55-64	19	14.2	4.7	9	6.9	10.1	28	21.2	13.2	114	78.8	13.2
25-64	217	21.6	3.3	88	8.1	3.1	305	29.7	6.1	791	70.3	6.1

Total Population (N=2044)

Age	Daily			Non-Daily			Daily and Non-Daily			Non-Smokers		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	184	33.3	3.3	60	9.3	3.9	244	42.6	4.9	356	57.4	4.9
35-44	161	26.6	4.7	60	10.7	5.1	221	37.3	8.2	425	62.7	8.2
45-54	157	32.5	3.1	44	9.2	3.0	201	41.7	4.4	298	58.3	4.4
55-64	63	22.9	4.9	23	7.5	6.7	86	30.4	10.1	213	69.6	10.1
25-64	565	29.9	3.3	187	9.5	3.2	752	39.4	5.8	1292	60.6	5.8

Table 3.2.1.3 Mean age started smoking among current daily smokers

Age	Men (N=348)			Women (N=217)			Total Population (N=565)		
	N	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	105	19.3	0.7	72	18.8	1.0	177	19.1	0.3
35-44	94	20.6	1.2	65	22.5	2.0	159	21.3	0.9
45-54	98	21.1	1.5	57	24.1	2.5	155	22.2	0.8
55-64	43	20.1	2.5	19	22.0	4.7	62	20.6	2.7
25-64	340	20.1	0.8	213	21.3	1.4	553	20.6	0.5

Table 3.2.1.4 Mean number of years of smoking among current daily smokers

Age	Men (N=348)			Women (N=217)			Total Population (N=565)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	105	10.6	0.8	72	10.6	1.4	177	10.6	0.7
35-44	94	19.4	1.0	65	17.0	2.4	159	18.5	1.0
45-54	98	27.9	1.3	57	24.0	2.5	155	26.6	1.2
55-64	43	39.0	3.6	19	36.2	5.2	62	38.2	3.7
25-64	340	19.9	1.1	213	17.4	2.0	553	19.0	1.1

Table 3.2.1.5 Mean number of manufactured cigarettes smoked per day by current smokers of manufactured cigarettes

Age	Men (N=348)			Women (N=217)			Total Population (N=565)		
	N	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	109	12.3	2.4	71	12.6	2.1	180	12.4	1.7
35-44	90	16.0	1.6	62	12.2	2.2	152	14.5	0.9
45-54	97	16.0	1.7	57	13.2	4.8	154	15.0	2.3
55-64	39	12.8	3.1	19	9.5	3.0	58	11.7	1.8
25-64	335	14.2	1.6	209	12.4	1.3	544	13.5	1.2

Result description

The survey indicated that 39.4% of the study population were current smokers with 29.9% of all respondents smoking daily. 60.6% do not smoke (Table 3.2.1.1).

A gender difference was observed with 49.0% and 29.7% of males and females respectively, being current smokers (Table 3.2.1.1). There was also a higher proportion of male daily smokers 38.1% (±4.6) than female daily smokers 21.6% (±3.3). There was no significant difference across age groups or gender, with 77.8% (±5.8) of male and 72.7% (±5.6) of female smokers being daily smokers (Table 3.2.1.2, Appendix 1).

For all current daily smokers, the mean age of starting smoking was 20.6 (± 0.5) years (Table 3.2.1.3). Male current daily smokers began smoking at a mean age of 20.1 (± 0.8) years, while female current daily smokers began smoking at a mean age of 21.3 (± 1.4) years. There was no significant difference in the mean age of starting smoking for current male smokers across age groups. Current female smokers in the youngest age group started smoking at a significantly lower mean age than current female smokers in the older age groups of 35-44 or 45-54 years (Table 3.2.1.3).

The mean number of years of smoking for the total study population was 19.0 (± 1.1) years (Table 3.2.1.4). Male current daily smokers had been smoking for a mean of 19.9 (± 1.1) years, while female current daily smokers had been smoking for a mean of 17.4 (± 2.0) years.

All current male smokers smoked manufactured cigarettes (Table 3.2.1.5). A small proportion of male smokers in the age group of 55-64 smoked manufactured cigarettes with a mean number of 12.8 cigarettes. All of the surveyed current daily female smokers smoked manufactured cigarettes only.

For daily smokers of manufactured cigarettes the mean number of cigarettes smoked per day was 13.5 (± 1.2) (Table 3.2.1.5); Male smokers used 14.2/day (± 1.6), Female smokers used 12.4/day (± 1.3). There was no significant difference in the number of cigarettes smoked per day between the genders across the 10-year age groups.

Table 3.2.1.6 Smoking prevalence in American Samoa

Publication	Survey year	Gender	Age groups (years)	Current Smoking Prevalence
Dwyer et.al. (1999)[11]	1985 (Household survey of smoking)	Males	≥ 20	41%
		Females	≥ 20	16.2%
	1994 (Tobacco or Health in the Western Pacific Region, 1997)	Males	≥ 15	41%
		Females	≥ 15	16%
McGarvey (2001)[12]	1994	Males	29-43	43%
		Males	44-60	51%
		Females	29-43	36%
		Females	44-60	19%
Mishra et.al. (2005)[13]		Males & Females		28%

Comparison with previous data

Table 3.2.1.6 lists previous surveys of current smoking prevalence for American Samoa. In general prevalence of smoking amongst females has been lower than that amongst males. Comparisons with the results of the present survey are limited since most of the other surveys do not specify if the current or current daily smoking prevalence was measured.

In the present survey 39.4% of the survey population were current smokers. The prevalence of daily smoking for males ≥25 years was 38.1% and the prevalence of daily smoking for females ≥25 years was 21.6%. This indicates that smoking prevalence for males has remained relatively stable over almost two decades. For females the prevalence of smoking has probably undergone a slight increase over the same period.

3.2.2 Alcohol Consumption

Prevalence of alcohol consumption was assessed by asking study participants questions on alcohol consumption. The consumption behaviour of binge drinking was specifically assessed due to its cardiovascular and associated risks.

The definitions used were as follows:
Ever drinkers - those who have ever consumed a drink that contains alcohol

Current drinkers - those who have consumed a drink containing alcohol in the past 12 months

Binge drinkers - for males: those who have consumed 5 or more drinks per day on at least one day in the past week. For females: those who have consumed 4 or more drinks per day on at least one day in the past week.

Result tables

Table 3.2.2.1 Alcohol drinking status during the past 12 months

Age	Abstainers			Current Consumers		
	Men (N=577)					
	N	%	CI	n	%	CI
25-34	39	19.9	5.9	133	80.1	5.9
35-44	46	27.9	11.0	124	72.1	11.0
45-54	53	34.9	15.7	91	65.1	15.7
55-64	36	36.1	9.1	55	63.9	9.1
25-64	174	**27.3**	5.6	403	72.7	5.6
Age	**Women (N=266)**					
	n	%	CI	n	%	CI
25-34	43	52.1	11.8	43	47.9	11.8
35-44	47	56.9	13.8	39	43.1	13.8
45-54	45	62.5	13.9	25	37.5	13.9
55-64	21	89.1	10.3	3	10.9	10.3
25-64	156	58.8	10.3	110	41.3	10.3
Age	**Total Population (N=843)**					
	n	%	CI	n	%	CI
25-34	82	29.2	4.1	176	70.8	4.1
35-44	93	36.8	11.2	163	63.2	11.2
45-54	98	43.6	15.8	116	56.4	15.8
55-64	57	47.0	7.4	58	53.0	7.4
25-64	330	36.5	7.1	513	63.5	7.1

Table 3.2.2.3 Percentage of current drinkers of alcohol who reported binge drinking*

Heavy Drinking – Men (N=402)

Age	More than 5 Drinks			More than 4 days		
	n	%	CI (±)	N	%	CI (±)
25-34	66	52.8	13.4	1	1.2	2.3
35-44	71	58.5	6.4	5	5.8	7.5
45-54	36	39.9	17.1	2	2.1	2.5
55-64	17	28.7	15.7	4	7.6	4.3
25-64	190	49.6	6.5	12	3.4	2.3

Heavy Drinking – Women (N=110)

Age	More than 4 Drinks			More than 4 days		
	n	%	CI (±)	N	%	CI (±)
25-34	22	50.8	22.1	0	----	0
35-44	10	29.4	19.5	0	----	0
45-54	3	9.7	14.1	1	5.9	9.9
55-64	0	----	0	0	----	0
25-64	35	33.9	11.5	1	1.3	2.5

* 5 or more standard drinks per drinking day for males and 4 or more standard drinks per drinking day for females

Result description

In the previous 12 months 63.5% (±7.1) of the study population had consumed alcohol (Table 3.2.2.1). There was a significant gender difference with 72.7% (±5.6) of males and 41.3% (±10.3) of females having consumed alcohol in the previous 12 months. All age groups had statistically significant differences between males and females, with a smaller proportion of those in the oldest age group having consumed alcohol in the previous 12 months as compared to the youngest age group.

63.5% (±7.1) of those who had ever consumed alcohol, the "ever drinkers", were also "current drinkers" having consumed alcohol in the past 12 months. This proportion of "current drinkers" among the "ever drinkers" was higher in males (72.7% ± 5.6) than in females (41.3% ± 10.3) (Table 3.2.2.2, Appendix 1).

Table 3.2.2.3 shows the percentage of current consumers of alcohol who participated in binge drinking on at least one day in the previous week. For females binge drinking was defined as having 4 or more standard drinks on at least one day in the previous week. For males binge drinking was defined as having 5 or more standard drinks on at least one day in the previous week. 49.6% (±6.5) of males were binge drinkers as were 33.9% (±11.5) of females. There was no significant gender difference for binge drinking, except in the 35-44 age group. Binge drinking was most common amongst the age groups of 25-34 and 35-44. In general there was a trend for participation in binge drinking to decline with increasing age, and this was observed for both males and females.

Comparison with previous data

There are no previous survey data available on the prevalence of alcohol consumption in American Samoa. However the WHO Global Status Report on Alcohol (2004)[14] states that the Western Pacific Region is on of the two WHO regions showing "recent and continuing increases in alcohol consumption".

3.2.3 Diet

To assess the eating pattern of the surveyed population relative to cardiovascular disease risk, the study participants were asked how often they ate fruit and vegetables and the number of servings of each that they ate each day. Study participants were shown a card with illustrations of fruit and vegetables to assist them in answering these questions.

For the purposes of the survey, fruit included paw-paw, orange, guava, pineapple, passion fruit, apple, jackfruit, mango, banana, lemon, lime, pear, etc. Coconut and coconut juices were not included.

A single serving of fruit was defined as follows:
- ½ cup of chopped, cooked or canned fruit
- 1 medium whole fruit (e.g. orange, apple, banana, pear)
- ¾ cup (180ml) of 100% fruit juice

Vegetables included the following:
- Dark green leaves: green leafy vegetables (e.g. lettuce, pinapi), rukau, rukau viti, pumpkin leaves, kumara leaves, spinach, etc.
- Yellow/red/orange vegetables: corn, carrot, tomatoes, pumpkin
- Other vegetables: cabbage, green beans, cucumber, beets, eggplant, broccoli, cauliflower, onion, capsicum, chilli

Starchy foods such as taro, cassava, breadfruit, potato, rice, flour products, etc. were NOT included as vegetables.

A single serving of vegetable was defined as follows:
- 1 cup of raw leafy vegetables
- ½ cup of cooked or chopped raw vegetables

Result tables

Table 3.2.3.1 Mean number of days fruit and vegetables consumed per week

Mean Number of Days that Fruits are Consumed in a Week

Age	Men (N=944)			Women (N=1093)			Total Population (N=2037)		
	N	Mean	CI (±)	N	Mean	CI (±)	n	Mean	CI (±)
25-34	269	2.1	0.2	327	2.4	0.2	596	2.2	0.1
35-44	275	2.1	0.2	370	2.6	0.2	645	2.3	0.2
45-54	245	2.0	0.2	252	2.9	0.2	497	2.4	0.2
55-64	155	2.6	0.3	144	3.0	0.7	299	2.8	0.3
25-64	944	2.1	0.2	1093	2.6	0.1	2037	2.4	0.1

Mean Number of Days that Vegetables are Consumed in a Week

Age	Men (N=947)			Women (N=1091)			Total Population (N=2038)		
	N	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	270	3.7	0.3	328	4.0	0.3	598	3.8	0.3
35-44	273	3.7	0.3	368	4.2	0.4	641	3.9	0.3
45-54	246	3.7	0.4	251	4.7	0.4	497	4.2	0.4
55-64	158	4.1	0.7	144	4.0	0.6	302	4.0	0.6
25-64	947	3.7	0.3	1091	4.2	0.4	2038	4.0	0.3

Table 3.2.3.2 Mean number of servings of fruit and vegetables consumed on a day that fruits and vegetables are eaten

Men

Age	Fruits			Vegetables			Fruits and Vegetables		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	269	1.5	0.1	270	2.2	0.1	271	3.7	0.2
35-44	275	1.6	0.3	273	2.3	0.3	275	3.9	0.6
45-54	245	1.3	0.3	246	2.6	0.4	246	3.9	0.6
55-64	155	1.5	0.4	158	2.3	0.4	158	3.8	0.7
25-64	944	1.5	0.1	947	2.4	0.2	950	3.8	0.3

Women

Age	Fruits			Vegetables			Fruits and Vegetables		
	N	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	326	1.7	0.1	328	2.3	0.2	329	4.0	0.3
35-44	370	1.7	0.2	368	2.5	0.2	370	4.2	0.4
45-54	252	1.7	0.2	251	2.5	0.2	253	4.2	0.3
55-64	144	1.6	0.4	144	2.3	0.4	145	3.9	0.8
25-64	1092	1.7	0.1	1091	2.4	0.2	1097	4.1	0.3

Total Population

Age	Fruits			Vegetables			Fruits and Vegetables		
	N	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	595	1.6	0.1	598	2.3	0.1	600	3.9	0.2
35-44	645	1.7	0.2	641	2.4	0.2	645	4.0	0.3
45-54	497	1.5	0.2	497	2.5	0.2	499	4.0	0.4
55-64	299	1.6	0.3	302	2.3	0.3	303	3.9	0.6
25-64	2036	1.6	0.1	2038	2.4	0.1	2047	4.0	0.2

Table 3.2.3.3 Percentage who consume less than 5 of combined servings of fruit and vegetables per day

Age	Men (N=707)			Women (N=917)			Total Population (N=1624)		
	N	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	171	87.9	2.1	221	85.4	7.3	392	86.6	3.8
35-44	185	88.1	2.8	283	88.8	3.1	468	88.5	2.2
45-54	152	86.7	6.1	183	81.0	10.3	335	83.7	5.3
55-64	116	89.4	5.9	104	85.3	9.4	220	87.5	4.7
25-64	624	87.9	2.1	791	85.6	5.5	1415	86.7	2.6

Result description

The survey indicated that fruit and vegetable consumption by the majority of the study population in American Samoa was lower than the WHO recommended intake of 400g per day (equivalent of 5x 80g servings per day)[15].

In regards to fruit consumption, Table 3.2.3.1 shows that study participants reported only an average of 2.4 days per week (± 0.1) on which fruit was consumed with a smaller mean number of days for males (2.1 days ± 0.2) as compared to females (2.6 days ± 0.1). Furthermore, as noted in Table 3.2.3.2, the mean number of servings of fruit consumed on one of those days that fruit was consumed was only 1.6 servings (±0.1). The number of servings of fruit eaten showed no significant gender difference, with males consuming a mean of 1.5 servings of fruit (±0.1) and females consuming a mean of 1.7 servings of fruit (±0.1) on one of the days during which they ate fruit. There was no significant difference by age group in either the number of days of fruit consumption, or in the number of servings of fruit eaten.

In regards to vegetable consumption, Table 3.2.3.1 shows that vegetables were consumed on an average of 4.0 days per week (± 0.3) with no significant difference in the number of days per week that males (3.7 days ± 0.3) and females (4.2 days ± 0.4) reported consuming vegetables. As with fruit consumption, there was again no significant difference in the reported number of days of vegetable consumption across age groups. Furthermore, as noted in Table 3.2.3.2, the mean number of servings of vegetables consumed on one of those days that vegetables were consumed was only 2.4 servings (±0.1) with no significant difference by either gender or age group.

Overall, in this survey population, the level of consumption of vegetables was higher than that for fruit.

In summary, Table 3.2.3.3 shows that 86.7% (± 2.6) of the total study population consumed less than five combined servings of fruit and vegetables per day with no significant differences by either gender or age group.

Comparison with previous data

There are no previous data available on specific levels of fruit and vegetable consumption in American Samoa. However, the traditional diet of Samoans (both American and Western Samoans) based mostly on taro, yams, coconut, bananas and breadfruit has moved to one in which imported and purchased foods including white rice, flour and sugar are more prominent[16 17]. A similar situation, where traditional foods and local diets have been progressively replaced with Spanish, Japanese and American influenced and imported foods, has occurred in Micronesia and is comprehensively reviewed in Cassels 2006[18].

3.2.4 Physical Activity

Physical activity participation was measured by asking survey participants to report on the amount of time they spend doing different types of physical activity in their employment, transport and leisure time. Study participants were shown a card with illustrations of various types of physical activity to assist them in answering these questions.

For the purposes of the survey, moderate activity was defined as more than 10 minutes at a time of any of the following:

- painting
- gardening
- cleaning
- plastering
- swimming
- climbing stairs
- cycling
- farming

Vigorous physical activity was defined as more than 10 minutes at a time of any of the following:

- heavy construction
- carrying heavy loads
- digging

- running
- strenuous sport
- sawing wood
- shovelling

For the purposes of this report physical activity was converted to METminutes. The term MET is an abbreviation for metabolic equivalent and is used to reflect the intensity of the specific physical activity. A MET is defined as the ratio of the associated metabolic rate for a specific activity divided by the resting metabolic rate. The resting metabolic rate is approximately 1 MET and reflects the energy cost of sitting quietly. The MET values for the three PA domains are as follows:

- Moderate PA (work and leisure domain) = 4.0 METS
- Vigorous PA (work and leisure domain) = 8.0 METS
- Transport related walking/cycling = 3.0 METS

In terms of METminutes the following levels of activity were defined:

- Inactive - <600 METminutes per week
- Moderately active - 600-1500 METminutes per week
- Vigorously active - >1500 METminutes per week

Table 3.2.4.1 Total physical activity by age group (METminutes/day)

Age	Men (N=904)			Women (N=1155)			Total Population (N=1926)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	251	84.2	33.0	299	41.9	18.8	550	63.3	19.5
35-44	255	86.8	32.0	338	56.6	12.4	593	71.2	21.3
45-54	227	94.8	44.1	233	60.3	47.0	460	78.1	42.4
55-64	144	65.8	28.7	134	52.6	17.5	278	59.7	19.8
25-64	877	85.1	22.6	1004	51.7	15.1	1881	68.5	18.5

Table 3.2.4.2 Levels of physical activity during work, transport and recreation time by gender and age group (METminutes/day)

Physical Activity – Work

Age	Men (N=904)			Women (N=1022)			Total Population (N=1926)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	258	44.4	28.9	305	14.3	9.3	563	29.6	17.0
35-44	257	47.4	25.3	342	22.2	6.3	599	34.4	15.0
45-54	232	51.2	31.3	236	19.6	24.5	468	35.9	24.6
55-64	147	28.3	25.7	134	16.9	14.2	281	23.1	20.4
25-64	894	44.8	20.6	1017	18.3	9.2	1911	31.7	14.1

Physical Activity – Travel

Age	Men (N=904)			Women (N=1022)			Total Population (N=1926)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	256	28.3	5.0	302	21.9	7.0	558	25.2	5.2
35-44	257	31.1	15.1	339	27.4	7.5	596	29.2	9.9
45-54	231	31.8	8.6	235	31.8	15.5	466	31.8	8.8
55-64	145	27.1	5.9	135	32.6	18.3	280	29.7	9.4
25-64	889	29.7	6.9	1011	26.9	4.6	1900	28.4	5.4

Physical Activity – Recreation

Age	Men (N=904)			Women (N=1022)			Total Population (N=1926)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	259	11.5	8.0	305	5.9	4.9	564	8.8	5.0
35-44	259	10.5	6.4	341	7.0	3.0	600	8.7	2.8
45-54	236	10.6	12.7	238	8.4	9.2	474	9.5	10.8
55-64	148	9.4	6.0	135	3.9	4.6	283	6.9	4.1
25-64	902	10.8	3.8	1019	6.6	2.6	1921	8.7	2.8

Table 3.2.4.5 Percentage with low , moderate and high levels of physical activity by gender and age group

Physical Activity Levels – Men (N=904)

Age	Low			Moderate			High		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	137	55.2	8.1	106	38.9	5.9	18	5.9	3.8
35-44	151	62.8	10.7	97	33.4	8.7	11	3.8	3.2
45-54	136	58.3	8.4	93	38.3	7.8	7	3.4	2.1
55-64	87	58.9	9.0	59	39.8	8.4	2	1.3	1.8
25-64	511	58.6	6.8	355	37.3	5.8	38	4.2	1.8

Physical Activity Levels – Women (N=1022)

Age	Low			Moderate			High		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	213	69.6	6.2	93	29.8	5.6	1	0.6	1.1
35-44	206	62.7	9.0	133	36.5	8.6	3	0.8	1.2
45-54	149	64.6	15.4	88	35.2	15.4	1	0.2	0.5
55-64	93	66.0	10.1	41	33.0	10.2	1	1.0	2.4
25-64	661	66.0	5.8	355	33.4	5.8	6	0.6	0.4

Physical Activity Levels Total Population (N=1926)

Age	Low			Moderate			High		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	350	62.3	5.3	199	34.5	4.6	19	3.3	1.7
35-44	357	62.8	9.0	230	35.0	8.1	14	2.3	1.3
45-54	285	61.4	11.0	181	36.8	10.8	8	1.8	1.0
55-64	180	62.1	8.4	100	36.7	8.4	3	1.2	1.5
25-64	1172	62.2	6.2	710	35.4	5.7	44	2.4	0.9

Result description

For study participants who reported engaging in physical activity during their work, transport or leisure time, Table 3.2.4.1 shows total activity in METminutes per day. Overall, study participants reported a mean time spent in daily physical activity of 68.5 METminutes. There was no significant gender difference with males engaged in physical activity for a mean of 85.1 (±22.6) METminutes per day and females for a mean of 51.7 (±15.1) METminutes per day. There was no significant difference in activity levels across age groups for males or females.

It should be noted that while the mean time spent in daily physical activity was 68.5 METminutes, that the median time spent in daily physical activity was much lower at 12.9 METminutes. This indicates that a large majority of study participants reported very low levels of daily physical activity.

Table 3.2.4.2 shows the total physical activity (METminutes/day) by activity domains for study participants who reported engaging in physical activity. The results suggest that males undertake the majority of their physical activity during work time (44.8 ± 20.6 METminutes per day), and that females undertake the main physical activity during transport time (26.9 ± 4.6 METminutes per day). However, the confidence intervals for work time and transport time overlap for both genders. Table 3.2.4.2 also shows the total amount of physical activity undertaken in the work domain across age groups. The results show that there was no significant difference in the level of work-related physical activity across age groups for males or females. The activity domain accounting for the least amount of physical activity was the recreation domain. The amount of physical activity undertaken during leisure time was less than that during work time for both males and females (Table 3.2.4.2).

Table 3.2.4.3, Appendix 1 shows for females there was significant difference between moderate work-related physical activity (14.4 ± 5.3 METminutes per day) and vigorous work-related physical activity (3.8 ± 4.6 METminutes per day), there was no such significant difference in males. Females also undertook less work-related vigorous physical activity (3.8 ± 4.6 METminutes per day) as compared to males (22.5 ± 11.3 METminutes per day).

Table 3.2.4.4, Appendix 1 indicates for females there was also significant difference between moderate recreation-related physical activity (4.9 ± 1.8 METminutes per day) and vigorous recreation-related physical activity (1.7 ± 1.4 METminutes per day), there was again no such significant difference in males. As in the recreation-related domain, females also undertook less recreation-related vigorous physical activity (1.7 ± 1.4) as compared to males (7.0 ± 2.5).

Table 3.2.4.5 indicates that 62.2% (±6.2) of the study population reported a low level of physical activity in their combined work, transport, and leisure time. There was no significant gender difference with 58.6% (±6.8) of males and 66.0% (±5.8) of females having a low level of physical activity. There was also no significant difference in the proportions of low physical activity across age groups.

Overall, only 2.4% (±0.9) of the study participants reported a high level of physical activity defined as 3000 or more METminutes per week. A larger proportion of males reported a high level of physical activity (4.2% ± 1.8) as compared to females (0.6% ± 0.4).

Comparison with previous data

There are no previously reported data on levels of physical activity in American Samoans. However it is repeatedly asserted that declining levels of physical activity across the Pacific region result from increasing economic and lifestyle modernization. Studies carried out in Western Samoa found that lower male BMI (but not females) was associated with increased physical activity[19]. More recently Keighley et.al. (2006)[20] described an association between participation in farm work and significantly lower BMI in older American Samoan females and American Samoan males of all ages.

3.3 Physical measures

3.3.1 Obesity

Height and weight

Height and weight was measured for each participant as described in the Survey Operational Manual[21].

Waist circumference

The waist circumference was measured for each participant (excluding pregnant females).

Results for height, weight and waist circumference are presented in the text using SI (metric) units. In the Appendix results tables SI (metric) units are presented.

Body Mass Index (BMI) and risk factor categories

Body mass index* (BMI) was calculated for each participant as the weight in kilograms over the height in metres^2. Risk categories for BMI were defined as follows:

Underweight	BMI <18.5
Normal	BMI 18.5 to 25.0
Overweight	BMI ≥25.0 and < 30.0
Obese	BMI ≥30.0

*BMI can also be calculated by the following formula with U.S. customary units:
BMI = 703 x [weight (pounds) / height (inches) x height (inches)]

Result tables

Table 3.3.1.1 Mean body mass index by gender and age groups (kg/m^2)

Age	Men		
	n	Mean	CI (±)
25-34	271	33.2	1.3
35-44	273	34.2	0.7
45-54	246	34.1	0.7
55-64	155	32.9	1.3
25-64	945	33.7	0.5
Age	Women		
	n	Mean	CI (±)
25-34	297	36.1	0.8
35-44	357	36.7	1.1
45-54	252	35.7	1.6
55-64	144	36.0	1.4
25-64	1050	36.2	0.3
Age	Total Population		
	n	Mean	CI (±)
25-34	568	34.6	0.7
35-44	630	35.5	0.6
45-54	498	34.9	1.0
55-64	299	34.3	0.4
25-64	1995	34.9	0.2

Table 3.3.1.3 Percentage of BMI risk categories by gender and age groups

Men (N=945)

Age	Underweight			Normal			Overweight			Obese			Overweight and Obese		
	n	%	CI (±)	N	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	----	----	----	27	8.2	3.4	78	28.8	6.0	166	63.0	6.4	244	91.8	3.4
35-44	----	----	----	18	6.9	2.6	51	19.0	5.0	204	74.0	4.6	255	93.1	2.6
45-54	----	----	----	12	5.4	2.7	45	18.4	4.3	189	76.1	5.6	234	94.6	2.7
55-64	----	----	----	13	8.7	4.5	37	27.5	7.8	105	63.8	8.6	142	91.3	4.5
25-64	----	----	----	70	7.3	1.2	211	23.5	2.1	664	69.3	2.0	875	92.7	1.2

Women (N=1050)

Age	Underweight			Normal			Overweight			Obese			Overweight and Obese		
	n	%	CI (±)	N	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	1	0.1	0.4	17	6.5	3.4	43	16.3	4.8	236	77.0	6.6	279	93.3	3.3
35-44	1	0.2	0.6	16	4.3	3.2	40	11.0	3.4	300	84.5	2.9	340	95.5	2.9
45-54	0	----	0	13	6.1	3.6	35	14.6	5.2	204	79.4	8.1	239	93.9	3.6
55-64	0	----	0	6	4.8	2.2	22	15.9	5.8	116	79.3	6.0	138	95.2	2.2
25-64	2	0.1	0.2	52	5.5	1.7	140	14.2	2.0	856	80.2	3.3	996	94.4	1.6

Total Population (N=1995)

Age	Underweight			Normal			Overweight			Obese			Overweight and Obese		
	n	%	CI (±)	N	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	1	0.1	0.2	44	7.4	1.1	121	22.9	3.7	402	69.7	4.1	523	92.5	1.1
35-44	1	0.1	0.3	34	5.6	1.9	91	14.9	2.7	504	79.4	2.2	595	94.3	1.8
45-54	0	----	0	25	5.7	2.5	80	16.6	4.3	393	77.7	6.5	473	94.3	2.5
55-64	0	----	0	19	6.9	2.2	59	22.2	5.1	221	71.0	4.6	280	93.1	2.2
25-64	2	0.1	0.1	122	6.4	0.8	351	18.9	1.1	1520	74.6	1.5	1871	93.5	0.7

Result Description

The mean body mass index (BMI) for the study population was 34.9 (±0.2) kg/m^2 (Table 3.3.1.1). A significant gender difference was observed with the mean BMI for males being 33.7 (±0.5) kg/m^2 and for females being 36.2 (±0.3) kg/m^2. The gender difference was significant for all age groups except for in the 45-54 year group.

The mean height of the study population was 168.9 ±0.3 cm (66 & ½ inches) and the mean weight was 100.4 ± 0.5 kg (220.9 pounds) (Tables 3.3.1.2, Appendix 1). For males the mean height was 174.0 ± 0.5 cm (68 & ½ inches) and the mean weight was 102.7 ± 2.2 kg (225.9 pounds). For females the mean height was 163.7 ±1.0 cm (64 & 7/16th inches) and the mean weight was 98.1 ± 2.1 kg (215.8 pounds) (Tables 3.3.1.2, Appendix 1).

Table 3.3.1.3 shows the proportion of the study population in each BMI risk category by gender and age group. The percentage of obesity (BMI ≥30 kg/m^2) among the study population was 69.3% (±2.0) and 80.2% (±3.3) of males and females, respectively, indicating a significant gender difference. In combination, 92.7% and 94.4% of males and females respectively were either overweight or obese, a figure which is too big to ignore.

There was no significant gender difference in waist measurement, with the mean waist circumference of males being 104.7 ± 1.0 cm (41 & 3/16th inches) and that of females being 104.8 ± 3.0 cm (41 & ¼ inches) (Table 3.3.1.4, Appendix 1). Mean waist circumferences for both genders were above the values of 102 cm (40 & 1/8th inches) for males and 88cm (34 & 5/8th inches) for females that are considered to infer high risk of cardiovascular disease[22].

Comparison with previous data

Previous survey data regarding the prevalence of overweight and obesity in American Samoa has been reviewed by Coyne (2000)[23].

Recent prevalence data on obesity in American Samoans has been cited by Keighley et al (2006)24. For males living in American Samoa the prevalence of obesity was estimated to rise from 32.2% in 1976 to 63.1% in 2002. For females living in American Samoa, the prevalence of obesity in 1976 was 58.0% and 75% in 2002. In an earlier study using different BMI cut-offs (overweight BMI ≥27.8 for males, overweight BMI ≥27.3 for females) McGarvey et.al. (1993)[25] found that prevalence of overweight in1990 was 83.6% for males and 87.6% for females. This is a significant increase over the prevalence of overweight for males in 1976. While the prevalence of overweight in the female population did not rise over this period, it was speculated that this was because females already had a higher prevalence of overweight in 1976. The current (2004) WHO NCD-surveillance data indicate that the combined prevalence of overweight and obesity in American Samoa is well over 90% indicating a very significant public health challenge.

3.3.2 Blood Pressure and Hypertension

Diastolic and systolic blood pressure measurements were taken for all study participants using an Omron digital automatic blood pressure monitor (DABPM). Two readings were taken for each participant. If the difference between the first and second readings was 10mm Hg or more, then a third reading was taken.

Study participants were also asked about aspects of their medical history relating to high blood pressure.
A diagnosis of high blood pressure was recorded if, during the past 12 months, a doctor or health worker had told the participant that they had elevated blood pressure or hypertension. Those participants with a diagnosis of hypertension or elevated blood pressure were asked if they had taken any blood pressure drugs during the past two weeks that were prescribed by a doctor or health worker.

For the purposes of this report, high blood pressure is defined as:

- Systolic blood pressure greater than or equal to 140 mmHg and/or
- Diastolic blood pressure greater than or equal to 90 mmHg and/or
- Receiving treatment for high blood pressure.

Result table

Table 3.3.2.1 Mean resting systolic and diastolic blood pressure by gender and age groups (mmHg)

Men	SBP			DBP		
Age	n	Mean	CI (±)	n	Mean	CI (±)
25-34	270	131.4	3.3	270	80.9	2.9
35-44	264	133.2	1.7	264	84.7	1.6
45-54	214	136.0	1.8	214	85.4	1.6
55-64	124	142.9	4.2	124	86.3	2.9
25-64	872	134.1	2.1	872	83.5	1.9
Women	SBP			DBP		
Age	n	Mean	CI (±)	n	Mean	CI (±)
25-34	328	119.0	1.1	327	76.8	1.2
35-44	359	123.5	2.0	359	80.1	1.1
45-54	221	132.3	1.2	221	84.5	2.0
55-64	116	141.5	3.9	116	83.3	2.0
25-64	1024	125.1	1.0	1023	80.0	0.9
Total	SBP			DBP		
Age	n	Mean	CI (±)	n	Mean	CI (±)
25-34	598	125.2	2.0	597	78.9	1.9
35-44	623	128.1	1.9	623	82.3	1.3
45-54	435	134.3	1.2	435	84.9	1.5
55-64	240	142.3	2.2	240	84.9	1.6
25-64	1896	129.6	1.5	1895	81.8	1.3

Table 3.3.2.2 Percentage of the study population with raised blood pressure or currently taking medication for raised blood pressure

Hypertension – Men N=951

Age	Previously Diagnosed and on Medication			SBP>=140 or DBP>=90 and NOT on Medication			Total Prevalence		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	2	0.6	1.0	81	31.3	10.2	83	31.9	9.7
35-44	11	3.1	2.1	109	39.2	6.1	120	42.3	7.4
45-54	32	12.6	7.7	87	35.3	10.9	119	47.9	4.7
55-64	34	19.3	6.9	65	44.3	12.9	99	63.6	8.5
25-64	79	6.2	2.0	342	36.1	7.4	421	40.9	7.0

Hypertension – Women N=1099

Age	Previously Diagnosed And on Medication			SBP>=140 or DBP>=90 and NOT on Medication			Total Prevalence		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	2	0.4	0.8	39	13.1	6.9	41	13.5	6.7
35-44	11	2.9	2.3	90	22.4	4.4	101	25.2	5.6
45-54	33	14.1	4.1	81	31.8	5.9	114	45.8	6.4
55-64	29	19.9	7.6	59	43.1	8.8	88	63.1	9.5
25-64	75	6.1	1.1	269	23.2	4.9	344	27.5	5.2

Hypertension – Total Population N=2050

Age	Previously Diagnosed and on Medication			SBP>=140 or DBP>=90 and NOT on Medication			Total Prevalence		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	4	0.5	0.6	120	22.3	7.9	124	22.7	7.6
35-44	22	3.0	1.8	199	30.4	5.0	221	33.4	6.1
45-54	65	13.3	3.2	168	33.6	7.6	233	46.9	4.9
55-64	63	19.6	5.4	124	43.8	9.6	187	63.4	6.2
25-64	154	6.2	0.8	611	29.7	5.9	765	34.2	5.8

Result Description

Table 3.3.2.1 shows that the mean systolic blood pressure for males in the study population was 134.1 (±2.1) mmHg and the mean diastolic blood pressure was 83.5 (±1.9) mmHg. The mean systolic blood pressure for females was 125.1 (±1.0) mmHg and the mean diastolic blood pressure was 80.0 (±0.9) mmHg. There was a statistically significant gender difference in both systolic and diastolic blood pressure with males having higher blood pressure readings than females.

Table 3.3.2.1 also shows that for systolic blood pressure, there was significant gender difference in most age groups, except for the age group of 55-64 years. For diastolic blood pressure, there was no gender difference in most age groups, except for the age group of 35-44 years.

Overall the data suggests increasing systolic and diastolic pressures with increasing age. The mean systolic blood pressure of 55 - 64 year old males was statistically higher than in all younger male age groups. The mean systolic and diastolic blood pressure for females statistically increased in each successive 10-year age group except between the age groups of 45-54 years and 55-64 years for diastolic pressure (Table 3.3.2.1).

The prevalence of hypertension was calculated to include those currently on medication for hypertension and those either with a systolic blood pressure ≥140mmHg and/or a diastolic blood pressure ≥90mmHg; or with higher cut-off values of a systolic blood pressure ≥160mmHg and/or a diastolic blood pressure ≥100mmHg. Using the cut-off values of 140/90mmHg, the overall prevalence of hypertension in the study population was 34.2% (±5.8) with a higher prevalence among males of 40.9% (±7.0) as compared to females with 27.5% (±5.2) (Table 3.3.2.2).

As shown in Table 3.3.2.3, Appendix 1, only 10.9% (±1.0) of the study population had a diagnosis of high blood pressure by a health worker in the previous 12 months. There was no gender difference with 11.1% (±1.8) of males and 10.8% (±1.7) of females being diagnosed with high blood pressure in the preceding 12 months. However there was a pronounced increase in the proportion of the study population diagnosed with hypertension with increasing age. This trend was significant between the age groups of 25-34 years and 35-44 years for males, as well as between the age groups of 35-44 years and 45-54 years for females, with no significant difference between other age groups.

Comparison with previous data

Coyne (2000)[26] has summarized previous investigations of blood pressure undertaken in Samoa and American Samoa. In general, blood pressure increased with age for both males and females. The prevalence of hypertension for Samoan males in 1994 was greater than 35% and for females it was approximately 18%. The extent to which this can be compared with previous data is limited since the previous surveys incorporated information from both Western Samoa and American Samoa; and furthermore since there are likely differences in cut-off values and definitions of those included in the prevalence figures.

3.4 Biochemical measures

3.4.1 Blood Glucose and Diabetes

Whole blood capillary glucose was measured for each participant using an Accutrend (Bayer Corp) as described in the operational manual. Elevated blood glucose was defined as being ≥110mg/dL or 6.1 mmol/L and impaired fasting glucose levels were defined as being ≥100 mg/dL and <110 mg/dL (≥5.6 and <6.1 mmol/L)[27].

The participants were also asked questions about their history of diabetes and treatment for diabetes.

A reported diagnosis of diabetes was recorded if, during the past 12 months, a doctor or health worker

had told the participant that they had diabetes. Participants with a reported diagnosis of diabetes were asked if they were currently receiving insulin, oral drugs or special dietary treatments as prescribed by a doctor or health worker.

To assess the diabetes status of the surveyed population, the total diabetes prevalence was calculated and was defined as including the following two groups of participants:

- Known or previously diagnosed diabetes if they were currently receiving anti-diabetes medication and/or insulin prescribed by a health worker, OR
- Having fasting blood glucose greater than or equal to 110 mg/dl (6.1 mmol/L) without having known diabetes or being on treatment. These were called Newly Diagnosed Diabetics.

Result tables

Table 3.4.1.1 Fasting blood glucose by gender and age groups (mmol/L) excluding those currently on medication for high blood glucose

Age	Men (N=842)			Women (N=983)			Total Population (N=1825)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	257	6.2	0.3	313	5.8	0.1	570	6.0	0.1
35-44	257	7.1	0.5	353	6.7	0.3	610	6.9	0.4
45-54	207	7.2	0.4	208	7.5	0.3	415	7.3	0.1
55-64	121	7.7	1.1	109	7.0	0.7	230	7.4	0.9
25-64	842	6.8	0.3	983	6.5	0.2	1825	6.7	0.2

Table 3.4.1.2 Prevalence of Diabetes

Men

Age	IFG			Previously Diagnosed and on Medication			Blood Glucose >=110 and NOT on Medication			Total Prevalence		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	64	25.5	9.0	1	0.4	0.9	89	35.6	12.7	90	36.0	12.8
35-44	67	24.9	2.4	9	2.7	2.5	134	51.4	5.6	143	54.1	4.2
45-54	48	20.2	2.2	27	12.5	2.4	119	51.2	3.8	146	63.7	4.6
55-64	25	14.2	8.1	33	18.6	9.9	77	52.4	8.1	110	71.0	6.3
25-64	204	22.8	2.0	70	6.0	1.6	419	45.8	3.6	489	52.3	3.6

Women

Age	IFG			Previously Diagnosed and on Medication			Blood Glucose >=110 and NOT on Medication			Total Prevalence		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	70	23.3	5.5	3	0.8	1.1	73	23.2	7.7	76	23.9	7.9
35-44	86	20.9	7.2	11	3.0	2.8	147	42.5	4.8	158	45.5	5.6
45-54	54	22.1	3.2	30	12.6	2.7	104	45.2	6.1	134	57.8	4.6
55-64	28	20.9	10.2	29	20.9	4.4	64	45.3	8.2	93	66.2	6.4
25-64	238	22.0	2.1	73	6.0	1.4	388	36.4	3.5	461	42.4	4.2

Total Population

Age	IFG			Previously Diagnosed and on Medication			Blood Glucose >=110 and NOT on Medication			Total Prevalence		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	134	24.4	6.5	4	0.6	0.6	162	29.3	9.1	166	29.9	9.1
35-44	153	22.8	4.1	20	2.9	2.2	281	46.7	4.5	301	49.6	3.8
45-54	102	21.1	2.3	57	12.5	1.4	223	48.3	3.0	280	60.9	3.0
55-64	53	17.2	8.0	62	19.6	5.4	141	49.2	5.2	203	69.7	5.3
25-64	442	22.4	1.2	143	6.0	0.9	807	41.1	3.3	950	47.3	3.3

Result description

The mean fasting blood glucose level of the study population was 6.7 (±0.2) mmol/l (Table 3.4.1.1). There was no significant difference between males (6.8 ±0.3 mmol/L) and females (6.5 ±0.2 mmol/L). For males, mean blood glucose levels increased with increasing age, although the only significant difference in consecutive 10-year age groups was between the age group of 25-34 years and 35-44 years. For females, mean blood glucose levels also generally increased with increasing age with a significant difference only between the age group of 25-34 (5.8mmol/L) years and 35-44 (6.7mmol/L)

years. Only in the age group of 25-34 years was the mean fasting blood glucose level in males (6.2 ± 0.3 mmol/L) significantly higher than that in females (5.8 ± 0.1 mmol/L)

As shown by Table 3.4.1.2, the prevalence of diabetes in the total study population using a blood glucose level of 110 mg/dL as a cut-off was 47.3% (±3.3). The prevalence of diabetes in males from the study population was 52.3% (±3.6) and for females it was 42.4% (±4.2). While the overall prevalence of diabetes was significantly higher in males than in females, and even though prevalence amongst males is greater than among females in each of the 10-year age groups, the differences in diabetes prevalence between males and females was not statistically significant in any of the 10-year age groups.

In general, for both males and females the prevalence of diabetes increased with increasing age, 69.7% of males and females in the 55-64 year age group were diabetic. There was an increasing trend in the prevalence of diabetes with increasing age in males with a significant difference between the age groups of 25-34 years and 35-44 years. There was also an increasing trend in the prevalence of diabetes with increasing age in females with significant differences between consecutive 10-year age groups, except between the age group of 45-54 years and 55-64 years.

Table 3.4.1.3 and Table 3.4.1.4 show the proportions of diagnosed diabetics receiving various prescribed diabetes treatments in the past 2 weeks. The results indicate that the majority of the previously known diabetics in the study population were taking oral drugs (57.1% ± 8.2). 64.6% (±10.4) of males and 51.1% (±7.4) of females were taking oral drugs, with no significant gender difference. The data also show that 19.4% (± 7.0) of the previously diagnosed diabetics in the study population were taking insulin. 21.5% (±13.6) of males and 17.9% (±4.7) of females were taking insulin from among those with a previous diagnosis, with no significant gender difference.

Table 3.4.1.3 Currently Taking Insulin

Age	Men (N=79)			Women (N=118)			Total Population (N=197)		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	1	34.7	59.0	1	11.2	18.0	2	17.9	16.4
35-44	3	26.0	27.7	3	13.4	9.3	6	17.0	10.7
45-54	3	7.1	8.4	7	14.8	14.1	10	11.2	10.2
55-64	12	34.5	24.9	9	29.1	17.9	21	31.8	13.8
25-64	19	21.5	13.6	20	17.9	4.7	39	19.4	7.0

Table 3.4.1.4 Currently Taking Oral Drugs

Age	Men (N=79)			Women (N=118)			Total Population (N=197)		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	0	----	0.0	4	29.7	27.1	4	22.6	20.8
35-44	8	66.4	17.1	8	23.4	17.9	16	36.5	11.5
45-54	25	72.6	7.0	29	69.2	15.7	54	70.9	10.7
55-64	29	63.2	24.0	23	65.0	16.3	52	64.0	17.1
25-64	62	64.6	10.4	64	51.1	7.4	126	57.1	8.2

As indicated in Table 3.4.1.5, Appendix 1, 9.1% (±1.4) of the study population had been diagnosed with diabetes by a health worker in the previous 12 months and on medication. 8.4% (±1.7) and 9.8% (±2.5) of males and females respectively, with no significant gender difference.

The proportion of participants with a recent diagnosis of diabetes was observed to increase with increasing age (Table 3.4.1.5, Appendix 1), with significant differences between the youngest age groups. For the most senior age grouping, 26.7% of males and 24% of females had been given a diagnosis of diabetes within the previous 12 months.

Comparison with previous data

A previous 1990 study cited by Coyne (2000)[28] indicated the prevalence of diabetes in American Samoa to be 13.1% for males and 7.8% for females. Using a fasting glucose level of 126 mg/dL as a cut-off,

McGarvey (2001)[29] found the 1995 prevalence of diabetes to 11% and 36% for males aged 29-43 and 44-60 years, respectively. Prevalence of diabetes was 15% for females in 29-43 and 44-60 year age groups. There have been no other reports on prevalence of diabetes in American Samoa.

In the current survey the prevalence of those with a previously known diagnosis of diabetes in the study population was 9.1% with 8.4% and 9.8% in males and females respectively. The total prevalence of diabetes takes into account those participants on medication with a previously known diagnosis of diabetes as well as those with no new diagnosis but with elevated blood glucose levels. Using a glucose cut-off of 110mg/dL the prevalence of diabetes in the total study population was 47.3%. The prevalence of diabetes was 52.3% for males and 42.4% for females.

3.4.2 Blood Cholesterol[22]

Total blood cholesterol was measured for each participant as described in the operational manual using an Accutrend GCT. Elevated total blood cholesterol was defined as being >200mg/dL (5.15 mmol/L)[30].

The measurement range of the Accutrend GC is from 150 mg/dL (3.88 mmol/L) to 300 mg/dL (7.76 mmol/L) with a stated accuracy of ± 5 % compared with CHOD-PAP method[31]. The instrument indicated values outside the measurement range but not zero as either "low" or "high". During statistical analyses these "low" values were set to the lowest readable value (150 mg/dL) and the "high" values were set at the highest readable value i.e. 300 mg/dL for further statistical analysis.

Result tables

Table 3.4.2.1 Mean total blood cholesterol levels (mmol/L)

Age	Men (N=608)			Women (N=759)			Total Population (N=1367)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	145	4.6	0.1	176	4.4	0.0	321	4.5	0.1
35-44	183	4.7	0.1	249	4.8	0.1	432	4.7	0.1
45-54	172	4.9	0.2	211	5.0	0.2	383	4.9	0.1
55-64	108	4.9	0.2	123	5.1	0.1	231	5.0	0.1
25-64	608	4.7	0.1	759	4.8	0.1	1367	4.7	0.0

Table 3.4.2.2 Percentage with raised blood cholesterol (Total Cholesterol >= 5.2)

Age	Men (N=608)			Women (N=759)			Total Population (N=1367)		
	n	%	CI (±)	n	%	CI (±)	n	%	CI (±)
25-34	22	16.3	11.7	18	9.5	3.0	40	12.9	7.1
35-44	38	21.1	5.9	53	21.5	3.0	91	21.3	2.6
45-54	54	28.1	9.3	68	34.0	10.6	122	31.3	7.9
55-64	37	34.7	12.7	49	39.5	7.3	86	37.2	5.3
25-64	151	23.1	4.6	188	23.7	4.9	339	23.4	4.7

Result description

The mean total blood cholesterol level of the total population was 4.7 (±0.0) mmol/L, i.e., 183.6 (±1.9) mg/dL. There was no significant gender difference with the mean cholesterol level for males and females being 4.7 (±0.1) mmol/L and 4.8 (±0.1) mmol/L, respectively. For both males and females mean cholesterol level increased with age, while the only one significant difference in consecutive 10-year age groups existed between the age groups of 25-34 years and 35-44 years of females (Table 3.4.2.1).

The mean total cholesterol level for each participant was used to determine the proportion of individuals at high risk for coronary artery disease as determined by levels of cholesterol 5.2 mmol/L or 200 mg/dL (Table 3.4.2.2). The overall proportion of females and males in the high risk group were 23.7% (±4.9) and 23.1% (±4.6), respectively, with no gender differences overall or in any of the 10-year age groups.

For both males and females the proportion of participants in the high risk category increased with increasing age, such that 34.7% (±12.7) and 39.5% (±7.3) of males and females from the 55-64 year age group, respectively were in the high risk category (Table 3.4.2.2).

Comparison with previous data

Table 3.4.2.3 Mean and average total cholesterol levels in American Samoans

Publication	Survey Year	Number of participants	Gender	Age groups (years)	Cholesterol level (mg/dL)
WHO NCD-STEPS (current study)	2002	2072	Males Females	25-64	183.6
Crews et.al. 2004 [32]	1992	274	Males= 125 Females = 149	35-87	193.0
Kamboh et.al. 2000 [33]		361	Males = 145 Females = 216	20-70	195.2
McGarvey et.al. 1993 [34]	1990 1978	67 16	Males Males	40-49 40-49	205.0 180.5
Pelletier & Hornick 1986 [35]		153	Males = 50 Females = 96	NA[1]	189.5

1. Not available

Table 3.4.2.3 shows previously reported average total blood cholesterol levels for American Samoans. In each case the levels are higher than the mean total blood cholesterol determined in the current survey (172.8 mg/dL). The current survey measured blood cholesterol in 2072 individuals while the previously reported mean cholesterol levels were all determined from fewer than 400 individuals.

The prevalence of high cholesterol levels (>200 mg/dL) in a 1994 study in American Samoa was reported to be above 48% for males aged 29-43 years and 39% for males aged 44-60 years35 For females the prevalence of high cholesterol levels was 32% for those aged 29-43 years and 57% for those aged 44-60%. These prevalence figures are significantly higher than those assessed in the current survey. Some of this difference might be attributable to the age difference between the participants in the different studies (with the current survey probably having the lowest mean age) and some due to methodological differences.

3.5 Combined risk factors

There are 5 common and critical risk factors for NCDs including:

- current daily smokers,
- overweight or obese (BMI≥25kg/m^2),
- raised blood pressure (SBP≥140 and/or DBP≥90 mmHg or currently on medication for raised BP),
- less than 5 servings of fruit and vegetables per day, and
- low level of activity (<600 METminutes per week).

As noted in Table 3.5.1, only 0.4% of the study population were at low risk for NCDs (i.e., with none of the 5 risk factors). 71.8% (±6.1) of the total study population aged 25 to 64 years old were at a raised risk for NCDs with three or more of the key risk factors. There was no significant difference overall between the 45 to 64 year age group (76.7% ± 4.6) and the 25 to 44 year age group 69.2% (± 7.0). There were also no statistically significant gender differences in risk level.

Table 3.5.1 Level of risk based on combined risk factors among American Samoans

Raised Risk – Men (N=939)

Age	Low risk (none of the risk factors)			Moderate Risk (1-2 of the risk factors)			raised risk (at least 3 of the risk factors)		
	n	%	CI	n	%	CI	n	%	CI
25-44	1	0.3	0.8	106	25.1	8.7	274	74.6	8.8
45-64	2	0.8	1.4	61	18.9	6.9	223	80.4	7.9
Total	3	0.5	0.9	167	22.9	7.8	497	76.6	8.1

Raised Risk – Women (N=1073)

Age	Low risk (none of the risk factors)			Moderate Risk (1-2 of the risk factors)			raised risk (at least 3 of the risk factors)		
	n	%	CI	n	%	CI	n	%	CI
25-44	2	0.5	0.7	188	35.3	6.5	333	64.3	6.2
45-64	1	0.3	0.7	81	26.6	4.7	232	73.1	4.7
Total	3	0.4	0.4	269	32.4	5.1	565	67.2	5.1

Raised Risk – Total Population (N=2012)

Age	Low risk (none of the risk factors)			Moderate Risk (1-2 of the risk facto rs)			raised risk (at least 3 of the risk factors)		
	n	%	CI	n	%	CI	n	%	CI
25-44	3	0.4	0.3	294	30.4	7.1	607	69.2	7.0
45-64	3	0.5	0.7	142	22.7	4.3	455	76.7	4.6
Total	6	0.4	0.3	436	27.8	6.0	1062	71.8	6.1

4. Conclusions and Discussion

The American Samoa NCD STEPS survey indicated that noncommunicable disease risk factors are highly prevalent in the population.

Tobacco Smoking

Tobacco smoking is the major risk factor for heart disease, stroke and chronic respiratory disease. It causes cancer of the lungs, oesophagus, mouth, bladder, and larynx and contributes to cancer of the cervix, kidney and pancreas. It is the single largest preventable cause of disease and premature death. Although smoking prevalence has declined in many developed nations, it has increased in many less developed countries, including those in the Western Pacific region. The current data indicate that smoking prevalence has not declined in nearly two decades in American Samoa. The risk of smoking related chronic disease therefore remains high for a large proportion of American Samoans.

Alcohol Consumption

Excess alcohol consumption is a leading cause of preventable death and illness. It is a contributing cause of liver cirrhosis, mental illness, pancreatitis, foetal alcohol syndrome and cardiovascular disease. It also is a contributing cause of cancers of the oral cavity, pharynx, oesophagus, liver and breast. In addition, excess alcohol consumption has adverse social consequences, including road traffic injuries and suicide. Although it is not known if alcohol consumption in American Samoa is increasing, alcohol consumption in the Western Pacific region shows an upward trend. Together with information from the current survey that 49.6% and 33.9% of male and female current consumers of alcohol participated in binge drinking, it indicates a need for an increased awareness of the health implications of excess alcohol consumption, particularly amongst younger American Samoans.

Fruit and Vegetable Intake

Evidence reviewed by the FAO/WHO Joint Workshop on Fruit and Vegetables for Health (2004), strongly suggests that fruit and vegetable consumption has a potential role in reducing the risk of type 2 diabetes mellitus (Fruit and Vegetables for Health: Report of a Joint FAO/WHO Workshop, 2004). It was also reported that diets rich in fruit and vegetables could significantly reduce the risk of ischaemic heart disease and stroke. The report also noted that consumption of fruit and vegetables might have a role in obesity, weight management, and cancer prevention. The WHO recommendations are for 400g daily of fruit and vegetable consumption (assuming 80g/serving). 86.7% of the total study population in American Samoa consumed less than this recommended amount.

Obesity

BMI is used to describe overweight and obesity. A BMI of greater than 25 kg/m^2 and less than 30 is defined as overweight and one of greater than or equal to 30 kg/m^2 is defined as obese. Waist circumference, which can be used as an indication of excess abdominal fat, is closely correlated with BMI and is independently associated with overweight and obesity. The WHO currently specifies that waist circumferences of >80cm for females and >94cm for males infer increased risk of cardiovascular disease. Both BMI and waist circumference are therefore important in predicting risk for the various co-morbidities associated with obesity.

Overweight and obesity are related to a range of serious chronic conditions that reduce overall quality of life and may lead to premature death. Obesity is associated with a greatly increased relative risk for type 2 diabetes, gallbladder disease, and sleep apnoea, with a moderately increased relative risk for coronary heart disease, hypertension and osteoarthritis, and with a slightly increased risk for impaired fertility, and some cancers (postmenopausal breast cancer, endometrial cancer, colon cancer) (WHO 1997).

In the current survey, 69.3% of males and 80.2% of females in the study population had BMIs of >=30 kg/m^2. The mean waist circumferences of males and females were greater than those that infer increased risk of cardiovascular disease. It should be noted that these rates for obesity are among the highest in the world. These characteristics place the majority of the study population in high risk

categories for serious obesity-related chronic diseases such as type 2 diabetes, cardiovascular disease, hypertension, stroke and some cancers.

Physical Activity

Physical inactivity is a major preventable risk factor for noncommunicable diseases and has been estimated by the WHO to cause 10-16% each of breast cancer, colon cancer and diabetes, and about 22% of ischemic heart disease. About 60% of the world's population do not achieve the minimum recommended physical activity each day (about 30 minutes of moderate intensity physical activity).

In the current American Samoan survey, it was found that 62.2% of the study population was physically inactive. Along with other risk factors, such as smoking, excessive alcohol intake, and inadequate fruit and vegetable intake, this places a large proportion of the population at risk for the above-mentioned noncommunicable diseases.

Hypertension

Hypertension is a major risk factor for cardiovascular disease, stroke, renal damage and heart failure. The prevalence of hypertension in the current study was found to be 40.9% for males and 27.5% for females thus placing a large proportion of the population at risk of these serious diseases.

Diabetes

Diabetes is a serious condition that is a risk factor for renal failure, blindness, stroke and ischemic heart disease. In the current survey it was found that the prevalence of diabetes was 47.3%, 52.3% for males and 42.4% for females. Again, as with obesity, these rates for diabetes are among the highest in the world. Together with the high prevalence of risk factors for diabetes, such as obesity and physical inactivity, in American Samoa, this data suggests that a large proportion of the population are at risk of serious diabetes-related illnesses.

Cholesterol

Overall, 23.4% of the study population were in the high risk category for cholesterol levels. Although the majority of the study population is clearly not in the high risk category, the proportions in the high risk category increased with age, so that in the 55-64 age group, over 37% of the participants had cholesterol levels of above $\geq$5.2 mmol/L, i.e., 200 mg/dL. When considered with other risk factors common in the older population, such as obesity, elevated blood pressure, inadequate dietary fruit and vegetable intake and physical inactivity this may indicate that this group needs special attention.

Combined Risk Factors

71.8% of the total study population aged 25 to 64 years old were at a raised risk for NCDs with three or more of the key risk factors.

5. Recommendations

To inform the American Samoan public about:

- Implementation of WHO Framework Convention on Tobacco Control (FCTC).
- The health risks associated with smoking and of the health benefits of smoking cessation.
- The adverse health effects of excessive alcohol consumption and the health benefits of decreasing alcohol consumption, particularly targeted towards younger males and females.
- Increasing of production and importation of fruit and vegetables.
- The health benefits of increasing fruit and vegetable consumption and decreasing consumption of fatty foods.
- The contributions of overweight and obesity to chronic diseases such as type II diabetes, cardiovascular disease, stroke and some cancers.
- The health benefits of reducing and preventing overweight and obesity.
- Ways of achieving weight reduction through modification of diet and physical activity.
- The health risks of hypertension, diabetes and cardiovascular disease and the health benefits of preventing or controlling them.
- Lifestyle factors contributing to hypertension, diabetes and cardiovascular disease.
- The importance of appropriately monitoring and treating hypertension and diabetes, particularly amongst the older age groups.

To develop and introduce strategies to decrease the prevalence of lifestyle risk factors including tobacco use, excessive alcohol consumption among American Samoans, including specific measures to:

- prevent younger Samoans from taking up smoking.
- encourage and support current smokers to give up smoking.
- discourage younger Samoans from participating in binge drinking.
- encourage current consumers of alcohol to decrease their level of alcohol consumption.

To develop and introduce programs that support the prevention and control of hypertension, diabetes and cardiovascular disease, including the following:

- An increase in efforts to encourage healthy eating habits across all age groups by promoting the availability and consumption of greater levels of fruit and vegetables.
- Instigating strategies that support and promote weight reduction. This should include increased access to healthy foods and options for physical activity. Increasing levels of physical activity during leisure and transportation could be targeted specifically.
- Ensuring that the health system adequately performs monitoring and treatment of hypertension, diabetes and cardiovascular disease.

Appendix 1. Additional Results

1. Demographic Information

Table 3.1.2 Mean number of years spent in school

Age	Men (N=952)			Women (N=1100)			Total Population (N=2052)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	271	12.4	0.3	329	12.4	0.2	600	12.4	0.2
35-44	273	12.2	0.5	367	12.2	0.3	640	12.2	0.2
45-54	244	11.5	0.4	252	12.1	0.7	496	11.8	0.3
55-64	156	12.0	0.6	142	10.4	0.6	298	11.3	0.4
25-64	944	12.1	0.2	1090	12.1	0.2	2034	12.1	0.1

2. Tobacco Use

Table 3.2.1.2 Percentage of daily and non -daily smokers amongst current smokers

Age	Non-Daily			Daily		
	Men (N=948)					
	n	%	CI (±)	n	%	CI (±)
25-34	31	19.4	9.5	110	80.6	9.5
35-44	31	27.5	10.8	95	72.5	10.8
45-54	23	20.7	6.9	99	79.3	6.9
55-64	14	20.8	9.8	44	79.2	9.8
25-64	99	22.2	5.8	348	77.8	5.8
Age	Women (N=1096)					
	n	%	CI (±)	n	%	CI (±)
25-34	29	25.5	7.2	74	74.5	7.2
35-44	29	30.6	8.5	66	69.4	8.5
45-54	21	24.3	5.5	58	75.7	5.5
55-64	9	32.7	29.3	19	67.3	29.3
25-64	88	27.3	5.6	217	72.7	5.6
Age	Total Population (N=2044)					
	n	%	CI (±)	n	%	CI (±)
25-34	60	21.8	7.5	184	78.2	7.5
35-44	60	28.7	8.8	161	71.3	8.8
45-54	44	22.0	5.8	157	78.0	5.8
55-64	23	24.6	14.8	63	75.4	14.8
25-64	187	24.1	5.4	565	75.9	5.4

3. Alcohol Consumption

Table 3.2.2.2 Alcohol drinking status during the past 12 months

Men

Age	Abstainers			Current Drinkers		
	n	%	CI (±)	n	%	CI (±)
25-34	39	19.9	5.9	133	80.1	5.9
35-44	46	27.9	11.0	124	72.1	11.0
45-54	53	34.9	15.7	91	65.1	15.7
55-64	36	36.1	9.1	55	63.9	9.1
25-64	174	27.3	5.6	403	72.7	5.6

Women

Age	Abstainers			Current Drinkers		
	n	%	CI (±)	n	%	CI (±)
25-34	43	52.1	11.8	43	47.9	11.8
35-44	47	56.9	13.8	39	43.1	13.8
45-54	45	62.5	13.9	25	37.5	13.9
55-64	21	89.1	10.3	3	10.9	10.3
25-64	156	58.8	10.3	110	41.3	10.3

Total Population

Age	Abstainers			Current Consumers		
	n	%	CI (±)	n	%	CI (±)
25-34	82	29.2	4.1	176	70.8	4.1
35-44	93	36.8	11.2	163	63.2	11.2
45-54	98	43.6	15.8	116	56.4	15.8
55-64	57	47.0	7.4	58	53.0	7.4
25-64	330	36.5	7.1	513	63.5	7.1

Table 3.2.2.4 N umber of drinks per day among current drinkers

Age	1 drink			2-3 drinks			4-5 drinks			6+ drinks		
	Men (N=393)											
	n	%	CI (±)	N	%	CI (±)	N	%	CI (±)	n	%	CI (±)
25-34	4	3.8	1.9	19	15.5	5.4	38	26.0	10.7	70	54.7	7.8
35-44	3	2.5	3.0	21	15.6	10.4	22	17.0	8.9	73	64.9	16.4
45-54	3	2.9	4.8	29	31.5	12.3	15	13.9	12.9	43	51.7	22.3
55-64	3	4.0	6.6	18	36.4	9.6	10	18.3	7.6	22	41.3	10.2
25-64	13	3.2	1.9	87	20.7	3.8	85	20.3	8.0	208	55.8	8.6
Age	**Women (N=102)**											
	n	%	CI (±)	N	%	CI (±)	N	%	CI (±)	n	%	CI (±)
25-34	0	----	0	9	23.7	17.2	7	20.0	11.8	24	56.3	18.5
35-44	8	22.0	19.5	6	14.5	19.3	7	19.6	11.9	16	43.9	14.6
45-54	3	12.0	19.3	11	53.7	44.9	4	12.3	19.5	5	21.9	16.5
55-64	1	25.2	70.5	1	74.8	70.5	0	----	0	0	----	0
25-64	12	10.5	9.7	27	27.7	21.3	18	17.9	5.2	45	43.9	13.7
Age	**Total Population (N=495)**											
	n	%	CI (±)	N	%	CI (±)	N	%	CI (±)	n	%	CI (±)
25-34	4	3.1	1.5	28	17.0	5.9	45	24.9	8.7	94	55.0	5.6
35-44	11	6.5	5.9	27	15.4	11.2	29	17.6	6.5	89	60.6	12.7
45-54	6	4.7	5.3	40	35.9	10.0	19	13.6	13.3	48	45.7	15.9
55-64	4	4.6	6.5	19	37.6	9.9	10	17.7	7.6	22	40.1	10.3
25-64	25	4.6	3.3	114	21.9	6.1	103	19.9	6.7	253	53.6	5.5

Table 3.2.2.5 Mean n umber of drinks per day among current drinkers

Age	Men (N=393)			Women (N=102)			Total Population (N=495)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	131	6.8	0.6	40	8.4	2.9	171	7.1	0.6
35-44	119	7.9	1.8	37	5.7	1.4	156	7.4	1.5
45-54	90	6.4	1.4	23	3.1	0.6	113	5.7	1.2
55-64	53	5.9	1.1	2	2.5	1.4	55	5.8	1.2
25-64	393	6.9	0.6	102	6.3	2.0	495	6.8	0.6

4. Physical Activity

Table 3.2.4.3 Levels of work-related physical activity by gender and age group (METminutes per day)

Work Activity - Vigorous

Age	Men (N=904)			Women (N=1020)			Total Population (N=1926)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	259	25.3	21.4	307	4.0	5.7	566	14.8	11.3
35-44	258	22.1	9.8	342	4.5	6.9	600	13.0	6.0
45-54	234	25.0	20.0	236	2.2	4.4	470	14.0	11.5
55-64	147	10.4	7.5	135	4.4	7.2	282	7.7	7.4
25-64	898	22.5	11.3	1020	3.8	4.6	1918	13.3	7.2

Work Activity – Moderate

Age	Men (N=904)			Women (N=1022)			Total Population (N=1926)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	259.0	19.0	9.1	305	10.3	6.3	564	14.7	6.6
35-44	257.0	26.1	22.4	342	17.7	6.3	599	21.8	10.1
45-54	233.0	28.8	12.9	236	17.4	20.7	469	23.3	13.7
55-64	148.0	17.8	18.6	134	12.4	7.3	282	15.4	13.4
25-64	897.0	23.1	11.0	1017	14.4	5.3	1914	18.8	7.6

Table 3.2.4.4 Levels of recreation-related physical activity by gender and age group (METminutes per day)

Recreation Activity - Vigorous

Age	Men (N=904)			Women (N=1022)			Total Population (N=1926)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	261	8.4	6.0	305	1.7	1.2	566	5.1	3.1
35-44	259	7.0	5.7	341	2.4	3.8	600	4.6	2.0
45-54	236	4.7	4.9	238	1.3	2.0	474	3.1	3.1
55-64	148	7.1	4.7	135	0.3	0.7	283	4.0	2.6
25-64	904	7.0	2.5	1019	1.7	1.4	1923	4.4	1.4

Recreation Activity – Moderate

Age	Men (N=904)			Women (N=1022)			Total Population (N=1926)		
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	259	3.0	2.4	306	4.3	4.8	565	3.6	2.6
35-44	259	3.5	1.8	342	4.6	2.3	601	4.1	1.8
45-54	236	5.9	8.1	238	7.1	7.8	474	6.5	7.9
55-64	148	2.4	2.7	135	3.6	4.5	283	2.9	1.9
25-64	902	3.7	2.4	1021	4.9	1.8	1923	4.3	1.7

5. Obesity

Table 3.3.1.2 Mean height, weight and body mass index by gender and age groups

Age	BMI			Height			Weight		
	Men								
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	271	33.2	1.3	272	175.9	1.7	272	103.9	7.1
35-44	273	34.2	0.7	275	174.3	0.9	275	104.7	2.9
45-54	246	34.1	0.7	246	172.5	0.5	246	101.7	2.0
55-64	155	32.9	1.3	157	170.1	0.6	158	96.2	3.7
25-64	945	33.7	0.5	950	174.0	0.5	951	102.7	2.2
Age	Women								
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	297	36.1	0.8	330	165.8	1.8	330	100.2	3.8
35-44	357	36.7	1.1	370	163.3	0.3	370	99.6	2.7
45-54	252	35.7	1.6	254	161.9	1.9	254	94.3	6.4
55-64	144	36.0	1.4	145	161.1	1.1	145	94.0	4.4
25-64	1050	36.2	0.3	1099	163.7	1.0	1099	98.1	2.1
Age	Total Population								
	n	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	568	34.6	0.7	602	170.9	0.7	602	102.1	2.4
35-44	630	35.5	0.6	645	168.6	0.7	645	102.0	1.3
45-54	498	34.9	1.0	500	167.3	0.7	500	98.1	3.5
55-64	299	34.3	0.4	302	166.0	0.5	303	95.2	2.1
25-64	1995	34.9	0.2	2049	168.9	0.3	2050	100.4	0.5

Table 3.3.1.4 Mean waist circumference (cm) by gender and age groups

Age	Men (N=925)			Women (N=1063)			Total Population (N=1988)		
	N	Mean	CI (±)	n	Mean	CI (±)	n	Mean	CI (±)
25-34	264	102.7	3.9	302	104.1	3.4	566	103.4	1.4
35-44	270	105.5	2.7	363	104.4	1.6	633	105.0	1.8
45-54	240	106.3	2.3	253	104.7	5.6	493	105.5	3.7
55-64	151	105.7	1.3	145	108.7	3.8	296	107.1	1.3
25-64	925	104.7	1.0	1063	104.8	3.0	1988	104.8	1.4

6. Blood Pressure and Hypertension

Table 3.3.2.3 Percentage of diagnosed hypertension by a health worker in the previous 12 months

Age	Men (N=949)			Women (N=1099)			Total Population (N=2048)		
	n	%	CI	n	%	CI	n	%	CI
25-34	7	2.5	2.1	12	3.9	2.0	19	3.2	0.7
35-44	28	9.9	3.6	26	7.1	2.3	54	8.4	2.8
45-54	43	17.2	5.6	51	21.8	4.1	94	19.4	1.8
55-64	48	28.7	7.5	35	23.7	9.9	83	26.4	7.6
25-64	126	11.1	1.8	124	10.8	1.7	250	10.9	1.0

7. Blood Glucose and Diabetes

Table 3.4.1.5 Percentage of diagnosed diabetes by a health worker in the previous 12 months

Age	Men (N=949)			Women (N=1099)			Total Population (N=2048)		
	N	%	CI	n	%	CI	n	%	CI
25-34	2	0.7	1.1	12	3.5	1.6	14	2.1	0.9
35-44	14	4.5	3.3	28	7.9	4.2	42	6.3	2.7
45-54	36	16.2	5.4	45	16.6	4.7	81	16.4	2.9
55-64	45	26.7	11.7	36	24.0	7.5	81	25.5	8.5
25-64	97	8.4	1.7	121	9.8	2.5	218	9.1	1.4

Appendix 2. Questionnaire (English Version)

GOVERNMENT OF AMERICAN SAMOA
DEPARTMENT OF HEALTH & WORLD HEALTH ORGANIZATION

The WHO STEPwise approach to Surveillance of noncommunicable diseases (STEPS)

Check if the following are completed (to be checked by:)	Yes	No
Fasting status (Step 2&3 Registration Station)	☐	☐
Checkout (Step 2&3 Check-out Station)	☐	☐
EpiData data entry (Data entry personnel)	☐	☐
EpiInfo data entry (Data entry personnel)	☐	☐
Data entry irregularities (Data entry personnel)	☐	☐

Identification Information:

V 1	Is the respondent on the participation list for the survey?	Yes, on the original list 1 Yes, on the replacement list 2 No (if "No", then END) 3	☐
I 2	Village name:		
I 3	Village code: (SEE NOTE BELOW)	☐☐	
I 4	Interviewer code	☐☐	
I 5	Date of completion of the questionnaire	☐☐/☐☐/2004 Month Day Year	

Respondent ID Number ☐☐☐☐☐			
	Consent		
I 6	Consent has been read out to respondent	Yes 1 No 2	☐ If NO, read consent
I 7	Consent has been obtained (verbal or written)	Yes 1 No 2	☐ If NO, END
I 8	Interview Language	English 1 Samoan 2	☐
I 9	Time of interview (24 hour clock)		☐☐:☐☐
I 10	Family Name		
I 11	First Name		
I 12	Contact phone number where possible		
I 13	Specify whose phone	Work 1 Home 2 Neighbor 3 Other 4	☐

Note: Identification information I6 to I12 should be stored separately from the questionnaire because it contains confidential information. Please note: village code is required as part of main instrument for data analyses. Date of interview is required to calculate age.

Step 1 Demographic Information			
			Coding Column
C1	Sex (*Record Male / Female as observed)*	Male 1 Female 2	☐
C2	What is your date of birth? *If Don't Know, See Note* below and Go to C3*	Month☐☐ Day☐☐ Year19☐☐	

C3	How old are you?	Years	☐☐
C4	In total, how many years have you spent at school or in full-time study (excluding pre-school)?	Years	☐☐

Step 1 Behavioural Measures					
Tobacco Use (Section S)					
Now I am going to ask you some questions about various health behaviours. This includes things like smoking, drinking alcohol, eating fruits and vegetables and physical activity. Let's start with smoking.					
		Response		Coding Column	
S 1a	Do you currently smoke any tobacco products, such as cigarettes, cigars or pipes? *(NOTE: Currently = past 12 months)*	Yes No	1 2	☐	*If No, go to Next Section*
S 1b	<u>If Yes,</u> Do you currently smoke tobacco products daily?	Yes No	1 2	☐	*If No, go to Next Section*
S 2a	How old were you when you first started smoking daily?	Age (years) Don't remember	 DK	☐☐	*If Known, go to S 3*
S 2b	Do you remember how long ago it was? *(CODE DK FOR DON'T KNOW OR DON'T REMEMBER)*	In Years OR in Months OR in Weeks		Years ☐☐ Months ☐☐ Weeks ☐☐	
S 3	On average, how many of the following do you smoke each day? *(RECORD FOR EACH TYPE)* *(CODE DK FOR DON'T KNOW OR DON'T REMEMBER)*	Manufactured cigarettes Hand-rolled cigarettes Pipes full of tobacco Cigars, cheroots, cigarillos Other (please specify):		☐☐☐ ☐☐ ☐☐ ☐☐ ☐☐	
Alcohol Consumption (Section A)					

The next questions ask about the consumption of alcohol.				
		Response		Coding Column
A 1a	Have you ever consumed a drink that contains alcohol such as beer, wine, spirit, or fermented cider? *USE SHOWCARD or SHOW EXAMPLES*	Yes No	1 2	☐ *If No, Go to Next Section*
A 1b	Have you consumed alcohol within the past 12 months?	Yes No	1 2	☐ *If No, Go to Next Section*

NOTE: The Date of Birth (C2) or the age (C3) or both (C2 and C3) have to be filled. CODE "DK" FOR DON'T KNOW or DON'T REMEMBER.

Code DK for DON'T KNOW or DON'T REMEMBER except for where answers are mandatory such as Village code, date of interview and either date of birth or age.

A 2	In the past 12 months, how frequently have you had at least one drink? *(READ RESPONSES)* *USE SHOWCARD*	5 or more days a week 1-4 days per week 1-3 days a month Less than once a month	1 2 3 4	☐
A 3	When you drink alcohol, on average, how many drinks do you have during one day?	Number Don't know	 DK	☐☐
A 4	During each of the past 7 days, how many standard drinks of any alcoholic drink did you have each day? *(RECORD FOR EACH DAY* *USE SHOWCARD*	Monday Tuesday Wednesday Thursday Friday Saturday Sunday		☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐

Diet (Section D)				
The next questions ask about the fruits and vegetables that you usually eat. I have a nutrition card here that shows you some examples of local fruits and vegetables. Each picture represents the size of a serving. As you answer these questions please think of a typical week in the last year.				
D 1a	In a typical week, on how many days do you eat fruit? *USE SHOWCARD*	Number of days	☐	If Zero days, go to D 2a
D 1b	How many servings of fruit do you eat on one of those days? *USE SHOWCARD*	Number of servings	☐☐	
D 2a	In a typical week, on how many days do you eat vegetables? *USE SHOWCARD*	Number of days	☐	If Zero days, go to P1
D 2b	How many servings of vegetables do you eat on one of those days? *USE SHOWCARD*	Number of servings	☐☐	

Physical Activity (Section P)				
Next I am going to ask you about the time you spend doing different types of physical activity. Please answer these questions even if you do not consider yourself to be an active person. Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, household chores, harvesting food, fishing or hunting for food, seeking employment.				
P 1	Does your work involve mostly sitting or standing, with walking for no more than 10 minutes at a time?	Yes 1 No 2	☐	*If Yes, go to P6*
P 2	Does your work involve vigorous activities, like *heavy lifting, digging or construction work* for at least 10 minutes at a time? *INSERT EXAMPLES & USE SHOWCARD*	Yes 1 No 2	☐	*If No, go to P4*
P 3a	In a typical week, on how many days do you do vigorous activities as part of your work?	Days a week	☐	

Note: Code DK for DON'T KNOW or DON'T REMEMBER except for where answers are mandatory such as Village code, date of interview and either date of birth or age.

P 3b	On a typical day on which you do vigorous activities, how much time do you spend doing such work?	In hours and minutes OR in Minutes only	hrs☐☐ : mins☐☐ or minutes ☐☐☐	
P 4	Does your work involve moderately intense activities, like brisk walking *or carrying light loads* for at least 10 minutes at a time? *INSERT EXAMPLES & USE SHOWCARD*	Yes 1 No 2	☐	*If No, go to P6*
P 5a	In a typical week, on how many days do you do moderately intense activities as part of your work?	Days a week	☐	
P 5b	On a typical day on which you did moderately intense activities, how much time do you spend doing such work?	In hours and minutes OR in Minutes only	hrs☐☐ : mins☐☐ or minutes ☐☐☐	
P 6	How long is your typical work day?	Number of hours	hrs ☐☐	
Other than activities that you've already mentioned, I would like to ask you about the way you travel to and from places. For example to work, for shopping, to market, to church etc				
P 7	Do you walk or use a bicycle (*pedal cycle*) for at least 10 minutes continuously to get to and from places?	Yes 1 No 2	☐	*If No, go to P9*
P 8a	In a typical week, on how many days do you walk or bicycle for at least 10 minutes to get to and from places?	Days a week	☐	
P 8b	How much time would you spend walking or bicycling for travel on a typical day?	In hours and minutes OR in Minutes only	hrs☐☐ : mins☐☐ or minutes ☐☐☐	
The next questions ask about activities you do in your leisure time. Think about activities you do for recreation, fitness or sports. Do not include the physical activities you do at work or for travel mentioned already.				
P 9	Does your *leisure time* involve mostly sitting, reclining, or standing, with no physical activity lasting more than 10 minutes at a time?	Yes 1 No 2	☐	*If Yes, go to P 14*
P 10	In your *leisure time*, do you do any vigorous activities like *running or strenuous sports, weight lifting* for at least 10 minutes at a time? *INSERT EXAMPLES & USE SHOWCARD*	Yes 1 No 2	☐	*If No, go to P 12*
P 11a	<u>If Yes,</u> In a typical week, on how many days do you do vigorous activities as part of your *leisure time*?	Days a week	☐	
P 11b	How much time do you spend doing this on a typical day?	In hours and minutes OR in Minutes only	hrs☐☐ : mins☐☐ or minutes ☐☐☐	
P 12	In your *leisure time*, do you do any	Yes 1	☐	

	moderate-intensity activities like brisk walking, *cycling or swimming* for at least 10 minutes at a time? *INSERT EXAMPLES & USE SHOWCARD*	No	2	*If No, go to P 14*
P 13a	If Yes In a typical week, on how many days do you do moderately intense activities as part of *leisure time*?	Days a week		☐
P 13b	How much time do you spend doing this on a typical day?	In hours and minutes OR in Minutes only		hrs☐☐ : mins☐☐ or minutes ☐☐☐

Note: Code DK for DON'T KNOW or DON'T REMEMBER except for where answers are mandatory such as Village code, date of interview and either date of birth or age.

The following question is about sitting or reclining. Think back over the past 7 days, to time spent at work, at home, in *leisure*, including time spent sitting at a desk, visiting friends, reading, or watching television, but do not include time spent sleeping.			
P 14	Over the past 7 days, how much time did you spend sitting or reclining on a typical day?	In hours and minutes OR in Minutes only	hrs☐☐ : mins☐☐ or minutes ☐☐☐

History of High Blood Pressure					
H 2	During the past 12 months have you been told by a doctor or other health worker that you have elevated blood pressure or hypertension?	Yes No	1 2	☐	*If No, skip to H7*
H 3a	During the last 2 weeks, have you taken any drugs (medication) for high blood pressure prescribed by a doctor or other health worker?	Yes No	1 2	☐	

History of Diabetes					
H 7	During the past 12 months, have you been told by a doctor or other health worker that you have diabetes?	Yes No	1 2	☐	*If No, skip to V3*
H 8	Are you currently receiving any of the following treatments for diabetes prescribed by a doctor or other health worker? *(NOTE: Currently = past 2 weeks)*				
H 8a	Insulin	Yes No	1 2	☐	
H 8b	Oral drug (medication that you have taken in the last 2 weeks)	Yes No	1 2	☐	
H 8c	Special prescribed diet	Yes No	1 2	☐	

Comments: Step 1		(to be answered by Interviewer)		
V 2	Are there any irregularities or problems with the interview?	Yes No	1 2	☐

If yes, please state the irregularities or problems in the space provided below.

_____

_____

_____

_____

_____

_____

Step 2 Physical Measurements

Height and weight					Coding Column	
M 1	Technician ID Code	(1a) height ☐☐ (1b) weight ☐☐				
M 2a & 2b	Device IDs for height and weight	(2a) height☐ (2b) weight☐				
M 3	Height	(in Centimetres)			☐☐ ☐.☐	
M 4	Weight *If too large for scale, use TWO scales*	(in Pounds)			☐☐☐.☐	
M 5	*(For women)* Are you pregnant?	Yes No	1 2		☐	*If Yes, go to M9*
Waist						
M 6	Technician ID				☐☐	
M 7	Device ID for waist				☐	
M 8	Waist circumference	(in Centimetres)			☐☐☐.☐	

Blood pressure				Coding Column
M 9	Technician ID			☐☐
M 10	Device ID for blood pressure			☐
M 11	Cuff size used	Standard Large X-Large (Manual)	1 2 3	☐
M 12a	Reading 1 Systolic BP	Systolic	mmHg	☐☐☐
M 12b	Diastolic BP	Diastolic	mmHg	☐☐☐
M 13a	Reading 2 Systolic BP	Systolic	mmHg	☐☐☐
M 13b	Diastolic BP	Diastolic	mmHg	☐☐☐
M 14a	Reading 3 Systolic BP	Systolic	mmHg	☐☐☐
M 14b	Diastolic BP	Diastolic	mmHg	☐☐☐

Step 3 Biochemical Measurements

Blood glucose				Coding Column
B 1	Since 10 o'clock last night, have you had anything to eat or drink, other than water?	Yes No	1 2	☐
B 2	Technician ID Code			☐☐
B 3	Device ID code			☐
B 4	Time of day blood specimen taken (24 hour clock)			hrs☐☐ : mins☐☐
B 5	Blood glucose	Low High Unable to assess	1 2 3	mg/dL ☐☐☐.☐ ☐
Blood Lipids				
B 6	Technician ID Code			☐☐
B 7	Device ID code			☐
B 8	Total cholesterol	Low High Unable to assess	1 2 3	mg/dL ☐☐☐.☐ ☐

Comments: Step 2 and 3		(to be answered by any Step 2 or 3 technician)		
V 3	Are there any irregularities or problems with the measurements?	Yes No	1 2	☐

If yes, please state the irregularities or problems in the space provided below.

_____

_____

_____

_____

Appendix 3. Questionnaire (Samoan Version)

GOVERNMENT OF AMERICAN SAMOA DEPARTMENT OF HEALTH &

WORLD HEALTH ORGANIZATION

Suesuega o Faama'i Le Pipisi ma Mafua'aga i Samoa

Faamatalaga o le sui auai:			
I 1	Nuu/ Alalafaga: (name)	☐☐☐☐☐☐☐☐☐☐	
I 2	Nuu (code): (SEE NOTE BELOW)	☐☐	
I 3	*Mo Pagopago, Malaeimi, Malaeloa, Leone ma Pavaiai:* Does the participant live within the area defined on the map?	Ioe 1 Leai 2	☐
I 4	Numera o le sui suesue	☐☐	
I 5	Aso na mae'a ai le suesuega	☐☐/☐☐/☐☐☐☐ Aso Masina Tausaga	

✂ ---------- ✂

Numera a le tagata o loo suesueina ☐☐ ☐☐☐			
	Consent		
I 6	Pepa o maliega	Ioe 1 Leai 2	☐
I 7	Gagana faaaogaina	Gagana Peretania 1 Gagana Samoa 2	☐
I 8	Taimi o le suesuega (24 hour clock)	☐☐:☐☐	
I 9	Faaiu		
I 10	Igoa Muamua		
I 11	Telefoni		
I 12	Telefoni i le	Fale faigaluega 1 Aiga 2 Tua'oi 3 Se isi tagata (o ai?) 4	☐

Note: Identification information I5 to I11 should be stored separately from the questionnaire because it contains confidential information. Please note: village code is required as part of main instrument for data analyses. Date of interview is required to calculate age.

Step 1 Core Demographic Information

				Coding Column
C1	Ituaiga	Alii Tamaitai	1 2	☐
C2	O le a lou aso fanau? *Afai e le iloa, vaai Note* i lalo ma faaauau i le fesili C3*	Aso☐☐ Masina☐☐ Tausaga☐☐☐☐		
C3	Ua fia ou tausaga?		Tausaga	☐☐
C4	I le aotelega, e fia le aofai o tausaga sa e aoga ai (full time) e le aofia ai Aoga Faataitai?		Tausaga	☐☐

*Note: Coding Rule: Code "Don't Know" 7 (or 77 or 777 as appropriate).

Step 1 Core Behavioural Measures

Taumafa Tapa'a / Sikareti (Section S)

Ole a 'ou fesili atu ini amioga tau ile soifua Maloloina e aofia ai le ulaula, inu 'ava, taumafa I fuala'au suamalie ma fuala'au e taumafa-mataina male fa'agaoioiga ole tino. Ole a amata ile ta'umafa tapa'a.

		Response		Coding Column	
S 1a	O e taumafa tapa'a e pei o sikareti, sika po o tapa'a utu paipa i le taimi nei?	Ioe Leai	1 2	☐	*A leai, alu i le fesili A1a*
S 1b	*I Afai e Ioe:* E te taumafa tapa'a i aso uma?	Ioe Leai	1 2	☐	*A leai, alu i le fesili A1a*
S 2a	O le fia o ou tausaga na amata ai ona e taumafa tapa'a i aso uma?	Age (tausaga) Le manatua	 7 7	☐☐	*A manatua tausaga, alu i le fesili S3*

S 2b	Afai e te le manatua le matua o ou tausaga, o le a le umi talu ona e ulaula i aso uma? *(CODE 77 FOR DON'T REMEMBER)*	Tausaga talu ai PO O Masina talu ai PO O Vaiaso talu ai	Tausaga ☐☐ Masina ☐☐ Vaiaso ☐☐
S 3	E fia le aofai o ituaiga tapa'a nei e masani ona e taumafaina/ulaina i le aso e tasi? *(RECORD FOR EACH TYPE)* *(CODE 88 FOR NOT APPLICABLE)* ← ☐☐☐☐☐☐☐☐	Sikareti ua maea ona gaosia Sikareti ta'ai Tapa'a utu paipa (Samoa/Palagi) Sika/Tapa'a Samoa (tipi) O nisi tapa'a (please specify):	☐☐ ☐☐ ☐☐ ☐☐ ☐☐

Taumafa Ava Malosi (Section A)					
O fesili e soso'o ai e ta'atatau lea ile ta'umafaina o 'ava malosi.					
		Response		Coding Column	
A 1a	Ua e taumafaina se ava malosi (e pei o le pia, uaina, fagu malosi po o le pulū)? *USE SHOWCARD or SHOW EXAMPLES*	Ioe Leai	1 2	☐	*A "leai" alu i le fesili D1a*
A 1b	*Afai e Ioe :* Sa e taumafaina i totonu ole 12 masina talu ai?	Ioe Leai	1 2	☐	*A "leai" alu i le fesili D1a*
A 2	I le 12 masina talu ai, e faafia ona e taumafaina se ipu ava malosi se tasi pe sili atu? *(READ RESPONSES)* *USE SHOWCARD*	5 aso pe sili atu i le vaiaso 1-4 aso o le vaiaso 1-3 aso i le masina Lalo ifo i le tasi i le masina	1 2 3 4	☐	
A 3	I taimi e te taumafaina ai le ava malosi, e fia ni ipu ava faapenei e masani ona e taumafaina i le aso?	Numera Le iloa	7 7	☐☐	
A 4	I le 7 aso talu ai, e fia ni ipu ava faapenei sa e taumafaina i aso taitasi? *(RECORD FOR EACH DAY* *USE SHOWCARD)*	Aso Gafua Aso Lua Aso Lulu Aso Tofi Aso Faraile Aso Toonai Aso Sa		☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐	

Taumafa Tatau (Section D)				
Mafaufau i au taumafa masani o le taeao, aoauli, afiafi ma vai'aiga mo fesili o loo i lalo *(faaali fua o 'aiga ma ituaiga o fualaau 'aina).* Ole a 'ou fa'aali atu ni ata e fesoasoani ile fa'amalamalamaina o nei fesili.				
D 1a	E fia ni aso o le vaiaso e te taumafa ai i se fualaau 'aina suamalie? *(Vaai i le ata A)*	Aso	☐	*A"0" alu i le* fesili D2a
D 1b	E fia ni au 'aiga o fualaau 'aina suamalie e te taumafaina i se aso se tasi o ia aso? *(e aofia ai vaisalo, supoesi, suafai, kokoesi, salati fualaau 'aina suamalie, etc.)* *(Vaai i le ata A)*	Aofai o 'aiga	☐☐	
D 2a	E fia ni aso e te taumafa ai i se fualaau 'aina faisua/meaai aano i le vaiaso? *(Vaai i le ata B & C : e aofia ai talo, taamu, fai, ulu, ufi, pateta, umala, kapisi, kukama, maukeni, salati fualaau 'aina taumafa mata, etc.; e le aofia ai araisa ma falaoa).*	Aso	☐	*A "0", alu i le fesili P1*
D 2b	E fia ni au 'aiga o fualaau 'aina faisua / meaai aano sa e taumafaina i se aso se tasi o ia aso? *(Vaai i le ata B & C)*	Aofai o 'aiga	☐☐	

Faagaioiga o le Tino (Section P)				
Mafaufau i au galuega masani i le vaiaso, e tali mai ai fesili nei mo le 12 masina ua tea.				
P 1	E tele ina e nofo pe ete tu e te le gaioi, pe a e galue i lau galuega? *(ie. laititi ifo ma le 10 minute e savali ai mo se taimi)*	Ioe Leai	1 2	☐ *A Ioe, alu i le fesili P6*
P 2	E aofia i lau galuega masani le faatinoina o galuega mamafa e pei o le siisii mea mamafa, eliina o lua po o galuega fau fale? (ie: *Galuega e faatinoina i le 10 minute pe sili atu).*	Ioe Leai	1 2	☐ *A Leai, alu i le fesili P4*
P 3a	E fia ni aso o le vaiaso e masani ona e galue ai faapea?	Aso i le vaiaso		☐
P 3b	O le a se umi o le taimi e masani ona e galue ai faapea i le aso?	Itula ma minute PO O Minute		hrs☐☐ : mins☐☐ Po o minute ☐☐☐
P 4	E i ai ni vaega o lau galuega e manaomia ai le faanatinati o lau savali po o le siisii foi o ni mea e le mamafa tele i se 10 minute pe sili atu foi?	Ioe Leai	1 2	☐ *A Leai, alu i le fesili P6*
P 5a	e fia ni aso o le vaiaso e te faatinoina ai ia galuega?	Aso i le vaiaso		☐

P 5b	O le a se umi o le taimi e masani ona e galue ai faapea i le aso?	Itula ma minute PO O Minute only		hrs☐☐ : mins☐☐ Po o minute ☐☐☐	
P 6	O le a le umi e masani ona e faigaluega ai i aso taitasi?	Itula		hrs ☐☐	
E 'ese mai ai I au tali I fesili ua te'a atu. Oute toe fia fesili atu ia te oe I au fealua'iga. Fa'ata'ita'iga o lou alu e faigaluega, fa'atau, ma lou alu ile lotu.					
P 7	E te savali pe ete alu i se uila vili vae ma e toe foi mai i se taimi e sili atu i le 10 minute? *(ie: i le galuega, maketi, lotu etc)*	Ioe Leai	1 2	☐	*A Leai, alu i le fesili P9*
P 8a	e fia ni aso o le vaiaso e masani ona e malaga ai faapea?	Aso i le vaiaso		☐	
P 8b	O le a se umi o le taimi e masani ona e malaga ai faapea i le aso?	Itula ma minute PO O Minute only		hrs☐☐ : mins☐☐ po'o minute ☐☐☐	
(O fesili nei e faasino tonu i galuega e faagaioi ai lou tino i ou taimi paganoa i tafaoga ma taaloga (e le aafia ai galuega e te faatinoina pe a e faigaluega pe faimalaga foi i se mea).					
P 9	I ou taimi paganoa/tafao/taalo etc., e tele ina e saofa'i, taotooto faalagolago, tu ma savali foi mo se umi e i lalo ifo o le 10 minute? (*eg. matamata TV)*	Ioe Leai	1 2	☐	*A Ioe, alu i le fesili P 14*
P 10	I ou taimi paganoa, e te faatinoina ni galuega mamafa e pei o le siisii mea mamafa, tamo'e pe ete taalo malosi foi i ni taaloga i le 10 minute pe sili atu?	Ioe Leai	1 2	☐	*A Leai, alu i le fesili P 12*
P 11a	Afai e "Ioe" e fia ni aso o le vaiaso ete faatinoina ai ia galuega?	Aso i le vaiaso		☐	
P 11b	O le a le umi o le taimi e te faia ai ia galuega i se aso se tasi o le vaiaso?	Itula ma minute PO O Minute only		hrs☐☐ : mins☐☐ po'o minute ☐☐☐	
P 12	I ou taimi paganoa e te faatinoina ni gaioiga e le mamafa tele e pei o le taalo, savali, vili se uila po o le aau, i le 10 minute pe sili atu?	Ioe Leai	1 2	☐	*A Leai, alu i le fesili P 14*
P 13a	Afai e "Ioe", e fia ni aso o le vaiaso e te faatinoina ai ia galuega?	Aso i le vaiaso		☐	
P 13b	O le a le umi o le taimi e te faatinoina ai ia galuega i le aso?	Itula ma minute PO O Minute only		hrs☐☐ : mins☐☐ or minutes ☐☐☐	
O le fesili lenei e faasino i au galuega e fai pe a e nofonofo pe ete taotooto i taimi e te ala ai. Mafaufau i le 7 aso ua tuana'i atu i le taimi lea o lo o e faigaluega i lou fale faigaluega po o lou lava fale, pe o le taimi o lo o e tafao pe nofonofo ai ma taimi e te alu ai e vaai au uo pe matamata le TV. Ae le o le taimi e te tofa ai.					
P 14	I le 7 aso talu ai, o le a le umi o se taimi e masani ona e nofonofo pe ete taotooto ai, i se aso se tasi?	Itula ma minute PO O Minute only		hrs☐☐ : mins☐☐ or minutes ☐☐☐	

Step 2 Physical Measurements					
Height and weight				Coding Column	
M 1	Technician ID Code			☐☐	
M 2a & 2b	Device IDs for height and weight	(2a) height☐ (2b) weight☐			
M 3	Height	☐☐☐.☐ (in Centimetres)			
M 4	Weight *If too large for scale, code 666.6*	☐☐☐.☐ (in Kilograms)			
M 5	*(For women)* O 'E ma'l-tagata-(ma'l-to)?	Yes No	1 2	☐	*If Yes, Skip Waist*
Waist					
M 6	Technician ID			☐☐	
M 7	Device ID for waist			☐	
M 8	Waist circumference	☐☐☐.☐ (in Centimetres)			

Blood pressure				Coding Column
M 9	Technician ID			☐☐
M 10	Device ID for blood pressure			☐
M 11	Cuff size used	Small Normal Large	1 2 3	☐
M 12a	Reading 1 Systolic BP	Systolic	mmHg	☐☐☐
M 12b	Diastolic BP	Diastolic	mmHg	☐☐☐
M 13a	Reading 2 Systolic BP	Systolic	mmHg	☐☐☐
M 13b	Diastolic BP	Diastolic	mmHg	☐☐☐
M 14a	Reading 3 Systolic BP	Systolic	mmHg	☐☐☐
M 14b	Diastolic BP	Diastolic	mmHg	☐☐☐
M 15	Ile lua vaiaso ua te'a, na togafitia Oe ile toto maualuga ini fuala'au e se Foma'I?	Ioe Leai	1 2	☐

Step 3 Biochemical Measurements

CORE	Blood glucose		Coding Column
B 1	B1 Ile 12 itula ua te'a atu, sa e taumafa pe inu ise vai-inu e ese mai ile vai-auli?	Yes 1 No 2	☐
B 2	Technician ID Code		☐☐
B 3	Device ID code		☐
B 4	Time of day blood specimen taken (24 hour clock)		hrs☐☐ : mins☐☐
B 5	Blood glucose	 Low 1 High 2 Unable to assess 3	mmol/l ☐☐.☐ ☐
CORE	Blood Lipids		
B 6	Technician ID Code		☐☐
B 7	Device ID code		☐
B 8	Total cholesterol	 Low 1 High 2 Unable to assess 3	mmol/l ☐☐.☐☐ ☐

Appendix 4. Detailed equipment list

Specified equipment:

Weight:

Heine 737 Scales x4

Standard weights to calibrate scales x2 sets of 2 different weights

Flat boards x2

Height:

Seca Leicester Height Measure x4

Waist:

Figure Finder constant tension tape measure x8

Blood pressure:

Omron T5 with standard cuff and adaptor x4

Large cuff size (32cm-42 cm) x4

Sphygmomanometer with large cuff x2

Processing and analysis of biochemical measures:

Measurement of blood glucose and blood cholesterol was performed using Accutrend GCT devices from Bayer Corp which were purchased through the WHO, Apia Office.

Specified equipment:

Blood Glucose:

Glucometers (Advantage) x4

Glucometer strips x2100

Glucometer control solution

Blood Cholesterol:

Cholesterol Meters: Accutrend GC display in mg/dl x4

Cholesterol strips: pack of 25 x84

Cholesterol GC (1) Control Solution x11

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