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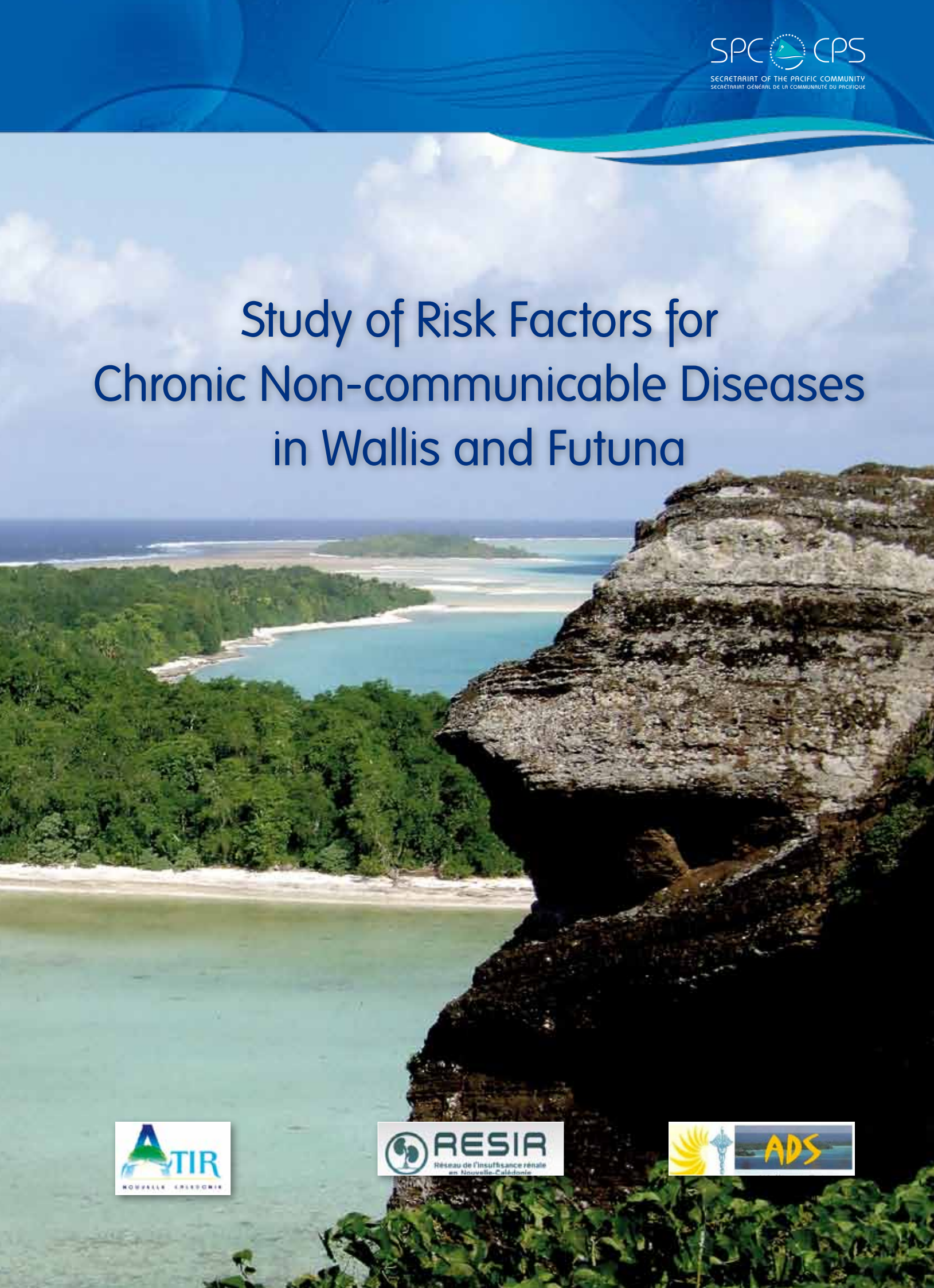
Study of Risk Factors for Chronic Non-communicable Diseases in Wallis and Futuna



Study of Risk Factors for Chronic Non-communicable Diseases in Wallis and Futuna

REPORT
by
New Caledonia Renal Failure Network (RESIR), Wallis and Futuna Statistics and Economic Surveys Department (STSEE), and Secretariat of the Pacific Community (SPC) Public Health Division,
Healthy Pacific Lifestyles Section.

Secretariat of the Pacific Community
Noumea, New Caledonia
June 2010

SPC
Secretariat
of the Pacific
Community

Original text: French

Secretariat of the Pacific Community Cataloguing-in-publication data

Study of risk factors for chronic non-communicable diseases in Wallis and Futuna /
report by New Caledonia Renal Failure Network (RESIR), Wallis and Futuna Statistics
and Economic Surveys Department (STSEE), and Secretariat of the Pacific Community (SPC)
Public Health Division Healthy Pacific Lifestyles Section

1. Diseases — Prevention — Wallis and Futuna Islands.
2. Substance abuse — Wallis and Futuna Islands.
3. Physical fitness — Wallis and Futuna Islands.
4. Nutrition — Wallis and Futuna Islands.

I. Title II. Réseau de l'Insuffisance Rénale en Nouvelle-Calédonie
III. Wallis and Futuna Islands. Service territorial de la statistique et des études économiques
IV. Secretariat of the Pacific Community

616.98099616 AACR2

ISBN: 978-982-00-0463-4

This report is based on the French-language publication *Étude des facteurs de risque des maladies chroniques non transmissibles à Wallis et Futuna*. Some of the tables relating to kidney disease in the original are replaced by a summary table and accompanying commentary in this English translation.

Design and layout: Muriel Borderie – SPC Publications Section
Prepared for publication at the Secretariat of the Pacific Community, Noumea, New Caledonia, 2011

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Acknowledgements

This report on the study of risk factors for chronic non-communicable diseases in the population of Wallis and Futuna is the result of close collaboration between a variety of organisations and individuals, all of whom contributed to the study's formulation, implementation and analysis.

The results were analysed and this report written as a joint effort by:

- Dr Jean-Michel Tivollier, kidney specialist, Gaston Bourret Hospital, Noumea;
- Mme Katia Cateine, study coordinator, New Caledonia Renal Failure Network (RESIR);
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- Mr Gregory Keeble, Monitoring and Evaluation Officer, Healthy Lifestyle Section, SPC Public Health Division;
- Mr Soane-Paulo Mailagi, Head of the Census and Social Surveys Section of the Wallis and Futuna Statistics and Economic Surveys Department (STSEE WF).

We would like to warmly thank the entire community of Wallis and Futuna for their welcome, their kindness, the high level of their participation in the study, and their patience during the data collection phase.

Our special thanks go to Wallis and Futuna's territorial and customary authorities for their welcome and assistance: the King of Wallis (Lavelua d'Uvea) Kapeliele Faupala and his ministers; the King of Alo (Tu'i Agaifo) Petelo Vikena; and the King of Sigave (Tu'i Sigave) Visesio Moeliku and their ministers; the Prefect of Wallis and Futuna, Philippe Paolantoni; the President of the Territorial Assembly, Victor Brial; and all the elected officials.

Many thanks also go to the Wallis and Futuna Health Agency and the Association for the Treatment of Kidney Failure in New Caledonia (ATIRNC) for providing office space (the Mata Utu haemodialysis centre, public health clinics on Wallis, and Kaleveleve Hospital on Futuna) and the medical analysis laboratory in Sia Hospital. Special thanks to Mr Jean-Pierre Batard, Director of the Wallis and Futuna Health Agency; Dr Laurent Morisse and Dr Jean-François Yvon; Mme Marie Isabelle Lisiahi and Mme Elisabeth Dutaut, Wallis and Futuna Health Agency (ADS) health officials; and Dr Mathieu Sacquepee, kidney specialist for the Association for the Treatment of Kidney Failure (ATIR), for their contributions.

A special mention goes to all the laboratory technicians, nurses, aides and student volunteers from many places who contributed to the formulation of this project, arrangements in the field and data collection (see Appendix 2 for a list). This study could not have been done without them.

Thanks to the management of Gaston Bourret Hospital for providing their laboratory's blood analysers and their medical and technical staff: Dr Yann Barguil, clinical pathologist; Dr Jean-François Cantin, kidney specialist; Lyne Mai, health manager; and the entire team of technicians.

Thanks to our funding partners: Laboratoires Roche, Laboratoires Abbott, Air Calin, CIPAC (Noumea), Medi-Services (Noumea), Général Import (Wallis), Comimex (Noumea), Cat services (Wallis).

And finally, many many thanks to the media — Les Nouvelles-Calédoniennes, RFO Nouvelle-Calédonie, RFO Wallis and Futuna, Vakala information site — for widely broadcasting the information and, in this way, contributing to the high level of participation in the community.

Foreword

Many projects need to be undertaken and continued in various areas of medicine and management at the Wallis and Futuna Health Agency: medical projects, improvements in the quality and security of health care for the benefit of the population, organisational improvements, optimisation of integration into a network of regional healthcare and re-establishment of financial integrity. The Health Agency is more than a healthcare institution. It is responsible for the promotion of public health in accordance with the Code of Public Health (legislative provision Article L 6431-4).

Within a very specific morbidity and mortality context (prevalence and risk factors that are particularly alarming in several respects in this country) of great concern to us is the fact that our activities are marked by major curative obligations, a consequence of inadequate prior health education and prevention work, and also insufficient knowledge of the state of health and behaviour of Wallisians and Futunans.

In other words, to be able to attain a state of complete physical, mental and social wellbeing (which is and will always remain the best blueprint for health) there are many efforts to be made, not least in terms of knowledge of health and risk behaviour. The ability to prevent or anticipate is not enough. Convincing arguments need to be based on data from population surveys.

Any advice provided to the population, authorities and traditional leaders with regard to poor lifestyle habits, what should be avoided (smoking and drinking) and what needs to be promoted (better eating habits and physical exercise) must be based on investigations and research undertaken in a methodical and practical manner.

The RESIR survey undertaken in 2009 achieved this objective. It is even more remarkable in that the lessons learned go beyond the present; it is possible to compare the current situation with the data from a study undertaken in 1986 and to better understand — in order to better counter — the trends to be feared in the future. We sincerely thank and congratulate the authors of this survey, which is extremely opportune and beneficial. For Wallis and Futuna this survey will become a reference tool for the resumption of prevention work, which we firmly intend to develop.

Benjamin Franklin said: 'Tell me and I forget. Teach me and I remember. Involve me and I learn.' We are convinced that the proper application of the RESIR survey outcomes will result in the involvement of a maximum number of stakeholders.

(signed) Claude Wetta
Director of Wallis and Futuna Public Health Agency

Foreword

The results of the *Study of risk factors for chronic non-communicable diseases in Wallis and Futuna* provide compelling evidence of a high prevalence of non-communicable diseases (NCDs) and their associated risk factors. This information will be valuable in guiding the efforts of the territory and its health institutions to reduce risk factors associated with NCDs through a combination of policy development and the formulation and implementation of public health programmes within the framework of the national NCD strategy.

NCDs have often been neglected in favour of work on diseases such as HIV, tuberculosis and malaria that have been given higher priority by donors. Yet NCDs affect more people in the Pacific than all the other diseases put together. It is therefore fitting that the results of the study are being published by the Secretariat of the Pacific Community (SPC) at this time, given that 2011 is shaping up to be the 'Year of NCDs' with the United Nations High-Level Summit on NCDs to be held in New York in September.

Funding support for the study was provided by a grant from the French Pacific Fund (AFD) administered by the Healthy Pacific Lifestyle Section of SPC and complemented by the New Caledonia Renal Failure Network, which took the lead role in conducting the study.

Technical assistance for the study and translation of the results supporting the implementation of the Wallis and Futuna National NCD Strategy were made possible through the 2-1-22 NCD programme, which is managed by SPC and the World Health Organization (WHO), and funded by the Australian government overseas aid programme (AusAID) and the New Zealand Aid Programme. The study was carried out in collaboration between the Wallis and Futuna Health Agency, the Wallis and Futuna Statistics and Economic Surveys Department, the New Caledonia Renal Failure Network and SPC. In addition, a collaborative approach with the community and volunteers kept costs down.

Notably, the study is part of an intervention to identify high-risk individuals—setting up healthy lifestyle and behaviour change interventions and monitoring progress over the next five years.

This study will complement the WHO STEPS surveys being done for all countries in the region. SPC remains committed to supporting Wallis and Futuna in its fight against NCDs as one of a wide range of stakeholders, including governments, civil society, regional agencies, donors and communities themselves.

William (Bill) Parr
Director, Public Health Division
Secretariat of the Pacific Community

1. Introduction

1.1 Non-communicable disease surveillance: background

The Pacific region is currently experiencing rapid growth in non-communicable diseases, to such a degree that it could easily be called an epidemic. The emergence of such diseases, e.g. diabetes, high blood pressure, cardio-vascular diseases, seem to be linked, in part, to rapid changes in behaviours, with the growing phenomenon of westernisation of lifestyles. Chronic non-communicable diseases affect all socio-economic and ethnic groups. They may account for about 60% of overall mortality.[1] It has also been estimated that 80% of the deaths linked to chronic non-communicable diseases occur in developing countries.[2]

Diabetes, hypertension, chronic renal failure and cardio-vascular disorders are diseases that are often linked to each other or are the causes or consequences of each other. They are commonly linked to overweight, obesity and a sedentary lifestyle. It is difficult to give exact figures for the overall financial cost of caring for people with these diseases and their complications but it accounts for a significant part of health expenditure.

In human terms, the patients and their close family and friends need to make adjustments in their daily life and sacrifices in their professional and non-professional activities, as the treatment and nursing care are time-consuming and often psychologically and/or physically debilitating.

The current state of knowledge has allowed initial preventive measures to be implemented in order to reduce the incidence of these diseases. A study carried out at the grassroots level should make it possible to assess the effectiveness of these measures and adapt them to specific circumstances. It was with this in mind that the Secretariat of the Pacific Community (SPC), the Association for the Treatment of Kidney Failure in New Caledonia (ATIR) and the Wallis and Futuna Health Agency (ADS) began a project designed to determine the prevalence of chronic non-communicable diseases in the population of Wallis and Futuna and to identify their risk factors so as to develop preventive programmes that are adapted to local circumstances. The Kidney Failure Network of New Caledonia (RESIR) was in charge of coordinating the project.

The study is based on the World Health Organization's STEPwise approach for the surveillance of risk factors for chronic non-communicable diseases and on the International Society of Nephrology (ISN) Program for Detection and Management of chronic **K**idney disease, **H**ypertension, **D**iabetes and **C**ardio-vascular diseases in developing countries, the KHDC Program.

1. *Daar A.S., P.A. Singer & D.L. Persad et al. 2007. Grand challenges in chronic non communicable diseases. The top 20 policy and research priorities for conditions such as diabetes, stroke and heart diseases. Nature 450:494–496.*

2 *Dwyer T., H. Tieru, K. Hynes & C. Zhang. 1999. Profile of cardiovascular diseases, diabetes mellitus and associated risk factors in the Western Pacific region. World Health Organization, Philippines.*

1.2 The situation in Wallis and Futuna

1.2.1 Geography

Located in the southern hemisphere, the Territory of Wallis and Futuna Islands comprises a group of three main islands — Wallis, Futuna and Alofi — located some 16,000 km from Paris and 2000 km from New Caledonia, between Fiji in the west, Samoa in the east and Tonga in the southeast. These islands are part of the Pacific's Polynesian sub-region. Fringing reefs surround the islands, which are volcanic and hilly; Mount Sigave on Futuna is 765 metres high and on Wallis the highest point is 151 metres. Rivers, which are numerous on Futuna but rare and temporary on Wallis, are dry from April to October and then suddenly overrun their banks during the rainy season. The climate is equatorial.

1.2.2 Population

In 2008, there were 13,445 inhabitants in Wallis and Futuna: 4238 on Futuna (31.52%) and 9207 on Wallis (68.47%). For the first time in half a century, the population of this territory decreased; in the 2003 census 14,944 inhabitants were reported. During the period between the two censuses, the population dropped some 10% (-8.6% on Wallis and -13% on Futuna). The island of Alofi is not inhabited. Most of the inhabitants are Polynesian (97.3%). There are a few European inhabitants.

1.2.3 Economy

The islands suffer from limited natural resources, particularly fresh water: on Alofi there is none, which is the reason the island is not inhabited. This deficit allows only an economy based on artisanal lagoon fishing and subsistence farming for local needs. These islands also suffer from their distance and isolation from potential markets.

Slightly more than 1070 of the approximately 1800 jobs are in the public service. While more than 300 young people come out of the educational system each year, only about 15 new jobs are created. This high unemployment is offset by a system of community sharing, which is the only way to meet basic needs since acquiring a property is not possible in these islands where property is essentially collectively owned.

The danger and difficulties of maritime access to the islands due to the reefs and rocky shore line; the lack of a deep water port; the distance from major commercial routes to richer countries like Australia and New Zealand; the virtual lack of any exportable goods (forcing cargo ships to leave empty, which contributes to higher costs for importing manufactured items); and the small number of flights that would facilitate the development of tourism — all these make development on the islands difficult, so a constant inflow of public capital is necessary.

1.2.4 Government

Wallis and Futuna is made up of three traditional monarchies: Uvéa (on Wallis), ʻAlo and Sigave (on Futuna). The kings rule together with elected councils and the Representative of the French Government, known as the *Administrateur supérieur* (senior administrator). In contrast to metropolitan France, French overseas departments and overseas entities, the Territory is not divided into townships but into electoral districts, with the head of the district holding powers equivalent to those of a mayor. The electoral districts cover exactly the same areas as each of the three kingdoms, i.e. the territorial electoral district of Wallis (for the Kingdom of Uvéa), the largest and most populated of the three; the territorial districts of ʻAlo (which also includes the uninhabited island of Alofi) and Sigave, the smallest, on Futuna. Each is a corporate entity with its own budget managed by a district council made up of customary chiefs and chaired by the king.

On Futuna, the two kingdoms (which play the adjudicative role of departmental arrondissements and sub-prefectures, the administrative role of a mayor's office, and have some of the responsibilities of general councils) coexist, and each covers several villages. On Wallis, three customary districts, each covering several villages, carry out the administrative duties of a mayor's office under the authority of a single king, who presides over civil adjudicative duties.

Since the 2003 constitutional amendment that abandoned the concept of 'overseas territory', Wallis and Futuna has been an overseas entity that enjoys fairly broad autonomy within the French Republic.

1.2.5 Health and social services

The Health Agency for the Territory of Wallis and Futuna Islands is a French national public administrative agency that enjoys financial and administrative autonomy and was created by the Order of 13 January 2000. Its purpose is 'to ensure health protection in the Territory'.

The Health Agency on Wallis comprises Sia Hospital — which has a 51-bed capacity, a technical support centre and medical and technical services — and three neighbourhood health care centres located in the island's three districts, Hihifo in the north, Hahaké in the centre and Mua in the south. On Futuna, the Health Agency comprises the Kaleveleve local hospital, which has a 21-bed ward.

The Health Agency has significant numbers of medical evacuations: from Futuna to Wallis (more than 400 a year) and from Wallis to Noumea, Australia or metropolitan France (more than 350 a year).

1.2.6 Health status of the population of Wallis and Futuna

Wallisian and Futunan men and women have a recognised high prevalence of diabetes and are, in general, overweight. A study Dr Bezannier carried out on Wallis and Futuna in 1996 and 1999 (weight, blood sugar levels, blood pressure for most of the population) gives a general idea of the epidemiological situation with diabetes. The methodology used for Dr Bezannier's study (results higher than 8.2 mmol/l when fasting and two separate samples) indicate that 8.8% of the adult population was diabetic. Given current criteria for determining diabetes (results higher than 7 mmol/l when fasting and two separate samples) these figures are probably lower than the actual figures.[3]

3 *R. Poirier , Epidémiologie du diabète à Wallis et Futuna, Bulletin médical Calédonien et Polynésien, mai 2004, spécial Wallis et Futuna, p 09-10.*

2. Study methodology

2.1 Purpose of the study

The purpose of this study was to determine the prevalence of chronic non-communicable diseases (diabetes, hypertension, cardio-vascular disorders) and their associated risk factors, including smoking, alcohol consumption, physical exercise, obesity, high blood pressure, and high sugar and fat levels in the blood.

As well as making data collected during this study available for local and regional planning purposes, the data will also be available for international agencies, such as: the World Health Organization's (WHO's) global STEPwise database on risk factors for chronic non-communicable diseases and ISN's KHDC Program's global database. This study was carried out jointly by the ADS, RESIR, ATIR, SPC and Wallis and Futuna's STSEE (Statistics and Economic Survey Department).

It should allow the territorial and health institutions of Wallis and Futuna to:

- formulate public health programmes designed to reduce risk factors that lead to chronic non-communicable diseases,
- anticipate the population's future health needs.

2.2 Sampling method

It would have been very difficult to carry out a study involving 2000 people, as recommended in the WHO's STEPwise study guide, given the small size of the adult population, i.e. about 8400 people spread over two islands (Table 1). Therefore, a smaller, but still adequate, sample of 560 people was selected and it was made as representative of the overall population as possible by eliminating selection bias. The task of coming up with a methodology to make this representative sample was given to a working group that brought together statisticians from SPC and STSEE.

Table 1: Adult population (18 years and older) of Wallis and Futuna

Island	District	Males	Females	Total
Wallis	Hahaké	1117	1237	2354
	Hihifo	680	739	1419
	Mua	1001	1114	2115
Futuna	Alo	759	804	1563
	Sigave	426	489	915
Wallis &	Total	3983	4383	8366
Futuna	Percent	47.61%	52.39%	100.00%

For confidentiality reasons, it was not possible to select the sample by drawing names at random from the 2008 general census results. Instead, the quota method was used to get a representative sample of the adult population of Wallis and Futuna. After selection, the subjects' participation was on a voluntary basis.

Four variables were used to stratify the selection of the participants:

- five-year age groups: 18 years old and over
- sex: male and female
- place of residence: presentation of villages by districts
- household size

The sample chosen for this study comprised 560 persons, i.e. 6.71% of the adult population living in Wallis and Futuna, aged 18 and older and with more than two years' residence in the Territory. The choice of sample size was based on the Bernoulli distribution for coverage, consistency and accuracy, given the human and financial resources available for the study and aiming for as low a margin of error as possible (Table 2).

Table 2: Sample weight. Bernoulli distribution

Confidence Interval	Sample Size	Margin of Error
3.0	2827	1.5
4.0	1866	2.0
5.0	1298	2.5
6.0	946	3.0
6.2	893	3.1
8.0	**560**	**4.0**
10.0	367	5.0
12.0	259	6.0
20.0	95	10.0

In order to form the sample, the first step was to select, at random, 560 households, divided by district on Wallis (Hihifo, Hahaké, Mua) and by electoral district on Futuna (Alo, Sigave). The 2008 map of dwellings used for the general population census formed the basis for the random selection of households. The map shows, against a digital backdrop, all the inhabitable dwellings on Wallis and Futuna. Figure 1 shows the map for Hihifo district. These data also helped to accelerate work and communications in the field, and decreased the risk of error.

Figure 1: Map of the villages of Vailala, Vaitupu and Tufuone in the district of Hihifo.

Distribution of the sample representing the population by sex/age group/district (Table 3) within the 560 selected households was done using sex/age group/district distribution tables for the entire population (Table 4).

Table 3: Number of males and females in the sample by age group and district

Age group	Hahake		Hihifo		Mua		Alo		Sigave		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
18–19	5	4	2	3	3	3	3	2	1	1	14	13
20–24	6	7	3	4	7	6	6	5	2	3	24	25
25–29	8	9	4	4	6	8	4	6	2	3	24	30
30–34	7	9	4	4	7	9	6	6	3	4	27	32
35–39	8	11	5	6	7	8	5	6	4	5	29	36
40–44	8	9	5	4	5	7	4	6	4	4	26	30
45–49	8	8	5	5	6	7	5	6	2	4	26	30
50–54	7	6	4	4	7	6	4	4	3	2	25	22
55–59	6	7	4	4	7	6	4	4	3	3	24	24
60–64	5	5	3	3	6	5	3	3	2	2	19	18
65–69	4	2	3	1	3	3	3	3	2	2	15	11
70–74	3	2	1	2	2	3	1	2	1	1	8	10
75+	3	3	1	3	2	3	2	3	0	1	8	13
Total	78	82	44	47	68	74	50	56	29	35	269	294

Table 4: Distribution of males and females in the total population by age group and district

Age group	Hahaké		Hihifo		Mua		Alo		Sigave		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
18–19	68	61	32	38	51	51	39	28	9	11	199	189
20–24	89	105	44	66	97	92	93	68	31	44	354	375
25–29	112	131	53	62	91	118	55	83	32	51	343	445
30–34	109	140	61	58	103	133	93	95	46	58	412	484
35–39	122	156	80	93	107	120	75	95	54	67	438	531
40–44	112	131	72	62	77	102	66	85	53	53	380	433
45–49	119	111	67	81	87	108	69	89	36	52	378	441
50–54	104	87	53	59	102	92	61	55	45	27	365	320
55–59	94	96	65	60	97	86	60	54	38	40	354	336
60–64	75	73	46	39	84	72	49	38	35	24	289	246
65–69	41	34	37	20	50	46	42	37	28	25	198	162
70–74	35	36	21	26	23	42	22	30	10	16	111	150
75+	35	50	22	48	32	47	31	45	6	18	126	208
Total	1115	1211	653	712	1001	1109	755	802	423	486	3947	4320

Finally, a random selection table (Table 5) was made, taking into account coverage by sex, district and age group. This table, which was used by agents in the field, made it possible to randomly select one person from the household and form a sample in the end (Table 6). An explanation of how this was done is given below Table 5.

Table 5: Extract from the table for random selection by district, sex and age group

Wallis			Futuna	
Hahake	Hihifo	Mua	Alo	Sigave
157	**91**	**142**	**106**	**64**
F 45-49 ans	H 45-49 ans	F 70-74 ans	F 25-29 ans	F 40-44 ans
F 45-49 ans	H 30-34 ans	H 70-74 ans	H 25-29 ans	F 30-34 ans
F 75 ans et +	H 40-44 ans	H 55-59 ans	F 65-69 ans	F 60-64 ans
F 55-59 ans	F 55-59 ans	F 20-24 ans	H 45-49 ans	F 55-59 ans
F 55-59 ans	F 55-59 ans	F 30-34 ans	H 18-19 ans	H 60-64 ans
H 40-44 ans	H 45-49 ans	F 20-24 ans	F 75 ans et +	H 40-44 ans
H 40-44 ans	F 40-44 ans	H 30-34 ans	F 40-44 ans	H 30-34 ans
H 60-64 ans	H 70-74 ans	F 60-64 ans	H 50-54 ans	F 35-39 ans
F 55-59 ans	F 70-74 ans	H 50-54 ans	F 30-34 ans	F 20-24 ans
F 35-39 ans	F 50-54 ans	F 40-44 ans	H 60-64 ans	H 18-19 ans
H 55-59 ans	F 75 ans et +	F 75 ans et +	H 50-54 ans	H 50-54 ans
F 40-44 ans	F 18-19 ans	F 40-44 ans	H 30-34 ans	F 65-69 ans
F 55-59 ans	H 55-59 ans	F 50-54 ans	F 35-39 ans	H 55-59 ans
F 45-49 ans	H 35-39 ans	F 45-49 ans	F 20-24 ans	F 30-34 ans
H 50-54 ans	F 45-49 ans	F 60-64 ans	F 60-64 ans	F 75 ans et +
H 50-54 ans	H 30-34 ans	H 35-39 ans	H 35-39 ans	F 18-19 ans
H 60-64 ans	F 45-49 ans	H 45-49 ans	H 20-24 ans	H 40-44 ans
F 35-39 ans	F 25-29 ans	H 30-34 ans	H 18-19 ans	F 35-39 ans
F 60-64 ans	F 30-34 ans	H 45-49 ans	F 20-24 ans	H 30-34 ans
H 50-54 ans	H 30-34 ans	F 45-49 ans	H 75 ans et +	F 40-44 ans

Explanation: When the interviewers arrived at a selected dwelling, they ran a finger down the column in the random selection table (beginning at the top) until they found the first occupant of that dwelling whose sex and age group corresponded to the one indicated. This was done in each district.

If the person was willing to take part in the survey, the box was checked, the interviewers went on to the next household and started again at the top of the column but passed over the checked box. They continued to do this until all the boxes had been checked.

If the person was not willing, the interviewers continued down the column until they found a new match within the household.

To compensate for any refusals, 10% of additional households were chosen randomly, i.e. a total of 616 households could be visited by the agents.

2.3 Fieldwork

2.3.1 Preliminaries

A preliminary team, composed of an SPC public health doctor and the RESIR coordinator, worked in the field from 24 to 31 January. They were in charge of contacting the Territory's political and customary institutions, the Bishop's office and the various agencies and volunteers taking part in the study:

- the Wallis Health Agency's medical and administrative service;
- the Head of the Census and Social Surveys Section of STSEE;
- the ADS clinical pharmacist and medical laboratory technicians;
- volunteer nurses from ADS and the *haele he lelei* walking group;
- the media (local radio, television, internet site: VAKALA).

The team was given the job of forming and training the group of volunteers (health professionals, students), determining each person's duties and handing out the related operating procedures and protocols.

Visits to the health clinics allowed the team to see how they were laid out and identify existing equipment and materials and what had to be acquired in order to implement the project.

In February, an initial batch of materials and equipment needed to collect and test biological samples was shipped in and stored at ATIR's haemodialysis centre in Mata Utu. A second shipment of materials was airmailed a month later.

A pilot test of the survey instrument was carried out with several volunteer patients at ATIR's haemodialysis centre, e.g. participants' understanding of the questionnaire, taking of body measurements over time.

The media was asked to broadcast information about the study to the community. Throughout the study, the local radio and television contributed in large part to the selected population's high level of participation by broadcasting reports on the team's work and holding live interviews during the TV news.

2.3.2 Field operations personnel

The main field operations were conducted in four weeks, from 30 March to 24 April 2009: one week on Futuna and one week each in the three districts of Wallis, Hahaké, Mua and Hihifo. The field teams were called in a week before the study began and given a brief review of everyone's roles and work schedule.

The field supervisors, two on Futuna and three on Wallis, had five different working documents:

- map of the locations of the dwellings;
- sample (randomly selected dwelling number);
- profile sheets (age group and sex, see Table 5);
- time-table for appointments (surname, first name, age, sex, does or does not need transport, date and time of appointment) to be given to the coordinators when completed;
- appointment slip to be given to volunteers (subject's name, date, time and place of appointment.

On Futuna, the medical team stayed in a rented house and the screenings were carried out at Kaleveleve Hospital. The team used a portable centrifuge to process the samples and package them. The tubes were then stored in a freezer at -20°C before being sent first to Wallis and then to Noumea. Very poor weather conditions blocked regular flights between the islands for more than a week. For that reason, the team had to stay there three more days than originally planned.

On Wallis the medical team stayed at the ATIR site. They had to be mobile so the ATIR provided a vehicle in which they made the rounds of the health clinics in the three districts, Hihifo, Hahaké and Mua. They were able to use one of the centrifuges at the Sia Hospital laboratory as long as they put the samples in the centrifuge and packaged them outside peak hours. For that reason, the teams worked between 11 a.m. and 1 p.m. The samples were kept in coolers with blocks of ice while waiting for processing. The packaged tubes were stored in the laboratory's freezer at -20°C while waiting to be shipped to the Noumea Hospital's biochemistry laboratory every Wednesday in appropriate coolers via the ADS' regular shipping route for laboratory samples.

Three visiting teams from Noumea took turns supervising the field operations on Wallis. Each team consisted of seven people on average, i.e. a kidney specialist and/or public health physician from the ATIR or SPC, a coordinator, a health manager from ATIR or RESIR, and ADS ATIR nurses and volunteers.

On average, 30 people were seen each day, early in the morning. A total of 506 people were screened over the four weeks out of the 621 invited for 560 expected, representing a participation rate of 81.5%.

2.4. Study instruments and questionnaire

The STEPwise method was used extensively to carry out this risk factor study.

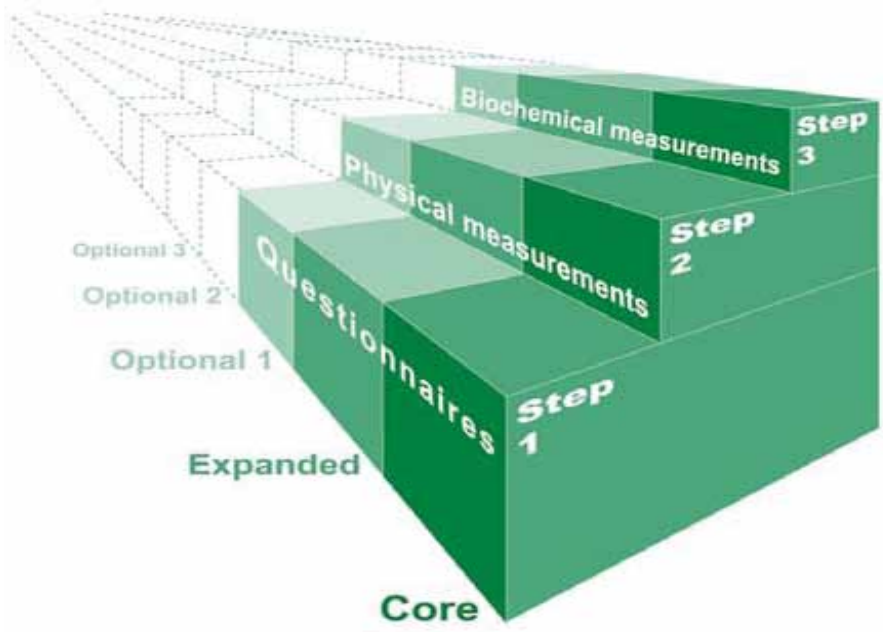

Figure 2: The STEPwise method

Step 1 involved administering a questionnaire covering the demographic information and lifestyles of people taking part in the study:

- Identity, ethnic origin, current profession, level of education
- Smoking, eating habits (fruits, vegetable, alcohol use), physical exercise (at work, travel, leisure time)
- Family medical history, personal medical history, current treatments.

Step 2 involved taking measurements of the body: systolic and diastolic blood pressure (three measurements taken at five minute intervals), heart rate, height, weight, abdominal circumference, hip circumference (waist to hip ratio).

Step 3 involved conducting laboratory tests on bio-chemical risk factors:

- Urine

  Qualitative tests using COMBINA 10 urine strips: urine density, Ph, leucocytes, nitrites, protein, glucose, ketones, urobilinogen, bilirubin, blood.

  Quantitative data (urine sample sent to the Noumea Hospital biochemistry laboratory): urinary ionogram, microalbuminuria, creatinine, protein (if traces of protein with urine strip)

- Blood

  Blood sugar levels, Jaffé creatinine, enzymatic creatinine, uric acid, total cholesterol, triglycerides, direct LDL-cholesterol, HDL-cholesterol, glycated haemoglobin (known diabetics)

On INSERM's recommendation, the following tests were added:

- Cystatine C (plasma marker of glomerular filtration rate that is less sensitive to variation due to body mass than plasma creatinine is)
- CRPus: a known cardio-vascular risk factor
- insulinaemia: makes it possible to study insulin resistance better.

The equipment used to take body measurements and carry out laboratory tests is described in Appendix 1.

2.5 Field procedure

The participants followed the procedure described below, which was decided on during the working group training sessions.

1. Go to the receptionist

Here the appointment slip is checked and information taken for the administrative part of the questionnaire. Stickers are prepared.

2. Go to the survey agent

The lifestyle part of the questionnaire is filled in and body measurements are taken (steps 1 and 2). The questions are asked in between the three blood pressure readings so as to respect the reading intervals.

3. Go to the person taking the samples

Here the participants are given a urine sample cup for the urine strip and blood is taken (four tubes, which are put in the centrifuge later, stored at – 20°C and shipped to the Noumea Hospital biochemistry laboratory). (Step 3)

4. Go to the doctor

The doctor checks that the questionnaire has been filled out completely, explains the 'informed consent' document that is signed by the participant and by the doctor, enters the data directly into database on the secure website, and informs the participant of the preliminary results.

5. Go to the person handing out snacks

A well-balanced breakfast (coffee, tea, fruit juice, bread, processed cheese) is offered.

Receptionist station:

The administrative information is noted on the questionnaire.

Stickers are prepared.

Survey agent station:

Measurements are taken: weight, height, abdominal and hip circumference, blood pressure.

Lifestyle part of questionnaire is filled in.

Sample station:

Urine (strip) and blood tests are done, questionnaire is verified.

Participants at the end waiting to meet the doctor.

2.6 Data management and analysis

Survey questionnaires were checked to assess the overall quality of data collection and completeness. Data entry was conducted at the Health Agency office on Wallis Island.

The project partners signed cooperation agreements. As the agency that would promote and house the data on its secure website, RESIR submitted the file to the French National Commission on Computing and Freedom of Information and took out civil liability insurance.

Post-stratification weights were calculated using the 2008 population census of the Wallisian and Futunan population aged over 15 years. This weighting adjusted for certain age/sex strata being either over- or under-represented in the survey data. Weighted sample means were computed for continuous variables. Frequency distributions were calculated using weighted frequencies for categorical variables. For both weighted frequency estimates and weighted means, 95% confidence intervals were reported by ten-year age groups and gender.

With support from SPC in Noumea, the Wallis and Futuna Statistics and Economic Surveys Department performed the statistical analysis and interpretation of the results. Data analyses were conducted using the pivot table function in MS Excel 2007.

In this report, the results of the analysis of the survey data are presented in statistical tables. For comparative purposes, some tables also include totals calculated for the 25–64 age group. The following nomenclature is used in the tables:

- n is the weighted number of observations contributing to the estimate of the statistic.
- % is the proportion of the weighted sample with the characteristic of interest (x 100).
- Mean is the weighted average of non-null values in a variable distribution ($\Sigma wx/n$).
- CI is the confidence interval at 95% significance (+/- SE *1.96).

It should be noted that not all totals in the tables add exactly due to rounding error, and caution should be exercised when interpreting percentages with small n values.

3. Results

3.1 Sample description

Of the 506 people who turned up, 19 were withdrawn from the study because they were not part of the sample but had come in place of the person originally invited. So, the results were analysed on a final sample of 487 people who represented the population (Tables 6, 7 and 8).

Table 6: Geographic distribution of sample and response rate

District	Population 18+	Selected Sample	Before Adjustment	Final Sample	Response Rate (%)
Hahaké	2354	176	132	126	71.6
Hihifo	1419	106	84	82	77.4
Mua	2115	159	133	126	79.3
Alo	1563	112	95	93	83.0
Sigave	915	68	62	60	88.2
Total	8366	560	506	487	87.0

Table 7: Population characteristics and sample coverage

Demographic Characteristics	Sample				Adult Population	
	Number of Persons	Percentage of Total	Weighted Proportion	Confidence Interval	Population	Percentage of Total
Sex						
Males	222	45.6	47.6	6.4	3983	47.6
Females	265	54.4	52.4	5.8	4383	52.4
Total	487	100.0	100.0	4.3	8366	100.0
Age group						
18-24	49	10.1	14.0	9.4	1166	14.0
25-34	95	19.5	20.3	7.7	1692	20.2
35-44	103	21.1	21.4	7.7	1790	21.4
45-54	98	20.1	18.1	7.3	1507	18.0
55-64	85	17.5	14.8	7.8	1234	14.8
65 +	57	11.7	11.7	8.1	977	11.7
Total	487	100.0	100.0	4.3	8366	100.0

3.2 Level of education

Table 8: Mean number of years of school by sex and age group

	Male			Female			Total		
Age group	n	%	CI*	n	%	CI	n	%	CI
–	22	65.3	18.24	26	75.1	17.68	48	70.3	12.78
25–34	22	50.0	15.60	34	62.1	12.57	56	56.7	9.88
35–44	13	27.4	13.76	22	40.1	11.94	35	34.2	9.08
45–54	11	25.5	13.06	10	22.6	10.77	21	24.0	8.35
55–64	7	17.3	10.51	6	17.8	12.18	13	17.5	7.96
65+	3	10.5	11.42	0	0.0	0.00	3	4.7	5.44
Total	77	33.4	6.15	98	38.7	5.80	175	36.2	4.23

Note: Number of people with some kind of qualification (junior secondary, baccalaureate or higher)

** CI: Confidence Index*

3.3 Behavioural measurements

3.3.1 Tobacco use

Tobacco use was estimated from the participants' responses to the following questions:

- Did you smoke over the past twelve months?
- Do you smoke on a daily basis?

Nearly 50% (+/-4.40) of the study population said they had smoked over the previous 12 months and 42.6% (+/-4.35) of those questioned said they smoked every day. Among the active smokers, men smoked more than women, i.e. 70.1% (+/- 5.97) compared to 30.1% (+/- 5.46). Men also smoked on a daily basis more often than women, i.e. 63.3% (+/-6.29) compared to 23.9% (+/- 5.08). Young people aged 18–34 (57%–58%) were the largest group of active smokers who smoked during the last 12 months. More than half the people aged 25–34 smoked on a daily basis. For women, the highest percentage of daily smokers was found in the 25–34 age group, i.e. 41.8% (+/- 12.78). After the age of 45, the percentage of women who smoked on a daily basis dropped sharply (to less than 20%) (Tables 9 and 10).

Table 9: Percentage of subjects who smoked over the previous 12 months

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	25	74.4	16.73	14	40.0	20.03	39	57.0	13.85
25–34	32	71.6	14.06	25	46.8	12.93	57	57.9	9.84
35–44	32	68.0	14.38	21	37.0	11.76	53	51.1	9.56
45–54	29	66.1	14.19	8	18.8	10.04	37	42.1	9.64
55–64	25	67.6	13.00	5	14.8	11.29	31	42.5	10.35
65 +	20	75.9	15.94	3	10.9	11.04	23	40.2	12.61
Total	162	70.1	5.97	77	30.1	5.46	239	49.1	4.40
25–64	118	68.4	6.95	60	31.5	6.17	177	49.1	4.96

Note: An active smoker is someone who smoked over the past 12 months.

Table 10: Percentage of subjects who smoked on a daily basis

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	22	66.3	18.12	7	21.6	16.84	30	43.7	13.87
25–34	27	61.9	15.15	23	41.8	12.78	50	50.8	9.97
35–44	29	61.3	15.02	17	30.4	11.21	46	44.4	9.51
45–54	27	61.8	14.56	7	16.8	9.62	34	39.0	9.53
55–64	23	62.8	13.43	3	7.8	8.52	26	36.4	10.07
65 +	18	69.0	17.24	3	10.9	11.04	21	37.1	12.42
Total	146	63.3	6.29	61	23.9	5.08	207	42.6	4.35
25–64	106	61.9	7.26	50	26.4	5.86	156	43.3	4.92

3.3.2 Alcohol use

Alcohol use was estimated from the participants' responses to the questions:

- Did you drink any alcohol over the past 12 months?
- How often do you drink alcohol?

The percentage of men who drank alcohol over the previous 12 months was more than twice (72.4% +/-5.83) that for women (32.8 % +/-5.59). A high percentage of young males aged 18–24 were active drinkers, i.e. 83.9% (+/-14.10) whereas for women, it was the 25–34 age group that had the most active drinkers, i.e. 63.9% (+/-12.45). For both sexes and all age groups combined, 12.1% (+/- 2.87) of those questioned said they drank alcohol at least once a week. Men drank on a regular basis seven times more often than women. Some 13.9% (+/- 4.52) of the males were heavy drinkers compared to 1.2% (+/- 1.32) of the females (Tables 11, 12 and 13).

Table 11: Percentage of the population who drank alcohol over previous 12 months

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	N	%	CI
18–24	28	83.9	14.10	18	51.3	20.44	46	67.4	13.11
25–34	36	81.0	12.25	35	63.9	12.45	70	71.5	9.00
35–44	37	76.4	13.09	14	24.3	10.45	50	48.2	9.56
45–54	32	74.5	13.06	9	20.3	10.35	41	47.0	9.75
55–64	26	69.2	12.82	7	20.3	12.80	33	46.0	10.43
65 +	9	36.7	17.97	2	5.1	7.78	11	19.3	10.15
Total	168	72.4	5.83	84	32.8	5.59	252	51.7	4.40
25–64	130	75.5	6.42	64	34.0	6.29	195	53.8	4.95

Note: An active drinker is a person who drank alcohol over the previous 12 months.

Table 12: Percentage of the population who drank alcohol at least once a week

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	8	23.3	16.21	1	4.0	8.04	9	13.6	9.57
25–34	13	29.2	14.18	3	5.8	6.06	16	16.3	7.36
35–44	9	18.1	11.88	2	3.0	4.15	10	9.9	5.72
45–54	6	14.9	10.66	0	0.0	0.00	6	7.3	5.09
55–64	12	32.7	13.04	2	4.7	6.77	14	19.5	8.29
65 +	3	12.3	12.26	0	0.0	0.00	3	5.6	5.89
Total	51	22.1	5.41	8	3.1	2.06	59	12.1	2.87

Note: A regular drinker is a person who drank alcohol at least once a week.

Table 13: Percentage of the population who were heavy drinkers

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	8	23.3	16.21	0	0.0	0.00	8	11.5	8.93
25–34	8	18.8	12.18	1	2.7	4.18	10	9.9	5.95
35–44	6	12.9	10.35	2	3.0	4.15	8	7.5	5.05
45–54	3	6.3	7.31	0	0.0	0.00	3	3.1	3.40
55–64	7	17.8	10.63	0	0.0	0.00	7	9.4	6.10
65+	1	2.3	5.57	0	0.0	0.00	1	1.0	2.59
Total	32	13.9	4.52	3	1.2	1.32	35	7.3	2.29

Note: A heavy drinker drinks alcohol at least once a week and at least three drinks at a time.

3.3.3 Kava use

Kava use was estimated from the participants' responses to the following questions:

- Did you drink kava over the past 12 months?
- Did you drink kava over the past 30 days?

There is a difference in kava use between the two islands of Wallis and Futuna. On Wallis, kava is drunk on special occasions whereas on Futuna, kava is drunk every evening in the villages (Tauasu), bringing the young and not-so-young together around the *tanoa* (kava bowl). The significant difference in kava use between men and women is due to the fact that traditionally on Wallis and Futuna, kava is a drink reserved exclusively for men. More than half the men questioned said they drank kava over the previous 12 months. The percentage of women who had drunk kava over the previous 30 days was very low, i.e. 0.6% (+/-0.91). Some 41.2% (+/-6.42) of the men were regular kava drinkers (drank it over the previous 30 days), and men aged 55–64 were the heaviest drinkers, i.e. 50.7% (+/-13.89) (Tables 14 and 15).

Table 14: Percentage of the population who drank kava over the previous 12 months

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	19	57.0	18.97	0	0.0	0.00	19	28.1	12.57
25–34	21	47.9	15.58	2	2.8	4.27	23	23.0	8.38
35–44	25	51.6	15.41	1	1.5	2.96	25	24.4	8.22
45–54	21	49.2	14.99	1	1.5	3.09	22	25.0	8.46
55–64	22	57.2	13.75	1	2.7	5.16	22	31.3	9.71
65 +	11	42.4	18.43	1	2.6	5.69	12	20.6	10.39
Total	119	51.1	6.52	5	1.9	1.61	123	25.3	3.82

Note: An active kava drinker is a person who drank kava over the previous 12 months.

Table 15: Percentage of the population who drank kava over the previous 30 days

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	15	45.8	19.09	0	0.0	0.00	15	22.6	11.69
25–34	20	44.8	15.51	0	0.0	0.00	20	20.1	7.98
35–44	18	38.6	15.01	1	1.5	2.96	19	18.5	7.43
45–54	17	38.6	14.59	1	1.5	3.09	17	19.8	7.78
55–64	19	50.7	13.89	0	0.0	0.00	19	26.7	9.26
65 +	6	24.0	15.93	0	0.0	0.00	6	10.8	7.99
Total	95	41.2	6.42	1	0.6	0.91	97	19.9	3.51

Note: A regular kava drinker is a person who drank kava over the previous 30 days.

3.3.4 Fruit and vegetable consumption

Fruit and vegetable consumption was estimated from the participants' responses to the following questions:

- Do you eat fruit every day?
- How many different kinds of fruit do you eat on those days when you eat fruit?
- Do you eat vegetables every day?
- How many different kinds of vegetable do you eat on those days when you eat vegetables?

To evaluate cardio-vascular risk, the following selected fruits were named in the questionnaire: pineapples, oranges, pawpaw, bananas, apples, pears, grapefruit, mangoes, lemons, guavas, passion fruit (coconut was excluded), and the following vegetables were named: leafy vegetables (spinach, cabbage, leeks, lettuce, pumpkin or squash leaves, taro leaves), red-orange-yellow vegetables (capsicum, pumpkin, tomatoes, carrots, maize, zucchini, eggplant, squash), and other vegetables (green beans, cucumbers, broccoli, onions, red beets). Cassava, taro, yam, breadfruit, potatoes and other starchy foods were excluded. Posters giving examples of fruit and vegetables were used to help people understand better.

On average, women ate more fruit and vegetables on a daily basis than men did, i.e. 36.8% (+/-5.74) compared to 29.0 % (+/-5 .92). Overall, young people (18–34 years old) ate more fruit and vegetables than their elders, i.e. 38.9% of 18–24 age group (+/- 13.64) and 41.4% of the 25–34 age group (+/- 9.82) compared to 25% to 34% in the 35–65 age group. Some 86.8% of the men (+/- 4.42) and 83.6% of the women (+/- 4.41) ate less than five fruits and/or vegetables per day. Overall, it was the older age groups that ate less than five fruits and/or vegetables a day (Tables 16–19).

Table 16: Percentage of the population who ate fruit on a daily basis

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	8	22.8	16.08	11	31.2	18.94	18	27.1	12.42
25–34	13	28.4	14.07	18	33.2	12.20	31	31.1	9.23
35–44	9	18.3	11.92	14	24.0	10.41	22	21.4	7.85
45–54	5	10.6	9.24	11	24.7	11.10	16	17.8	7.47
55–64	5	14.2	9.70	9	26.6	14.07	14	20.1	8.39
65 +	5	20.5	15.06	8	24.6	15.28	13	22.7	10.77
Total	44	19.0	5.12	70	27.5	5.32	114	23.5	3.73

Note: A daily fruit-eater is a person who ate at least one fruit every day.

Table 17: Percentage of the population who ate vegetables on a daily basis

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	9	26.5	16.91	4	12.0	13.30	13	19.2	11.01
25–34	9	20.6	12.62	8	14.6	9.15	17	17.3	7.54
35–44	6	13.0	10.38	8	13.6	8.36	14	13.3	6.51
45–54	3	6.4	7.32	9	19.4	10.16	11	13.0	6.56
55–64	5	14.4	9.75	8	23.3	13.46	13	18.6	8.15
65 +	4	16.6	13.88	5	16.2	13.08	9	16.4	9.52
Total	37	15.8	4.76	41	16.2	4.39	78	16.0	3.23

Note: A daily vegetable-eater is a person who ate at least one vegetable from the list of vegetables each day.

Table 18: Percentage of the population who ate fruit and/or vegetables on a daily basis

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	13	38.6	18.66	13	39.2	19.96	26	38.9	13.64
25–34	17	38.9	15.21	24	43.3	12.84	41	41.4	9.82
35–44	13	27.4	13.76	17	30.4	11.21	30	29.1	8.69
45–54	6	14.9	10.67	15	33.6	12.16	21	24.4	8.39
55–64	9	24.6	11.97	14	39.8	15.58	23	31.8	9.75
65 +	8	32.6	17.49	11	35.4	16.97	19	34.2	12.19
Total	67	29.0	5.92	94	36.8	5.74	161	33.1	4.14
25–64	46	26.6	6.60	69	36.6	6.40	115	31.8	4.62

Note: A daily fruit and vegetable eater is a person who eats at least one fruit and/or one vegetable from the list of vegetables given each day.

Table 19: Percentage of the population who ate less than five fruits and/or vegetables each day

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	26	77.5	16.00	29	83.2	15.30	54	80.4	11.11
25–34	35	80.1	12.45	38	69.1	11.97	73	74.0	8.74
35–44	42	88.2	9.94	48	86.5	8.33	90	87.3	6.37
45–54	41	97.8	4.37	39	87.7	8.46	80	92.6	5.11
55–64	34	89.6	8.49	32	92.6	8.35	65	91.0	5.99
65+	21	85.4	13.18	27	89.2	11.03	48	87.5	8.51
Total	199	86.8	4.42	211	83.6	4.41	411	85.1	3.13
25–64	153	88.8	4.71	156	82.8	5.01	309	85.7	3.48

3.3.5 Physical activity

Physical activity was estimated from the participants' responses to the following questions:

- Do you do your job mainly sitting down or standing up and do you walk at least ten minutes non-stop each day at work?
- Do you walk or ride bicycle more than ten minutes each day?
- Do you do any kind of physical exercise?
- What kind of physical exercise do you do?
- How many times a week do you do physical exercise?

Men did more physical exercise outside of work than women did. Overall 87.3% (+/- 4.34) of men and 65.9% (+/-5.64) of women did regular exercise during their leisure time. Young men aged 18–24 were more likely to do physical exercise during their leisure time, i.e. 91.7% (+/- 10.57) than older men. More than half of the population (56% +/- 4.36) did not do any physical activity during their daily work, although two-thirds (67.7 +/- 4.11) walked or rode a bicycle to get around (Tables 20, 21 and 22).

Table 20: Percentage of the population who did physical exercise outside working hours

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	31	91.7	10.57	20	59.1	20.10	51	75.2	12.08
25–34	38	87.1	10.44	37	67.3	12.15	75	76.2	8.49
35–44	40	84.2	11.25	39	69.3	11.24	79	76.2	8.15
45–54	40	91.5	8.35	31	70.3	11.75	71	80.8	7.70
55–64	32	86.0	9.63	26	77.0	13.39	59	81.8	8.08
65 +	21	82.8	14.08	14	46.3	17.69	35	62.9	12.42
Total	203	87.3	4.34	167	65.9	5.64	370	76.2	3.75

Note: A person who does regular physical exercise is someone who regularly did physical activity lasting more than ten minutes non-stop during their leisure time.

Table 21: Percentage of the population who had seated or standing jobs

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	16	57.8	18.93	11	40.7	20.08	27	49.4	13.98
25–34	25	60.8	15.23	36	71.3	11.72	61	66.7	9.40
35–44	26	54.2	15.37	32	66.0	11.54	58	60.2	9.37
45–54	25	61.5	14.58	18	46.8	12.84	43	54.3	9.73
55–64	18	51.0	13.89	19	62.3	15.43	37	56.3	10.38
65 +	13	57.7	18.42	4	18.5	13.78	17	38.7	12.52
Total	122	57.2	6.45	120	55.5	5.92	242	56.3	4.36

Note: A person considered to be sedentary at the workplace is someone who mainly did his/her job in a seated or standing position and moved around less than ten minutes non-stop each day.

Table 22: Percentage of the population who were physically active to get around

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	24	72.2	17.17	24	71.1	18.53	49	71.7	12.60
25–34	38	86.1	10.80	36	66.3	12.25	74	75.2	8.61
35–44	35	72.4	13.78	31	56.1	12.09	66	63.6	9.20
45–54	35	80.9	11.79	24	54.5	12.81	59	67.5	9.15
55–64	25	68.7	12.89	22	64.3	15.25	47	66.6	9.88
65 +	18	68.7	17.29	16	51.7	17.73	34	59.5	12.62
Total	175	75.6	5.61	154	60.6	5.82	328	67.7	4.11

Note: A person is considered to do a moderate level of physical activity in getting around if he/she walked or rode a bike more than ten minutes non-stop each day.

For this study and based on the WHO's STEPwise approach, physical activity was converted into MET minutes. The term MET is an abbreviation for metabolic equivalent, and is used to show the intensity of a specific physical activity. The MET is determined by the ratio between the metabolic rate associated with a specific activity divided by the resting metabolic rate. The resting metabolic rate is about 1 MET and shows the energy used while at rest. The MET values are given below for three levels of physical exercise.

Sedentary: <600 MET minutes per week

Moderate-intensity physical activity (work and recreation): activity lasting more than ten minutes non-stop, causing a breathing rate that is a bit higher than normal: between 3 and 6 MET, or between 600 and 1500 MET minutes per week.

Work

- Doing the housework: vacuuming, sweeping, dusting, etc.
- Doing the laundry, shaking out rugs, wringing clothing by hand, etc.
- Gardening (no digging), planting, harvesting, etc.
- Milking the cows, acting as shepherd
- Drawing water from a well, weaving, carpentry,
- Working in construction: pushing loaded wheelbarrows, using a jackhammer, mixing cement, etc.

Recreation

- Riding a bike, jogging, dancing, playing cricket
- Horseback riding
- Doing Tai chi or yoga
- Taking a low-impact aerobics class

High-intensity physical activity (work and recreation): activity lasting more than ten minutes non-stop, causing a breathing rate that is much higher than normal: 6 MET, or > 1500 MET minutes per week (Tables 23 and 24).

Work

- Working in the forest (cutting/transporting wood), sawing hardwoods, ploughing, harvesting (sugarcane), gardening (digging),
- Grinding with a pestle
- Working in construction (shovelling sand)
- Carrying heavy furniture, etc.

Recreation

- Playing football, rugby, tennis,
- Swimming at a sustained rate
- Taking a high-impact aerobics class, etc.

Table 23: Percentage of the population who had a low level of physical activity

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	11	32.3	17.92	19	55.3	20.33	30	43.9	13.88
25–34	15	35.0	14.87	25	46.6	12.93	41	41.4	9.82
35–44	14	28.7	13.96	32	56.9	12.07	45	43.9	9.49
45–54	7	16.9	11.24	20	44.1	12.77	27	30.7	9.01
55–64	7	17.8	10.63	12	35.8	15.26	19	26.4	9.22
65+	8	31.9	17.38	17	56.2	17.6	25	45.1	12.79
Total	62	26.8	5.78	125	49.3	5.95	187	38.6	4.28
25–64	43	25.0	6.47	89	47.1	6.63	132	36.5	4.78

Note: People who had low level of physical activity did less than 600 MET-minutes of physical activity per week

Table 24: Mean amount of physical activity expressed in MET minutes/day

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	139.0	23.07	34	100.4	27.72	68	119.5	18.52
25–34	44	134.9	20.29	54	114.6	22.39	99	123.7	15.41
35–44	48	136.7	21.40	56	87.6	18.07	104	110.3	14.56
45–54	43	152.6	17.71	44	115.9	24.65	88	133.9	15.65
55–64	38	154.3	21.34	34	118.6	24.62	72	137.4	16.58
65+	26	135.7	26.17	31	86.2	28.74	56	108.8	20.52
Total	232	142.4	8.72	254	104.1	9.76	486	122.4	6.79

3.4 Obesity and overweight

3.4.1 Height and weight

On average, men (1.8 metres +/-0.01) were slightly taller than women (1.7 metres +/-0.01), and weighed 5.3 kilograms more than women (92.6 +/- 2.52). Compared to other age groups, men aged 25–44 were the heaviest on average (between 101 and 104 kilograms), and women aged 25–34 weighed the most (99 kilograms on average) (Tables 25 and 26).

Table 25: Mean height (metres)

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	1.80	0.02	34	1.69	0.02	68	1.74	0.02
25–34	44	1.78	0.02	54	1.68	0.01	99	1.73	0.02
35–44	48	1.79	0.02	57	1.68	0.01	104	1.73	0.01
45–54	43	1.77	0.02	44	1.67	0.01	88	1.72	0.02
55–64	38	1.76	0.02	34	1.66	0.02	72	1.71	0.02
65+	26	1.73	0.03	31	1.59	0.02	57	1.65	0.03
Total	232	1.77	0.01	255	1.67	0.01	487	1.72	0.01

Table 26: Mean weight (kilograms)

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	97.4	7.46	34	82.0	5.56	68	89.6	4.96
25–34	44	101.4	6.03	54	99.3	7.19	99	100.2	4.79
35–44	48	103.8	6.99	57	96.6	4.73	104	99.9	4.13
45–54	43	99.2	6.58	44	98.6	5.23	88	98.9	4.16
55–64	38	97.1	6.34	34	89.0	4.70	72	93.3	4.09
65+	26	80.0	4.99	31	80.9	5.28	57	80.5	3.64
Total	232	97.9	2.83	255	92.6	2.52	487	95.1	1.90

3.4.2 Body mass index

The body mass index (BMI) is calculated by dividing weight (kilograms) by height squared (metre^2). The body mass index is divided into four categories:

- Below normal weight < 18.5 kg/m^2
- Normal weight 18.5 to 25.0 kg/m^2
- Overweight ≥ 25 and < 30 kg/m^2
- Obese ≥ 30 kg/m^2

Around 60% of the study population were obese (BMI ≥30) and 87.3% of the study population were either overweight or obese (BMI ≥25). Women seemed to be more affected by obesity than men, i.e. 65.5% (+/- 5.66) compared to 52.9% (+/- 6.51). Obesity seemed to affect the intermediate age groups more, i.e. 35–54 age group, in both men and women (Tables 27, 28 and 29).

Table 27: Mean body mass index (kg/m^2)

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	30.2	2.33	34	28.6	1.81	68	29.4	1.47
25–34	44	31.8	1.67	54	35.1	2.40	99	33.6	1.55
35–44	48	32.4	1.96	57	34.1	1.52	104	33.3	1.23
45–54	43	31.4	1.90	44	35.2	1.69	88	33.3	1.32
55–64	38	31.3	1.79	34	32.5	1.84	72	31.8	1.28
65 +	26	26.9	1.82	31	32.2	2.00	57	29.8	1.52
Total	232	31.0	0.81	255	33.3	0.84	487	32.2	0.59

Table 28: Percentage of the population who were obese (WHO classification)

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	17	51.8	19.15	13	37.7	19.81	30	44.6	13.90
25–34	26	58.3	15.38	35	65.0	12.36	61	62.0	9.68
35–44	30	62.6	14.92	44	78.2	10.06	74	71.1	8.68
45–54	27	61.5	14.59	37	83.8	9.48	64	72.8	8.69
55–64	17	45.1	13.82	23	68.4	14.80	40	56.2	10.39
65 +	6	23.7	15.85	14	44.7	17.64	20	35.2	12.28
Total	123	52.9	6.51	167	65.5	5.66	290	59.5	4.32
25–64	99	57.4	7.39	140	73.9	5.83	239	66.1	4.70

Note: A person is considered obese when his/her body mass index is equal to or higher than 30 kg/m²

Table 29: Percentage of the population who were obese or overweight (WHO classification)

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	25	74.5	16.71	27	78.4	16.83	52	76.4	11.87
25–34	38	87.1	10.44	48	87.5	8.57	86	87.3	6.63
35–44	44	92.4	8.17	52	91.6	6.78	96	91.9	5.21
45–54	39	90.3	8.86	42	95.1	5.55	81	92.7	5.07
55–64	34	91.3	7.85	32	92.6	8.35	65	91.9	5.72
65 +	15	57.2	18.45	29	94.2	8.29	44	77.5	10.74
Total	196	84.3	4.74	230	90.0	3.57	425	87.3	2.93
25–64	156	90.3	4.42	173	91.4	3.72	329	90.9	2.86

Note: Subjects area considered to be overweight or obese if they have a body mass index equal to or more than 25 kg/m².

3.4.3 Intra-abdominal obesity

Intra-abdominal obesity refers to a person with a waist size of more than 88 cm in women and 102 cm in men. It increases the risk of cardio-vascular diseases and Type 2 diabetes. On average, both sexes and all age groups combined, the entire study population had waist sizes that were higher than normal. However, the difference was less marked in men than in women. On average, in men, only the 18–24 age group and those over 65 were within normal range. Women, all age groups combined, were above the normal range. Nevertheless, the younger women (aged 18–24) were close to normal, i.e. 91.8cm (+/-3.99). Overall, waist size in women increased with age (Tables 30 and 31).

Table 30: Percentage of the population with intra-abdominal obesity

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	96.3	4.86	34	91.8	3.99	68	94.0	3.16
25–34	44	102.3	4.07	54	102.9	4.74	99	102.7	3.18
35–44	47	104.2	4.37	57	104.2	3.30	104	103.4	3.14
45–54	43	104.0	5.00	44	108.1	5.46	87	106.3	3.56
55–64	37	105.3	4.39	34	105.1	4.38	70	106.7	0.91
65+	26	98.2	5.15	31	108.2	5.35	57	103.7	3.93
Total	230	102.4	1.84	255	103.3	2.03	485	102.9	1.37

Note: Mean waist sizes are given in centimetres.

Another approach to measuring the amount of intra-abdominal obesity is the waist to hip ratio. People with excess weight at the waist are more at risk from diabetes and cardiovascular diseases than people with excess weight at the hips. WHO has set an obesity threshold at a ratio equal to or higher than 0.80 for females and higher than 0.90 for males. On average, both sexes and all age groups combined, the entire study population had ratios higher than normal. The sole exception was in young men aged 18–24: 0.86 (+/- 0.02). In males the ratio remained steady overall whatever the age group, whereas in females it increased noticeably with age.

Table 31: Mean waist circumference – hip circumference ratios

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	0.86	0.02	34	0.84	0.02	68	0.85	0.01
25–34	44	0.91	0.01	54	0.86	0.02	99	0.88	0.02
35–44	47	0.94	0.01	57	0.89	0.02	104	0.91	0.02
45–54	43	0.93	0.04	44	0.90	0.03	87	0.92	0.03
55–64	37	0.96	0.02	34	0.92	0.03	71	0.94	0.02
65+	26	0.95	0.02	31	0.95	0.04	57	0.95	0.02
Total	230	0.92	0.01	255	0.89	0.01	485	0.91	0.01

Note: The waist to hip ratio is calculated by dividing the waist circumference (in cm) by the hip circumference (in cm).

3.5 Blood pressure and hypertension

Three blood pressure readings were taken for each participant as per WHO's STEPwise approach recommendations. The first reading was taken after a fifteen-minute rest, and the other two after a three-minute rest between each reading. The mean blood pressure used for analysis was the mean of the final two readings.

Table 32: Mean systolic blood pressure readings (mmHg)

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	128.2	3.83	34	118.3	3.13	68	123.2	2.72
25–34	44	132.1	3.07	54	120.3	2.64	99	125.6	2.30
35–44	48	132.7	3.92	57	121.8	3.58	104	126.8	2.83
45–54	43	137.8	4.70	43	138.4	2.68	87	136.8	3.82
55–64	38	136.3	6.36	34	139.2	6.76	72	137.7	4.61
65+	26	139.2	7.21	31	140.8	8.41	57	140.1	5.60
Total	232	134.2	1.98	254	128.3	2.19	486	131.1	1.52

Some 39.1% (+/- 6.36) of men and 29.6% (+/- 5.44) of women had high blood pressure (systolic ≥ 140 and/or diastolic ≥ 90). The percentage of subjects with hypertension gradually increased with age in women. For men, the highest percentage of subjects with hypertension was in the 45–54 age group (Tables 32, 33 and 34).

Table 33: Mean diastolic blood pressure readings (mmHg)

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	69.3	3.34	34	71.6	2.86	68	70.4	2.19
25–34	44	76.9	2.84	54	72.2	2.56	99	74.3	1.94
35–44	48	77.1	3.48	57	74.6	2.70	104	75.7	2.16
45–54	43	79.3	2.94	43	82.2	1.36	87	80.0	2.28
55–64	38	80.1	3.73	34	78.5	3.32	72	79.4	2.50
65+	26	76.7	4.50	31	77.3	4.33	57	77.0	3.10
Total	232	76.8	1.45	254	75.7	1.28	486	76.2	0.97

Table 34: Percentage of the population with hypertension

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	5	15.9	14.02	3	8.1	11.13	8	11.9	9.06
25–34	12	27.5	13.93	4	6.5	6.39	16	15.9	7.29
35–44	17	35.9	14.79	7	12.1	7.95	24	23.0	8.05
45–54	25	58.5	14.77	20	46.0	12.82	45	52.2	9.76
55–64	18	48.8	13.88	19	57.2	15.75	38	52.8	10.45
65+	12	47.8	18.63	23	72.0	15.93	35	61.1	12.53
Total	91	39.1	6.36	75	29.6	5.44	166	34.1	4.17
25–64	73	42.2	7.38	50	26.3	5.85	123	34.0	4.70

Note: A person is suffering from hypertension when the subject's systolic reading is ≥ 140 mmHg and/or the diastolic reading is ≥ 90 mmHg and/or

the subject is being treated for high blood pressure. Table 33: Mean diastolic blood pressure readings (mmHg)

3.6 Fasting blood sugar levels and diabetes

According to WHO diabetes standards (fasting blood sugar ≥ 7 mmol/l) and subject to the fact that only a single blood sugar test was carried out, diabetic patients accounted for 17.1% (+/- 3.31) of the study population. The percentage of diabetics increased with age overall. The percentages of people at risk were 6.8% (+/- 3.28) in males and 3.9% (+/- 2.32) in females. It was in the 35–44 age group for males and the 45–54 age group for females that there seemed to be the most people at risk (Tables 35, 36 and 37).

Table 35: Mean fasting blood sugar levels

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	4.4	0.16	34	4.5	0.17	68	4.4	0.11
25–34	44	5.3	0.63	54	4.8	0.58	99	5.0	0.43
35–44	48	5.4	0.63	57	5.3	0.51	104	5.4	0.40
45–54	43	6.3	0.71	44	6.4	0.88	88	6.3	0.56
55–64	38	5.7	0.60	34	6.6	0.96	72	6.1	0.56
65 +	26	5.8	0.57	31	5.9	0.95	57	5.9	0.58
Total	232	5.5	0.26	255	5.5	0.30	487	5.5	0.20

Note: The fasting blood sugar levels are expressed here in mmol/l.

Table 36: Percentage of the population at risk for diabetes

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	N	%	CI
18–24	0	0.0	0.00	0	0.0	0.00	0	0.0	0.00
25–34	4	8.1	8.51	2	4.2	5.22	6	6.0	4.72
35–44	4	9.1	8.89	1	1.4	2.82	5	4.9	4.14
45–54	4	8.5	8.35	4	9.8	7.66	8	9.2	5.63
55–64	2	6.4	6.78	2	4.7	6.77	4	5.6	4.81
65+	2	6.9	9.46	1	3.2	6.20	3	4.9	5.52
Total	16	6.8	3.28	10	3.9	2.32	26	5.3	1.97

Note: People at risk of getting diabetes are those whose blood sugar levels are ≥6.1 mmol/l and <7 mmol/l and who are not being treated for diabetes.

Table 37: Percentage of the population with diabetes

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	0	0.0	0.00	0	0.0	0.00	0	0.0	0.00
25–34	1	2.7	5.10	4	7.4	6.77	5	5.3	4.47
35–44	4	7.8	8.28	9	16.3	9.01	13	12.4	6.31
45–54	12	26.7	13.27	12	27.1	11.44	24	26.9	8.67
55–64	7	18.4	10.77	15	42.8	15.75	22	30.0	9.59
65+	12	45.3	18.56	8	26.3	15.61	20	34.9	12.25
Total	35	15.1	4.67	48	18.9	4.66	83	17.1	3.31
25–64	23	13.6	5.12	40	21.0	5.41	63	17.5	3.77

Note: People with proven diabetes are those who have fasting blood sugar levels ≥ 7 mmol/l and/or are receiving treatment for diabetes.

3.7 Blood cholesterol

For elevated total blood cholesterol, a cut-off point ≥ 5.2 mmol/l was used to classify individuals as being in a high-risk group for coronary heart disease. The overall mean total cholesterol level for both men and women was 4.2 mmol + or -0.09 with higher levels recorded for men (4.3% +/- 0.13) than women (4.0% +/-0.12). Almost 20% of men (19.8% +/- 5.19) and 13% of women (12.7% +/- 3.97) had high total cholesterol levels (Tables 38 and 39).

Table 38: Mean total cholesterol levels

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	3.5	0.28	33	3.4	0.24	66	3.5	0.17
25–34	44	4.4	0.33	54	3.7	0.22	99	4.0	0.20
35–44	48	4.6	0.26	56	4.0	0.33	104	4.3	0.22
45–54	43	4.6	0.28	44	4.0	0.25	87	4.3	0.22
55–64	38	4.4	0.26	33	4.3	0.17	71	4.4	0.20
65 +	26	3.8	0.42	31	4.5	0.34	57	4.2	0.28
Total	231	4.3	0.13	252	4.0	0.12	483	4.2	0.09

Note: The mean total cholesterol levels are expressed here in mmol/l.

Table 39: Percentage of the population with high total cholesterol levels

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	1	3.9	7.44	1	4.2	8.04	3	4.0	5.46
25–34	11	25.3	13.56	1	2.7	4.18	13	12.8	6.66
35–44	10	20.4	12.42	12	22.1	10.11	22	21.3	7.83
45–54	14	32.8	14.07	3	7.3	6.71	17	19.7	7.78
55–64	7	18.8	10.85	5	16.2	11.76	12	17.4	7.93
65 +	3	10.3	11.33	9	27.3	15.80	11	19.6	10.20
Total	46	19.8	5.19	32	12.7	3.97	78	16.1	3.23
25–64	42	24.2	6.40	22	11.8	4.29	64	17.7	3.79

Note: Hypercholesterolaemia is characterised by total cholesterol levels ≥ 5.2 mmol/l.

If triglycerides are ≥ 4 g/l (4.6 mmol/l), whatever the total cholesterol level may be, LDL-cholesterol cannot be calculated (direct testing of LDL-cholesterol is possible). This is hypertriglyceridaemia (more rarely, a case of mixed hyperlipidaemia) that should be cared for by appropriate treatment. In patients with no risk factors, the following lipid profile is considered normal: LDL-cholesterol< 1.60 g/l (4.1 mmol/l), triglycerides < 1.50 g/l (1.7 mmol/l) and HDL-cholesterol > 0.40 g/l (1 mmol/l). According to the AFSSAPS (French Health Product Safety Agency) there is no reason to repeat the test, except in the event of a cardiovascular risk factor appearing (Tables 40, 41 and 42).

Table 40: Percentage of the population with high LDL-cholesterol levels

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	0	0.0	0.00	0	0.0	0.00	0	0.0	0.00
25–34	5	12.1	10.17	0	0.0	0.00	5	5.4	4.51
35–44	2	3.9	5.95	2	4.2	4.87	4	4.0	3.76
45–54	1	2.2	4.43	2	3.9	4.95	3	3.1	3.37
55–64	2	4.1	5.49	4	10.8	9.86	5	7.2	5.43
65+	1	3.4	6.72	4	11.6	11.35	4	7.9	6.92
Total	11	4.6	2.72	11	4.5	2.46	22	4.5	1.82

Note: LDL- cholesterol => 4.1 mmol/l

Table 41: Percentage of the population with low HDL-cholesterol levels

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	20	59.0	18.85	10	30.9	18.90	30	45.1	13.91
25–34	21	47.4	15.57	24	43.7	12.85	45	45.3	9.92
35–44	26	55.8	15.32	31	55.6	12.11	57	55.7	9.50
45–54	21	50.9	14.99	18	40.9	12.65	39	45.7	9.73
55–64	16	43.3	13.76	13	40.4	15.62	30	41.9	10.33
65+	19	75.4	16.06	14	45.0	17.65	33	58.7	12.66
Total	124	53.9	6.50	110	43.9	5.91	234	48.7	4.40

Note: HDL- cholesterol ≤1.0 mmol/l).

Table 42: Hypertriglyceridaemia

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	3	8.1	10.44	0	0.0	0.00	3	4.1	5.47
25–34	12	27.4	13.91	9	17.3	9.79	21	21.8	8.23
35–44	17	35.1	14.72	7	12.0	7.91	24	22.7	8.02
45–54	16	38.9	14.62	8	18.8	10.05	24	28.5	8.82
55–64	9	24.4	11.94	6	18.7	12.41	16	22.0	8.67
65+	4	16.0	13.69	6	17.9	13.59	10	17.0	9.67
Total	61	26.5	5.76	36	14.3	4.17	97	20.2	3.53

Note: Triglyceridaemia ≥1.7 mmol/l.

3.8 Renal failure

Estimated kidney function: glomerular filtration rate (GFR) is tested using the modification of diet in renal disease (MDRD) study equation.

In males = 186 x (creatinine (µmol/l) x 0.0113)$^{-1.154}$ x age$^{-0.203}$
x 1.21 for subjects of African origin (African American)
x 0.742 for women
Age is expressed in full years.

The MDRD formula has been clearly validated for patients between the ages of 18 and 70. It is probably also valid for estimating glomerular filtration rates above and beyond the age of 70. The equation does not require the subject's weight. It is standardised for 1.73 m^2 (mean body surface area in adults). Comparison of MDRD to other formulas (such as Cockcroft-Gault) has shown it to be better, after verification of the 24-hour urine creatinine clearance levels.

The mean GFR rate for men was 92.5 (+/-3.71) and for women 88.3 (+/-3.01). Over all age groups, 5.3% (+/-2.92) of men and 6.2% (+/-2.88) of women had moderate renal failure. However, a quarter of the population aged 65 years and over was estimated to have moderate renal failure (Tables 43 and 44).

Table 43: Simplified MDRD

	Male			Female			Total		
Age group	n	mean	CI	n	mean	CI	n	mean	CI
18–24	33	116.9	9.29	33	105.5	11.57	66	111.2	7.48
25–34	44	98.4	5.21	54	98.0	3.95	99	98.2	3.18
35–44	48	90.5	5.07	56	93.2	6.53	104	91.9	4.22
45–54	41	86.0	5.85	44	83.3	5.70	85	84.6	4.07
55–64	38	84.7	14.61	33	76.8	4.34	71	81.0	8.07
65+	26	77.1	7.73	31	64.4	4.73	57	70.1	4.61
Total	230	92.5	3.71	252	88.3	3.01	482	90.3	2.38

Table 44: Moderate renal failure

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	0	0.0	0.00	0	0.0	0.00	0	0.0	0.00
25–34	0	0.0	0.00	0	0.0	0.00	0	0.0	0.00
35–44	1	2.4	4.72	1	1.4	2.85	2	1.9	2.58
45–54	3	6.7	7.47	2	3.5	4.71	4	5.0	4.26
55–64	3	8.3	7.66	4	12.4	10.48	7	10.2	6.34
65+	5	20.1	14.96	9	29.7	16.21	14	25.4	11.19
Total	12	5.3	2.92	16	6.2	2.88	28	5.8	2.05

Note: *Moderate renal failure covers people with a GFR rate of between 30 and 59 ml/mn/1.73m² whether or not they have any kidney failure markers.*

3.9 Combined risk factors

According to WHO criteria, there are five common risk factors for non-communicable diseases:

- smoking
- overweight and obesity
- high blood pressure
- eating less than five fruits and vegetables each day
- sedentary lifestyle.

For this study, the various risk factors were added together in such a way as to establish a level of risk for chronic non-communicable diseases, based on the following principle:

- 0: very low risk
- 1 or 2: medium-level risk
- 3 to 5: high risk.

According to the criteria set out above, 69.4% (+/- 6.01) of men and 63.2% (+/- 5.74) of women had a high risk for chronic non-communicable diseases. This risk increased with age in women, while for men, it was highest in the 45–54 age group at 80.9% (+/- 11.78) (Table 45).

Table 45: Percentage of the population with at least three risk factors

	Male			Female			Total		
Age group	n	%	CI	n	%	CI	n	%	CI
18–24	21	63.6	18.43	16	46.5	20.39	37	55.0	13.91
25–34	28	63.0	15.06	31	56.0	12.86	58	59.1	9.80
35–44	36	75.1	13.33	35	62.0	11.83	71	68.0	8.92
45–54	35	80.9	11.78	29	66.0	12.19	64	73.3	8.64
55–64	26	68.9	12.85	25	72.4	14.22	51	70.6	9.54
65+	15	58.5	18.38	26	82.4	13.51	41	71.6	11.59
Total	161	69.4	6.01	161	63.2	5.74	322	66.2	4.16
25–64	125	72.1	6.70	120	63.1	6.41	244	67.4	4.65

Note: A person is considered to have a high level of risk when they had at least three of the selected risk factors, i.e. smoked on a daily basis; were overweight or obese; had high blood pressure; (ate) less than five fruits or vegetables each day; were sedentary, i.e. less than 600 MET minutes per week.

4. Discussion

This section summarises key findings from the survey and compares the results with a previous epidemiological study on Wallis Island as well as with another Pacific territory, American Samoa. A range of recommended policy actions to address the chronic disease problems facing the people of Wallis and Futuna is also presented.

4.1 Summary

Behavioural risk factors for chronic diseases are common in Wallis and Futuna and are a major public health problem at all ages for both men and women. This study provided a snapshot of the population's health and showed that the population is at high risk of developing chronic NCDs over the short- or long-term.

The survey shows that half the population are current smokers, with the majority of those reporting that they smoke on a daily basis. Seven out of ten men smoked during the last 12 months compared to three out of ten women. Given the high prevalence of smoking rates for men in Wallis and Futuna, implementing effective smoking cessation programmes should also be considered as a fundamental component of a comprehensive anti-tobacco campaign. Supporting smokers to discontinue their at-risk behaviour will significantly lower their risk of chronic diseases.

The survey shows that around three-quarters of men and a third of women drank alcohol during the previous 12 months. Almost a quarter of men drink alcohol at least once a week, and most of these consume more than three drinks at a time. Of concern was the high propensity for heavy drinking among men in the 18–34 years age group. Regular drinking of alcohol was not common among women, with only 3% reporting drinking on a weekly basis. More than half of men drank kava during the last 12 months and four out of ten men drank during the previous month.

The survey shows that the majority of Wallisian and Futunan adults were not consuming the recommended five combined servings of fruit and vegetables per day. While one in three adults were eating at least one fruit or vegetable on a daily basis, almost nine out of ten adults were not eating the recommended daily amount. While efforts to increase availability of quality and affordable nutritious foods are important, better understanding of Wallisian food preferences and tastes is also a critical component of comprehensive public health initiatives.

The survey shows that the majority of the population is achieving the minimum recommended levels of physical activity to maintain an adequate standard of health. However the survey also shows that four out of ten of the population reported a low level of total physical activity. For all age groups, women were more likely to report low physical activity compared to men. The primary source of physical activity was relating to work in the plantations or around the home, followed by (active) transport such as cycling or walking.

Excessive body weight and consequent chronic conditions remain a critical public health issue in Wallis and Futuna. The survey shows that six out ten adults were obese (body mass index ≥30 kg/m2). Obesity was more common among women than men at all ages, except the 18–24 age group. More alarmingly, the high rate of obesity was particularly evident among women aged 35–54 years where eight out of ten women were obese. The mean waist-to-hip ratio for both men and women showed that intra-abdominal obesity exceeded the threshold for increased risk from diabetes and cardiovascular disease.

The survey identified a substantial portion of the population with elevated risk of cardiovascular disease. Nearly one in three adults had raised blood pressure at the time of the survey and/or was on medication for hypertension, with this condition being more common among men than women. As expected, raised blood pressure generally increased with increasing age for both genders. Nearly one fifth of men and one tenth of women were found to have elevated fasting blood cholesterol.

The people of Wallis and Futuna face a high level of risk from diabetes, with almost one in four of the population estimated to have elevated fasting blood sugar levels. Of these, more than three quarters were considered to be diabetic. However, the diabetes prevalence increases with age ranging from zero in the 18–24 year age group to more than a third of the those aged over 65. In all age groups, diabetes is more common among women than men, except among those aged 65 years and older.

4.2 Comparison with other studies

American Samoa recently carried out a study on risk factors for chronic NCDs using WHO's STEPwise approach.[4] When the results are compared, a similarity in the percentage of the population at high risk of developing a chronic non-communicable disease can be seen. However, the risk factors differed slightly. For example, diabetes prevalence was about two and a half times higher in American Samoa than in Wallis and Futuna, while the population of Wallis and Futuna smoked more than people in American Samoa did. For both populations, the prevalence of obesity and the low levels of fruit and vegetable consumption were very significant, i.e. more than two thirds of the population were obese and 85% of the population consumed insufficient fruits and vegetables (Figure 3).

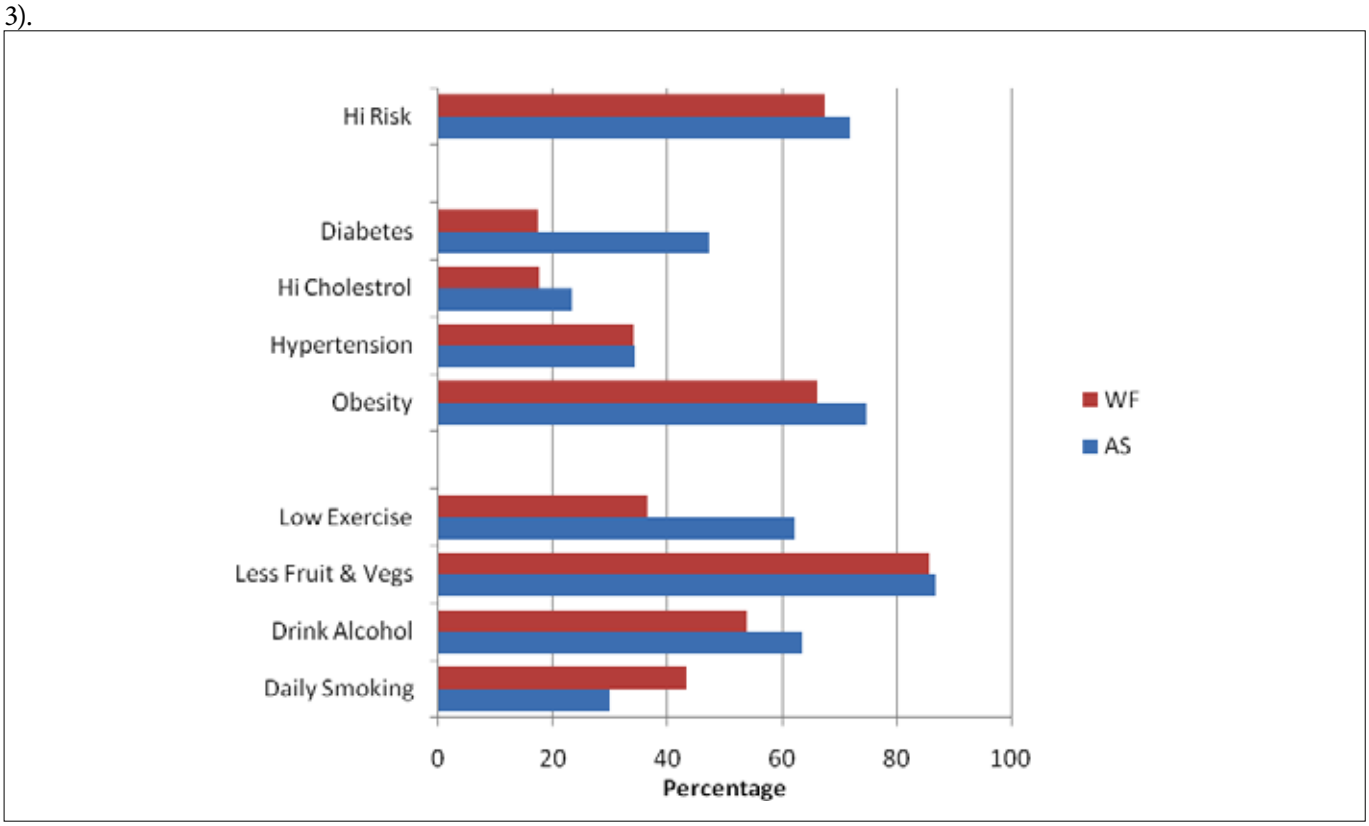

Figure 3: Risk factor comparison: Wallis and Futuna (WF) and American Samoa (AS)

4 *American Samoa NCD Risk Factors STEPS report, 2007*

Note: Estimates have not been age-adjusted.

A comparative study on NCDs involving Wallisians in Wallis and Wallisians in Noumea was carried out in 1980.[5] The study provided estimates of the prevalence of diabetes and high blood pressure and obesity for the Polynesian population on Wallis Island. The results of this study in 2009 were compared to those from 1980 (Figure 4). The study includes both Wallisians and Futunans.

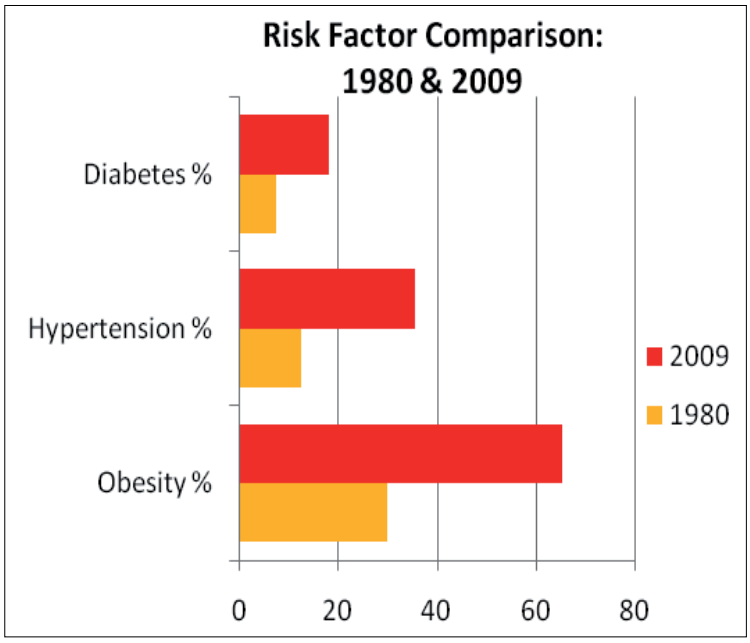

Figure 4: Risk factor comparison : 1980 and 2009

It can be seen that, over the three decades, the prevalence of the major risk factors for non-communicable diseases (NCDs) in Wallis and Futuna increased. The proportion of the population that was obese more than doubled (from 30% to 65%), the prevalence of high blood pressure increased threefold (from 13% to 36%) and the prevalence of diabetes more than doubled (from 7.4% to 18%).

A major benefit of the 2009 Wallis and Futuna NCD risk factor study was that it provided the basis for conducting a longitudinal case study. Local health care workers contacted survey respondents who were identified as at high risk of NCDs and conducted follow-up assessments every six months. It is planned to continue this follow-up assessment for a period of five years. This longitudinal approach will provide useful information about the effectiveness of lifestyle interventions and health promotion campaigns on the reduction of NCD risk factors in the at-risk population.

5 *Taylor,R., Bennet P.H., Zimmet P. Epidemiological Studies of Diabetes and Cardiovascular Disease in Wallis Polynesians: South Pacific Commission, New Caledonia 1984*

5. Conclusion and recommendations

The Wallis and Futuna NCD risk factor survey has confirmed that NCDs pose a major public health challenge. The human cost of these diseases—death, handicaps (amputation, paralysis, blindness) and problems (repeated dialysis)—is difficult to estimate. The financial cost is huge; diabetes alone often accounts for the largest part of health expenditure: drugs, hospital stays, and medical evacuation for kidney, cardiovascular and ophthalmologic complications. A diverse but complementary multi-level and multi-professional approach, combining primary, secondary and tertiary preventive strategies, is necessary to tackle the prevalent chronic diseases and associated conditions facing the Wallisian and Futunan people. To be effective, public health and clinical approaches need to be innovative and sensitive to the prevailing social, economic and cultural environments of Wallis and Futuna.

Given this major public health problem, it is vital that the health professionals in Wallis and Futuna set up a programme to prevent and treat these diseases. Public authorities, teachers, and customary, political and religious leaders must also take a clear stance by actively participating in this prevention policy. In particular, the public health system needs to shift its emphasis from clinical and curative treatments to include the prevention of NCDs. SPC and WHO have implemented a strategy to reduce NCD risk factors in the Pacific[6] that will assist Wallis and Futuna to set up a chronic non-communicable disease prevention programme.

The following recommendations are aimed at addressing organisational, environmental, and NCD behavioural risk factors:

- Establish a coordinated national programme for the prevention and control of NCDs focused on the promotion of lifestyle changes.
- Establish a sustainable funding mechanism and health infrastructure to support NCD strategy implementation and monitoring.
- Conduct comprehensive health promotion campaigns to promote healthy lifestyle choices and implement public health programmes to reduce the prevalence of NCD risk factors.
- Develop policies supporting the importation of healthy foods, improve the availability of fruit and vegetables, and promote the recommended levels of fruit and vegetable consumption.
- Develop policies to establish physical activity-friendly environments and implement culturally-appropriate programmes to promote daily physical activity.
- Conduct anti-smoking campaigns and implement smoking cessation programmes to reduce smoking rates across all age groups.
- Conduct comprehensive health promotion campaigns to reduce alcohol consumption, particularly targeting binge-drinking among men.
- Increase public awareness of the importance of regular monitoring and screening of blood pressure, blood cholesterol and blood sugar levels.
- Conduct a regular national health survey of NCD risk factors and chronic diseases, preferably every five years, and implement follow-up visits to persons at risk of NCDs.
- Develop and interact with coalitions, networks and partnerships for preventing and managing NCDs at global, regional, and national levels.

6 *Pacific Framework for the Prevention and Control of Non-communicable Diseases*

APPENDIX 1: Equipment used for body measurements and laboratory tests

Weight: SECA 813 electronic scale (200 Kgs), accuracy: 100g, certified for medical use

Height: SECA 214 portable metric rule

Blood pressure: OMRON M3 electronic blood pressure monitor + obese cuff.

Abdominal and hip circumference: SECA 200 circumference measuring tape.

Urine strips: Combur 10 Test ROCHE, visual reading

Urine biochemistry: Sodium, Potassium, chlorine, creatinine, micro-albumin: Abbott reagents in Architect C8000 Abbott blood analyser

Blood biochemistry: Glucose, uric acid, total cholesterol, triglycerides, direct LDL cholesterol, HDL-cholesterol, glycated haemoglobin: Abbott reagents in Architect C8000 Abbott blood analyser

Comparative analysis: Creatinine: Jaffé method / enzymatic creatinine: Abbott method in Architect C8000 blood analyser

Cystatine C: Gentian reagents in Architect C8000 Abbott blood analyser

Insulin: Abbott reagent in Architect I2000 Abbott blood analyser.

APPENDIX 2: List of people involved in the study

Multi-disciplinary committee
Dr. Laurent Morisse (hospital doctor on Wallis)
Dr. Jean-François Yvon (biochemist on Wallis)
Dr Thierry Jubeau (public health doctor – SPC)
Dr. Viliami Puloka (public health doctor – SPC)
Dr. Bernard Rouchon (public health doctor – ASS)
Philippe Eono (public health – DPASS Sud)
Luc Monimeau (statistician – DASS-NC)
Phil Bright (GIS developer – SPC Population/Statistics Department)
Dr. Sylvie Laumond-Barny (epidemiologist – DASS-NC)
Dr. Justus Benzler (epidemiologist – SPC)
Dr. Paul Qaeze (private-sector general practitioner)
Dr. Dominique Megraoua (MG – diabetes)
Dr. Olivier Axler (cardiologist)
Dr. Jean-Michel Tivollier (kidney specialist)
Dr. Jean-François Cantin (kidney specialist)
Dr. Nicolas Quirin (kidney specialist)
Dr. Yves Doussy (kidney specialist)
Dr. Mathieu Sacquepee (kidney specialist)

Other volunteer doctors
Dr Cristophe Fouquet: Quartier Latin Laboratory, Noumea
Dr Axel Wiegandt: public health doctor, SPC

Statistics Departments: SPC, ISEE, STSEE
Jennie Mac Kenzie, Healthy Lifestyles Section, SPC
Chris Ryan, Statistics and Demography Programme, SPC
Bertrand Buffieres, ISEE
Soane-Paulo Mailagi, STSEE
Jean-Paul Godefer, STSEE
Anastasia Vakauliafa, STSEE
Lesley Lakalaka, STSEE

STEPS TEAMS ON WALLIS AND FUTUNA

Coordinators:
WALLIS: Katia Cateine, Marie-Laure Rambaud, Marie Isabelle Lisiahi
FUTUNA: Elisabeth Dutaut

Volunteer nurses: ATIR
Marie-Agnès Delayre, Isabelle Marsault

Laboratory technicians:
WALLIS: Clément Couteaux

Volunteer nurses, nurse-aides, health educators from the Wallis and Futuna Health Agency:
WALLIS: Atonio Manuopuava, Paulina Appriou, Malia Koleti Maituku, Telesia Muliava, Soana Tafono, Monika Moefana, Jocelyne Tuifua, Sofia Ila, Anastasia Munikihaafata, Valentin Vahai Sosaia, Telesia Uuatemoakehe, Sesilia Logote, Selafina Kilama, Laurence Audebrand, Christian Lisiahi, Yvette Manuopuava, Aniseta Selemago, Esitokia Lamata, Alix Charpi, Koleti Taginoa, Telesia Tuilalo, Laimoto Taufana,
FUTUNA: Petelo Telai, Malia Lape, Pasikate Akiletoa, Pelenatita Savea, Falavia Lelevai

Volunteers from outside the Health Agency:
Hahaké Youth Association: Christelle Appriou, Yolanne Mackenzie, Jean-Marie Guillemain (CIPAC), Jérémy Salmon, Niumasi Seuvea, Savelina Seuvea
Mua Youth Association: Jean-Luc Hapate, Eddy Manufekai

APPENDIX 3: Questionnaire

SPC Secretariat of the Pacific Community

Study of Risk Factors for Chronic Non-Communicable Diseases in Wallis and Futuna

SCREENING FORM

Identification number ☐☐☐

Date (day / r month / year ☐☐ / ☐☐ / ☐☐☐☐

Dispensair ry ☐

ABOUT YOU

1	Second name (in block letters): _____	
2	Second name at birth (if different): _____	
3	First name (in block letters): _____	
4	Address: _____	
5	Telephone no:	☐.☐.☐.☐.☐.☐
6	Sex (tick box):	Male ☐0 Female ☐1
7	Date of birth (day / month / year):	☐☐ / ☐☐ / ☐☐☐☐
8	Place of birth: _____	
9	Weight at birth (*in kilograms*) (compare with '*carnet de santé*')	☐.☐☐☐kg
10	Do you live with a partner? (*tick one box only*)	Yes ☐0 No ☐1
11	How much time do you actually spend in Wallis and Futuna each year?	☐ months
12	How do you define your cultural background? *(tick one box only)*	Wallisian ☐0 Futunian ☐1 Melanesian ☐2 Other Polynesian ☐3 Caucasian ☐4 Other ☐7
13	Where do you normally work? *(tick one box only)*	Not in employment ☐0 Factory, workshop ☐1 Shop ☐2 Office ☐3 At home ☐4 Outdoors (urban) ☐5 Outdoors (rural) ☐6 Other ☐7
14	What is your highest qualification? *(tick one box only)*	None ☐0 BEPC ☐1 BAC ☐2 BAC+2 ☐3 BAC+3 ☐4 BAC+5 ☐5 Higher ☐6

SPC Secretariat of the Pacific Community

Identification number ☐☐☐

STEP 1: Your lifestyle and personal history

This first section concerns your habits, such as smoking, alcohol, kava, sport, etc. they have a direct influence on the risk of developing chronic diseases.

Tobacco use			
15	Have you ever smoked tobacco, cigarettes, cigars, a pipe, etc. ? (*tick one box only*)	Yes ☐0 No ☐1	*If no, go to Question 19*
16	If yes, have you smoked tobacco in the last 12 months? *(tick one box only)*	Yes ☐0 No ☐1	*If no, go to Question 19*
17	Do you smoke every day? *(tick one box only)*	Yes ☐0 No ☐1	*If no, go to Question 19*
18	How many cigarettes do you smoke a day? *(tick one box only)*	Less than 10 ☐0 Between 10 and 20 ☐1 Over 20 ☐2	
Alcohol consumption			
19	Have you ever consumed alcohol? (cider, beer, wine, etc.) *(tick one box only)*	Yes ☐0 No ☐1	*If No, go to Question 23*
20	If yes, have you consumed alcohol in the last 12 months?*(tick one box only)*	Yes ☐0 No ☐1	*If No, go to Question 23*
21	If yes, how often do you consume alcohol? *(tick one box only)*	Not often ☐0 1-3 days per month ☐1 1-4 days per week ☐2 5 days + per week ☐3	*where d=days and w=week*
22	When you consume alcohol, is it…? *(tick one box only)*	1 glass ☐0 2 to 3 glasses ☐1 More than 3 glasses ☐2	
Kava consumption			
23	Do you drink kava? *(tick one box only)*	Yes ☐0 No ☐1	*If No, go to Question 26*
24	If yes, have you consumed kava in the last 12 months?*(tick one box only)*	Yes ☐0 No ☐1	*If No, go to Question 26*
25	Have you consumed kava in the last 30 days? *(tick one box only)*	Yes ☐0 No ☐1	

Identification number ☐☐☐

Consumption of fruits and vegetables (Show the fruit and vegetable leaflets)			
26	Do you eat fruit every day? *(tick one box only)*	Yes ☐0 No ☐1	*If Yes, go to Question 28*
27	If no, how many days per week do you eat fruit?	☐ days	
28	How many different fruits do you eat per day on the days when you eat fruit? *(tick one box only)*	1 to 2 ☐0 2 to 5 ☐1 More than 5 ☐2	
29	Do you eat vegetables every day? *(tick one box only)*	Yes ☐0 No ☐1	*If yes, go to Question 31*
30	If no, how many times per week do you eat vegetables?	☐ days	
31	How many different vegetables do you eat per day on the days when you eat vegetables? *(tick one box only)*	1 to 2 ☐0 2 to 5 ☐1 More than 5 ☐2	
Physical activity			
32	Does your daily activity mostly involve being seated or standing **and** do you walk continuously for at least 10 minutes every day? *(tick one box only)*	Yes ☐0 No ☐1	
33	Do you walk or cycle for more than 10 minutes continuously every day (from one place to another) (*tick one box only*)	Yes ☐0 No ☐1	
34	Do you take any exercise? *(tick one box only)*	Yes ☐0 No ☐1	*If **No** , go to question 37*
35	What kind of exercise do you take? (walking, running, swimming, fishing, hunting, gardening, work at a plantation, etc.)	_____	
36	How many times per week do you do this activity?	☐ Times per week	

Identification number ☐☐☐

Personal history			
37	Over the last 12 months has a health professional told you that you had diabetes? *(tick one box only)*	Yes ☐0 No ☐1	*If No, go to Question 39*
38	If yes, are you currently taking treatment for diabetes? *(tick one box only)*	Yes ☐0 No ☐1	
39	In the last 12 months has a health professional told you that you had high blood pressure? *(tick one box only)*	Yes ☐0 No ☐1	*If No, go to Question 41*
40	If yes, are you currently taking treatment for high blood pressure? *(tick one box only)*	Yes ☐0 No ☐1	
41	Over the last 12 months has a health professional told you that you had a kidney disease? *(tick one box only)*	Yes ☐0 No ☐1	*If No, go to Question 43*
42	If yes, are you currently taking treatment for a kidney disease? *(tick one box only)*	Yes ☐0 No ☐1	
43	Over the last 12 months, has a health professional told you that you had a cardio-vascular disease? *(tick one box only)*	Yes ☐0 No ☐1	*If No, go to Question 45*
44	If yes, are you currently taking treatment for a cardio-vascular disease? *(tick one box only)*	Yes ☐0 No ☐1	
45	In your family, is there anyone who has already had diabetes? *(tick one box only)*	Yes ☐0 No ☐1 I do not know ☐9	
46	In your family, has someone already had high blood pressure? *(tick one box only)*	Yes ☐0 No ☐1 I do not know ☐9	
47	In your family, has someone already had a kidney disease? *(tick one box only)*	Yes ☐0 No ☐1 I do not know ☐9	
48	In your family, has someone already had a cardio-vascular disease? *(tick one box only)*	Yes ☐0 No ☐1 I do not know ☐9	

Identification number ☐☐☐

STEP 2: Physical examination

This step is a conventional 'non-invasive' medical examination

49	Weight *(to the nearest 0.1 kilogram)*			☐☐☐.☐ kg
50	Height *(in meters to the nearest 0.01 meter)*			☐.☐☐ m
51	Body Mass Index: kilogram / meter^2 **(Use a calculator)**			☐☐
52	Abdominal circumference *(rounded up to the nearest 0.5 centimeters)*			☐☐☐ cm
53	Hip circumference *(rounded up to the nearest 0.5 centimeters)*			☐☐☐ cm
54	Abdominal circumference / hip circumference ratio **(Use a calculator)**			☐.☐☐
55	Additional question for women: Are you pregnant? *(tick **one** box only)*			Yes ☐0 No ☐1
56	Additional question for women: If you have not yet reached menopause, what was the date of your last menstruation? (*day/month/year*)			☐☐ / ☐☐ / ☐☐☐☐
57	**1st blood pressure reading** (*in millimeters of mercury*)	**55A**	Systolic	☐☐☐
		55B	Diastolic	☐☐☐
58	**2nd blood pressure reading** *(in millimeters of mercury)*	**56A**	Systolic	☐☐☐
		56B	Diastolic	☐☐☐
59	**3rd blood pressure reading** (*in millimeters of mercury*)	**57A**	Systolic	☐☐☐
		57B	Diastolic	☐☐☐
60	Pulse (*beats/minute*)			☐☐☐
61	Armband used *(tick **one** box only)*			Standard ☐0 X-Large ☐1

Identification number ☐☐☐

STEP 3: Biochemical tests

This phase involves urine and blood testing for chemical compound content.

62	Have you had anything to eat or drink apart from pure water since 10 pm last night?	Yes ☐0 No ☐1

#

Urine test: strip (Combi 10 Test)		
63	Urine specific gravity	☐.☐☐☐
64	PH	☐
65	Leukocytes *(tick one box only)*	Negative ☐0 1 + ☐1 2 + ☐2 3 + ☐3 Unreadable ☐7
66	Nitrites (*cocher* *(tick one box only)*	Negative ☐0 Positive ☐1 Unreadable ☐7
67	Proteins *(tick one box only)*	Negative ☐0 1 + ☐1 2 + ☐2 3 + ☐3 Unreadable ☐7 *(if positive, send specimen to SIA laboratory for proteinuria)*
68	Glucose *(tick one box only)*	Negative ☐0 1 + ☐1 2 + ☐2 3 + ☐3 4 + ☐4 Unreadable ☐7
69	Ketones *(tick one box only)*	Negative ☐0 1 + ☐1 2 + ☐2 3 + ☐3 Unreadable ☐7
70	Urobilinogen *(tick one box only)*	Negative ☐0 1 + ☐1 2 + ☐2 3 + ☐3 4 + ☐4 Unreadable ☐7
71	Bilirubin *(tick one box only)*	Negative ☐0 1 + ☐1 2 + ☐2 3 + ☐3 Unreadable ☐7
72	Blood *(tick one box only)*	Negative ☐0 1 + ☐1 2 + ☐2 3 + ☐3 Unreadable ☐7

Thank you, the remainder of the questionnaire will be completed on receipt of the blood and urine test results

Identification number ☐☐☐

Urine biochemical tests: Laboratory test results		
73	Sodium	☐☐ mEq/l
74	Potassium	☐☐ mEq/l
75	Chlorine	☐☐☐ mEq/l
76	Creatinine	☐☐☐ mg/l
77	Proteins (complete only when positive proteinuria results from strip test*). See Phase* 3, Question 67.	☐☐ g/l
78	Microalbumin	☐☐ mg/l
79	ACR: Urine ratio: microalbumin in mg /creatinine in g	☐☐ mg/g

Blood test: Laboratory results		
80	Glucose	☐.☐ mmol/l
81	Creatinine	☐☐☐ µmol/l
82	HbA1c (To be completed for diabetics only). See Phase 1, Question 38.	☐☐.☐☐ %
83	Uric acid	☐☐☐ µmol/l
84	Haemoglobin	☐☐.☐ g/dl
85	Total cholesterol	☐.☐ mmol/l
86	HDL	☐.☐☐ mmol/l
87	Triglycerides	☐.☐☐ mmol/l
88	Cystatine C	☐.☐☐ mg/l

Identification number ☐☐☐

To be completed by a physician		
89	Diabetes Risk Score	☐☐
90	LDL (Friedwald formula)	☐.☐☐ mmol/l
91	Estimated glomerular filtration rate by simplified MDRD	☐☐☐ ml/min/1.73m^2

Diagnosis: *(To be completed by a physician: Second name - First name: _____)*

To be completed if diagnosis confirmed	*To be completed if considered at risk according to programme criteria*
☐ Diabetes →	☐ At risk according to programme criteria
☐ High blood pressure →	☐ At risk according to programme criteria
☐ Kidney failure →	☐ At risk according to programme criteria
☐ Cardio-vascular disease →	☐ At risk according to programme criteria
☐ Proteinuria	

Data collected by: Second name - First name _____

Questionnaire completed fully: Yes ☐0 No ☐1

Data entry by: Second name - First name _____

Entries consistent : Yes ☐0 No ☐1

Did this person take part in monitoring? Yes ☐0 No ☐1

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