



**SOCIAL DETERMINANTS OF  
NONCOMMUNICABLE  
DISEASES AND OTHER PUBLIC HEALTH ISSUES IN  
SEYCHELLES: EVIDENCE AND IMPLICATIONS**



**SOCIAL DETERMINANTS OF  
NONCOMMUNICABLE  
DISEASES AND OTHER PUBLIC HEALTH ISSUES IN  
SEYCHELLES: EVIDENCE AND IMPLICATIONS**

WORLD HEALTH ORGANIZATION  
Regional Office for Africa  
Brazzaville • 2014

## **WHO/AFRO Library Cataloguing – in – Publication**

Social determinants of non-communicable diseases and other public health issues in Seychelles: evidence and implications

- 1 Chronic diseases
- 2 Social determinants of health
- 3 Socioeconomic factors
- 4 Public health
- 5 Risk factors
- 6 National Health Programs
- 7 Organizational Case Studies

I. World Health Organization. Regional Office for Africa

ISBN: 978-929023258-2

(NLM Classification: **WA 525**)

© WHO Regional Office for Africa, 2014

Publications of the World Health Organization enjoy copyright protection in accordance with the provisions of Protocol 2 of the Universal Copyright Convention. All rights reserved. Copies of this publication may be obtained from the Library, WHO Regional Office for Africa, P.O. Box 6, Brazzaville, Republic of Congo (Tel: +47 241 39100; +242 06 5081114; Fax: +47 241 39501; E-mail: afrobooks@who.int). Requests for permission to reproduce or translate this publication – whether for sale or for non-commercial distribution – should be sent to the same address.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either express or implied. The responsibility for the interpretation and use of the material lies with the reader. On no account shall the World Health Organization or its Regional Office for Africa be liable for damages arising from its use.

Printed in the Republic of Congo

Prepared by

Dr William Muhwava

Consultant in Social Determinants of Health

## ACKNOWLEDGEMENTS

---

This report was prepared by Dr William Muhwava for the Ministry of Health, Seychelles with financial and technical assistance from the World Health Organisation, the Regional Office for Africa. Dr Muhwava worked with a technical team comprising experts from various government departments that provided technical guidance throughout the whole process of producing this report. The team consists of Dr. Cornelia Atsyor-WHO Liaison Officer in Seychelles; Dr. Shobha Hajarnis- Director General of Public Health in Ministry of Health; Mr. Joachim Didon-Principal Statistician in Ministry of Health; Ms Bharathi Viswanathan-Project Manager in the Unit for Prevention and Control of Cardiovascular Disease of the Ministry of Health, Mrs Gin Michel Project Manager in the Cancer and Mental Health Unit, Mrs Julita Williams-Programme Manager of Diabetic Unit Ms Veraine Louis-Marie-Nutritionist in the Nutrition Unit of Ministry of Health and Mr Jean Malbrook-Health Economist in the International Cooperation Unit.

We would want to thank the technical team led by Dr Bovet that has undertaken the three waves of the Heart Surveys. Most of the information we use on non-communicable diseases come from those studies. We acknowledge using a significant amount of their analyses and papers in the report and duly referenced their works in the respective sections. Any attempt at reanalysing data from the HEART studies would have been unnecessary duplication as they have exhaustively done so. However, where necessary, these analyses have been complemented by further analysis and evidence from other sources.

In the same context, we would like to thank Dr Kam Ki Tang, and Dr Dennis Petrie, both of the University of Queensland who provided technical assistance in using the realization of potential life years (RePLY), a new method to measure health inequalities caused by conditions amenable to policy intervention and use this to identify health differences between sexes and age groups. This collaboration will continue as we interrogate more the data from Seychelles and show the applicability of the method in the study of health inequalities.

Mr Joachim Didon deserves special mention as he assisted in identifying all the datasets that have been used in this report. The support we got from the Minister of Health, and Dr Jude Gedeon, Public Health Commissioner was immense. Lastly, we would want to thank Professor Davison Munodawafa of WHO AFRO for technical assistance during the whole process.

Cancer, diabetes, and heart diseases are no longer the diseases of the wealthy. Today, they hamper the people and the economies of the poorest populations even more than infectious diseases. This represents a public health emergency in slow motion.

**MR BAN KI-MOON**

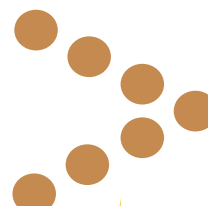
**United Nations Secretary-General**

**2009**

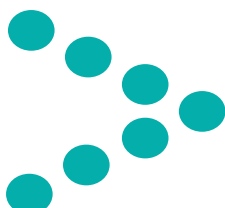


## Contents

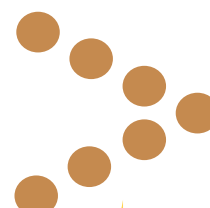
	<b>Page</b>
ACRONYMES .....	ix
EXECUTIVE SUMMARY .....	xi
<b>CHAPTER I: Introduction .....</b>	<b>1</b>
1.0 Background to the Study .....	1
1.1 Social Determinants of Health .....	5
1.2 Socio-Economic Profile .....	6
1.3 Demographic Profile .....	8
1.4 Health Care System .....	11
<b>CHAPTER II: Data Sources and Methods .....</b>	<b>13</b>
2.0 Introduction .....	13
2.1 Data Sources .....	13
2.1.1 Population and Housing Census 2010 .....	13
2.1.2 Vital Registration System (VRS) .....	13
2.1.3 HEART Surveys .....	14
2.1.4 Global School-based Student Health Survey (GSHS) .....	14
2.1.5 Global Youth Tobacco Survey in the Seychelles .....	15
2.2 Outcome Indicators .....	16
2.2.1 Life Expectancy .....	16
2.2.2 Causes of Deaths .....	17
2.3 Stratification Indicators: Measures of Inequality .....	18
2.4 Risk Factors for Non-Communicable Diseases .....	19
2.5 Measurement of Inequality .....	21



<b>CHAPTER III: Mortality and Morbidity Patterns in the Seychelles .....</b>	<b>26</b>
3.0 Introduction.....	26
3.1 Life Expectancy .....	27
3.2 Cause of Death and Burden of Disease.....	36
3.2.1 Cardiovascular Diseases .....	40
3.2.2 Cancers.....	43
3.2.3 Chronic Respiratory Diseases .....	45
3.2.4 Diabetes.....	47
3.2.5 Hypertension .....	48
3.2.6 Communicable Diseases .....	49
3.2.7 Violent and Accidents Deaths .....	51
3.3 Risk Factors for Non-Communicable Diseases.....	51
3.4 All Risk Factors for Non-Communicable Diseases .....	51
3.5 Obesity .....	54
3.6 Tobacco Use .....	62
3.7 Harmful Use of Alcohol and Drugs .....	63
3.8 Physical Inactivity.....	66
3.9 Food Consumption Patterns .....	69
<b>CHAPTER IV: Structural Determinants of Health.....</b>	<b>72</b>
4.0 Introduction.....	72
4.1 Waste Disposal .....	72
4.2 Trade.....	74
4.3 Marketing .....	75
4.4 Globalization.....	76
<b>CHAPTER V: Reproductive Health Issues .....</b>	<b>78</b>
5.1 Teenage Pregnancy and Abortion .....	78

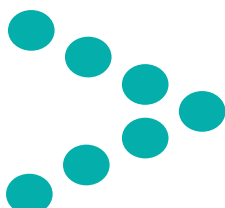


5.2	HIV & AIDS .....	80
5.3	Gender-Based Violence.....	82
5.4	Hepatitis C .....	84
<b>CHAPTER VI: Other Important Health and Social Issues .....</b>		<b>85</b>
6.1	Drug and Substance Abuse .....	85
6.2	Mental Health .....	89
<b>CHAPTER VII: Health Systems, Policy and Financing.....</b>		<b>89</b>
7.1	Health Systems .....	89
7.2	Health Policy .....	91
7.3	Health Financing .....	91
7.4	Out of Pocket Expenditure.....	93
<b>CHAPTER VIII: Review of National and Global Responses to NCDs .....</b>		<b>94</b>
8.1	National Responses to Non-Communicable Diseases.....	95
8.2	Global Responses to NCDs .....	97
8.3	Tackling Risk Factors for Non-Communicable Diseases in Seychelles .....	99
<b>CHAPTER IX: Discussion and Recommendations .....</b>		<b>101</b>
9.1	Discussion.....	101
9.2	Recommendations.....	102
References .....		107
Appendices.....		112



## List of Tables

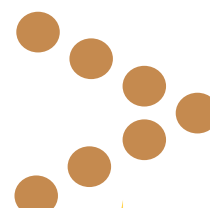
1. Demographic Indicators for Seychelles 1990-2010 .....	10
2. Death Rates by Region in 2011 .....	26
3. Life Expectancies: Seychelles 2006-2011. ....	28
4. The Gap between Male and Female Life Expectancies at Age x.....	29
5. Main causes of death, 2003–2010 .....	38
6. Number of Years Lost Due to Non-Communicable Diseases.....	39
7. 7. Trends in Age-Standardized Mortality for All-Cause Mortality and CVDs.....	41
8. Cancer Death Rates Per 100 000.....	44
9. Pollution Figures by Source: Seychelles .....	46
10. Relationship between categories of body mass index (BMI) and diabetes .....	47
11. Selected Communicable Diseases in Seychelles, 2002-2011 .....	50
12. Age-adjusted prevalence of risk factors of cardiovascular disease by various characteristics according to gender and year of survey.....	53
13. Multivariate analysis of overweight (BMI =>25) and smoking, education and occupation: Seychelles 2004.....	56
14. Association Between high self-perceived weight and socio-economic status among overweight and obese persons 2004 .....	58
15. Multivariate analysis of potential risk factors for children at the early stages of transition .....	60
16. Association between excess body weight (overweight or obese), calendar years and low levels of physical exercise in school children .....	61
17. Age-standardized trends in body mass index and alcohol consumption, 1989–2004 .....	64
18. Age-standardized trends in body mass index categories of physical activity in 2004 .....	67



19.	Association between sitting for more than 3 hours per day by various variables .....	69
20.	Fruit and Vegetable Consumption among Adults.....	70
21.	Amount and Percentage Changes in Cigarette Importation in Seychelles .....	75
22.	Trends in Teenage Fertility and Pregnancy Rates .....	78
23.	Trends in HIV Prevalence .....	80
24.	Number and percentage of causes of AIDS-related mortality .....	82
25.	Number of Children Seen in Drug Rehabilitation and Yearly Growth Rates (Expressed in Percentage in Brackets). .....	86
26.	Stepwise multivariate association between risk behaviours and psychosocial characteristics in boys and in girls .....	87
27.	Components of Client Satisfaction at the Point of Delivery .....	90
28.	Expenditure on Health by Sources .....	92
29.	Out of Pocket Expenditure by Type - 2009 .....	94
30.	Targets for achievements for NCDs by 2025 .....	98
31.	Cost-Effective Interventions for Non-Communicable Diseases .....	100

### List of Figures

1.	Layers of the Social Determinants of Health.....	5
2.	Demographic Transition Seychelles: 1976-2030 .....	9
3.	Common Risk Factors for Non-Communicable Diseases.....	20
4.	Lorenz Curve for Region and Mortality Rates.....	27
5.	Age-specific excess male mortality in Seychelles 2011 .....	30
6.	Conditional probability of dying by age and gender of the reference country and Seychelles 2011 .....	32
7.	Average RePLY by age at death Seychelles 2011. ....	33

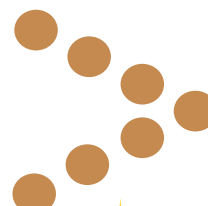


8.	Ratio of male to female average RePLY and Average gender inequality prevalence index by age at death. ....	35
9.	Mortality Pattern across the Life Span by Cause 2011: Seychelles .....	36
10.	Comparison of Age-Cause-Specific Death Ratios across the Life Span: 2011 Seychelles.....	37
11.	Relationship between Number of Cars and Traffic Accidents in the Seychelles 2003-2010.....	51
12.	Prevalence of Adult Overweight and Obesity .....	55
13.	Prevalence of cigarette smoking during the past 30 days, by frequencies .....	63
14.	Prevalence of drinking during the past 30 days .....	66
15.	Percent who had two classes of Physical Education Per Week.....	68
16.	Prevalence of students who ate five or more fruits or vegetables per day during the past 30 days .....	71
17.	Percentage of Women who have been ever abused by Income Group .....	83
18.	Lorenz Curve: Income and Ever Abused .....	83
19.	Health Expenditure by Source .....	93

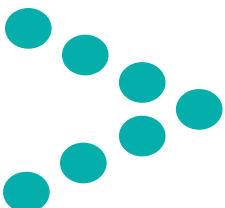


## Acronyms

DHS	Demographic and Health Surveys
GDP	Gross Domestic Product
GSHS	Global School-based Student Health Survey
GNI	Gross National Income
GOS	Government of Seychelles
GIPI	Gender Inequality Prevalence Index
GYTS	Global Youth Tobacco Survey
MDG	Millennium Development Goals
MoF	Ministry of Finance
MOH	Ministry of Health
NAFT	National Aids Trust Fund
NCD	Non-Communicable Diseases
NGOs	Non-Governmental Organisations
NHA	National Health Accounts
NIHSS	National Institute of Health and Social Studies
NSB	National Statistics Bureau
OECD	Organization for Economic Cooperation and Development
OOP	Out-of-Pocket
RePLY	Realization of Potential Life Years
SACOS	State Assurance Company of Seychelles



SES            Socio-Economic Status  
VRS            Vital Registration System  
WHO/AFRO   World Health Organization African Region  
WHO           World Health Organization  
WHO/POA    World Health Organization/Plan of Action





## EXECUTIVE SUMMARY

In response to the call in the Rio Political Declaration on Social Determinants of Health (2011) and the Strategy for addressing the key determinants of Health in the African Region (2010) for Member States to produce evidence-based research on health inequalities, the Government of Seychelles with financial assistance from the World Health Commissioned the study to identify social and economic factors which disadvantage certain population groups from realizing their potential life years. In Seychelles, non-communicable diseases such strokes, heart attacks, diabetes, cancer, asthma and depression causes highest burden on mortality and morbidity. Thus, a large part of this report will be devoted to non-communicable diseases. However, HIV & AIDS is emerging as one of the serious health threats in Seychelles and hence is included in the report.

Considering the numerous frameworks available for analysis of social determinants, the one developed by Dahlgren and Wilson (1991) has been found appropriate for this study because of its relevance to the variables being investigated and its amenability to quantification of the risk factors. The framework demonstrates the influences of social and economic determinants of health on population health through the use of rainbow-like layers model that include the individual lifestyle factors, social and community networks, living and working conditions and the general socioeconomic, cultural and environmental factors.

The report has used secondary data available in the Seychelles and these include the 2010 census, three waves of the Heart Study (1989, 1999 and 2004), the annual Global School Health Surveys and Global Youth Tobacco Surveys, Vital Registration System and other health statistics. However, the absence of the DHS-types of surveys, limits the measurement of socio-economic variables and availability of a wide array of other health outcome variables. In the analyses, while the traditional methods have been used, other new methods have been introduced to add value to the development of techniques for measuring health inequalities. The report has been structured to present health inequalities in the first part and discuss the social determinants in the second part.

Seychelles has made enormous gains in health. Communicable diseases have been brought under control. These have been supported by substantial government investment in the health system and the healthcare delivery network. The investments have narrowed social disparities, particularly in access to health-care services by eliminating user fees. This has ensured a high degree of protection of



households against the financial risks associated with payments for medical treatment.

The results clearly show that Seychelles is at the end of both the demographic and epidemiologic transition. In addition, Seychelles has undergone nutrition and development transitions that have exposed Seychellois to non-communicable diseases. These four transitions have influenced the mortality patterns by age and sex. Non-communicable diseases are now the major causes of deaths. Most communicable and infectious diseases have been eradicated. However, there is a growing threat from unnatural deaths.

### **Overall mortality**

- The life expectancies at birth for males and females are high in Seychelles and these are directly comparable to countries at the same stage of development.
- The life expectancy gap between males and females has been widening and currently the difference is about 10 years. These differences are indicative of the underlying gender differences in the causes of death. The results show that males have lower realization of potential life years (RePLY) than females due to avoidable deaths.

### **Cardiovascular disease**

- Mortality due to all CVDs has declined by 53 percent for men and 26 percent for females. However, deaths from strokes have only declined by an insignificant 1 and 2 percent for males and females, respectively. Major significant changes are recorded for MI and other CVDs. MI has decline by 60 percent for males and 37 percent for females and other CVDs declined by 64 percent for males and 33 percent for females.
- The decreases in CVDs have been attributed the reductions in smoking and drinking rates

### **Cancer**

- The second leading cause of death in the Seychelles is cancer accounting for about 20 percent of mortality. WHO estimates that the cancer mortality rate for males was 227 per 100,000 for males and 96 per 100,000 for females.
- The highest cancer mortality is due to prostate cancer which accounts 27



percent followed by breast cancer which accounts for 19 percent. The other important ones are lung cancer (15.1%), colon/rectum cancer (11.1%) and oral cancer (11.4%).

## **Diabetes**

- A comparison of the 1989 and 2004 surveys showed that the prevalence of diabetes (fasting blood glucose >7 mmol/l or treatment, or both) increased from 6.2% to 9.6% in men and from 6.1% to 9.2% in women.
- Half of all diabetes mellitus (DM) cases in the population could be attributed to excess weight. The proportion of all DM cases in the entire population that could be attributed to excess weight was 49% (95%: 35%–61%).

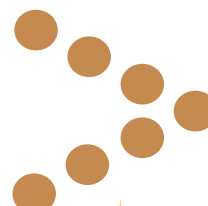
## **Overweight and obesity**

- The overall prevalence of overweight (BMI >25) and obesity (BMI >30) in Seychelles is high, with more than 29% and 52 % of men in 1989 and 2004, respectively being classified as overweight or obese. The prevalence rates are even higher for females recording 52 percent and 67 percent in 1989 and 2004, respectively.
- The association between obesity and SES is direct in men, but inverse in women. In the 2004, men who were in the professional and intermediate occupations were almost twice more likely to be overweight than those in manual labour, while for women it was the reverse.
- For males, those tertiary and secondary education were more likely to be overweight than those with primary or no education while among females there was an inverse relationship.

## **Smoking**

- The prevalence of cigarette smoking decreased markedly (from 52% to 31% in men, from 10% to 4% in women) between 1989 and 2004.
- Smoking was about 2 times more prevalent in men of low vs. high SES and relative inequalities in smoking remained stable between 1989 and 2004.
- Smoking was less prevalent in women of low vs. high SES in 1989 but this pattern reversed over time and the prevalence of smoking was higher in women of low vs. high SES in 2004.

## **Excessive Use Alcohol**



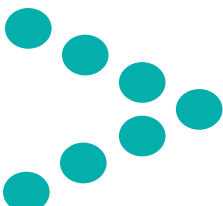
- Mean alcohol intake was substantially lower in 2004 than in 1989 showing a decrease. The prevalence of drinkers of homebrews decreased markedly between 1989 and 2004, which contributed to a large decrease in total alcohol intake in 2004 vs. 1989.

## **Hypertension**

- In 2004, the age-standardized prevalence of hypertension (BP  $\geq$ 140/90 mm Hg or under treatment) was 44% in men and 36% in women.

## **HIV/AIDS**

- The HIV epidemic in Seychelles is that of a concentrated epidemic with less than 2% of the population infected. However, HIV and AIDS continue to prevail in the population especially among injecting drug users (IDUs) and through homosexual acts (MSM).



# CHAPTER I: INTRODUCTION

## 1.0 Background to the Study

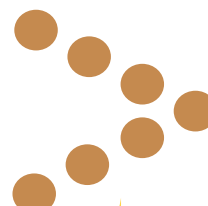
According to WHO (2004), the social determinants of health are the conditions in which people born, grow, live, work and age, including the health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels, which are themselves influenced by policy choices. The social determinants of health are mostly responsible for health inequities - the unfair and avoidable differences in health status seen within and between countries. Social determinants of health arise from the social and economic conditions in which we live and are not so fixed. The kind of housing and environments we live in, the health or education services we have access to, the incomes we can generate and the type of work we do, for instance, can all influence our health, and the lifestyle decisions we make.

**Definition:** The social determinants of health refer to both specific features of and pathways by which societal conditions affect health and that potentially can be altered by informed action. Examples are income, education, occupation, family structure, service availability, sanitation, exposure to hazards, social support, racial discrimination, and access to resources linked to health

Krieger N. (2001)

A range of factors has been identified as social determinants of health and these generally include: the wider socio-economic context; inequality; poverty; social exclusion; socio-economic position; income; public policies; health services; employment; education; housing; transport; the built environment; health behaviours or lifestyles; social and community support networks and stress. A life course perspective provides a framework for understanding how these social determinants of health shape and influence an individual's health from birth to old age.

People who are less well off or who belong to socially excluded groups tend to fare badly in relation to these social determinants. For example they may have lower incomes, poorer education, fewer or more precarious employment opportunities and/or more dangerous working conditions or they may live in poorer housing or less healthy environments with access to poorer services or amenities than those who are better off - all of which are linked to poorer health.



While the precise pathways through which social determinants influence health are not clear and are the subject of continuing research, it is important to note that:

- a. Social determinants contribute to health inequalities between social groups. This is because the effects of social determinants of health are not distributed equally or fairly across society.
- b. Social determinants can influence health both directly and indirectly. For example damp housing can directly contribute to respiratory disorders, while educational disadvantage can limit access to employment, raising the risk of poverty and its adverse impact on health.
- c. Social determinants of health are interconnected. For example poverty is linked to poor housing, access to health services or diet, all of which are in turn linked to health.
- d. Social determinants operate at different levels. Structural issues, such as socioeconomic policies or income inequality, are often termed 'upstream' factors. While 'downstream' factors like smoking or stress operate at an individual level – and can be influenced by upstream factors.

Efforts to address inequalities in health must address the way in which the social determinants of health are distributed unfairly. Addressing the social determinants of health suggests 'going beyond the immediate causes of disease' and placing a stronger focus on upstream factors, or the fundamental 'causes of causes' (WHO CSDH, 2007).

As Fran Baum, one of the WHO Commissioners on the Social Determinants of Health, has pointed out, governments need a commitment to the values of fairness and justice and an ability to respond to the complex nature of the social determinants of health 'beyond exhorting individuals to change their behaviour' (Baum 2007:90). In countries like Seychelles, significant steps have been taken in increasing equity to access by making health services free but this is one factor in a complex issue where factors are interconnected and there are different layers of operation from the individual to the global levels.

Responding to the work of the Commission on Social Determinants of Health, the WHO African Region (AFRO) has supported work in several countries to look at social determinants and health inequalities in African countries. Recognizing this, the importance of examining these issues in the context of the Seychelles, the Government of the Seychelles and the WHO Country Office requested WHO AFRO to

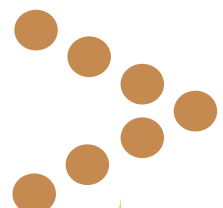


support a detailed quantitative review of the current situation. This report is the result of the quantitative review, which examines the data available in the Seychelles and other authoritative sources like the WHO and other UN agencies so as to identify the social determinants of health and health inequalities.

The Situation Analysis of Health Equity and Social and Economic Determinants of Health in Seychelles report (2011) and the follow-up dissemination workshop “Consensus Meeting on SDH Report, Seychelles – 12-13 March 2012” have highlighted the burden of non-communicable diseases (NCDs) in the Seychelles the need to delve deeper to finding the underlying causes and using multi-prong approach in mobilizing the public and private sectors as well as the civil society in finding long lasting solutions. Thus, like other countries in the middle income group, the burden of diseases has moved from communicable to non-communicable diseases and Seychelles has almost completed the epidemiologic transition and exhibiting a double burden of disease with unfinished issues with communicable diseases whilst tackling the new emerging on communicable diseases. While this epidemiologic transition is inevitable as a result of economic development, urbanization and globalization, it is important to have a good understanding of the underlying causes of the NCDs at the higher stages of development. The following conditions have been shown to be on the increases in Seychelles: obesity (Marques-Vidal, 2008; Bovet et al 2006); cancer, cardiovascular diseases (Bovet et al. 2012). This study will look at the underlying risk factors and the role of structural determinants, for example, trade, tourism, globalization etc in influencing non-communicable diseases.

However, there are some problems which have a bearing on health that are facing the Seychelles like domestic violence, teenage pregnancies, abortion, HIV & AIDS and Hepatitis C. The technical committee which is guiding the process of developing the health inequality analysis felt strongly that these should be investigated and included in this report. While Seychelles is on the path of achieving the Millennium Development Goals by 2015 signifying great strides in reproductive health, the emergence of issues like domestic violence, teenage pregnancies, abortion HIV & AIDS and Hepatitis C indicate that certain population groups like teenagers, injecting drug users, men who have sex with men are not adequately covered by current reproductive health strategies. Because of the significant contribution of these issues to the burden of diseases and mortality in Seychelles, they will be included in the report.

The analyses will use the social determinants of health framework. The underlying rationale of the framework is that health is determined not merely by behavioural,



biological and genetic factors but also by a range of environmental, economic and social factors. A safe environment, adequate income, meaningful and valued social roles, secure housing, higher levels of education and social support are all associated with better health and wellbeing. The reverse is also true, that those in disadvantaged social status have poor health outcomes. Thus, social determinants intersect to influence and affect health inequities and most importantly, they are the drivers of health inequities. In essence, the approach answers a fundamental question "Why treat someone only to return them to the situation or place that caused the illness in the first place?"

In view of the above exposé, the **specific objectives** of the study are:

a) To review available data sources and publications for information to describe the social determinants of health (focusing on NCDs and other negative health outcomes) in Seychelles with regard to health equity as well as potential policy entry points.

b) To identify datasets where needed, to complement existing analyses with more in-depth analyses on the social and economic determinants of health at the national level.

c) To follow-up information on policy entry points with specific stakeholder and expert interviews and to locate gray literature that may exist.

d) To compile and present a report on the social determinants of non-communicable diseases and other important health issues in Seychelles.

Despite the costs of the health care system in the Seychelles being almost fully funded by the Government, there are still inequalities which are inherently determined by the social, economic and political systems. It should be noted that the full coverage of health care costs by the government almost completely controls for income inequalities and hence health inequalities may be emanating from other social, behavioural and economic factors. In this report, special attention is placed on gender differences. This is based on the premise that gender inequalities in health are a manifestation of distinct roles and behaviours of men and women in a given culture, dictated by that culture's gender norms and values.



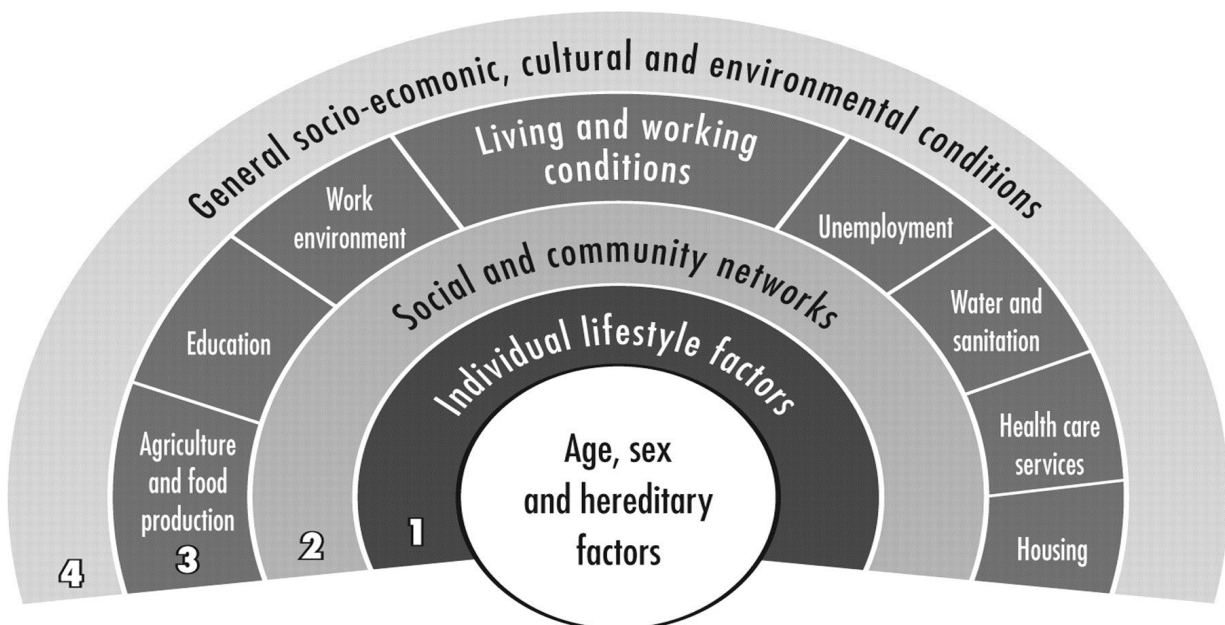


## 1.1 Social Determinants of Health

The term social determinants of health refers to the complex, integrated, and overlapping social structures and economic systems that include social and physical environments and health services. These determinants are shaped by the level of income, power, and resources at global, national, and local levels. They are also often influenced not only through personal choices, but through policy choices as well.

The model by Dahlgren and Whitehead in Fig 1 provides a conceptual framework for understanding the socioeconomic and political context; structural determinants and socioeconomic position; intermediary determinants (including material circumstances, social-environmental circumstances, behavioural and biological factors, social cohesion, and the health care system); and the impact on health equity and wellbeing measured as health outcomes.

**Figure 1: Layers of the Social Determinants of Health**



Source: Dahlgren and Whitehead (1991)

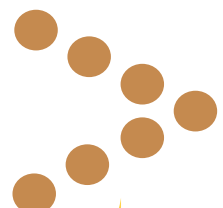


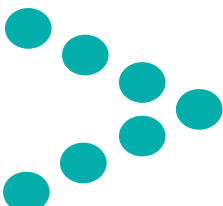
Figure 1 illustrates four layers of determinants of health, which function independently and collectively to impact health outcomes for individuals. The model indicates unequal individual genetic and lifestyle factors are the primary causes for inequality in health, though the wider determinants of health go beyond these. Individuals with their different characteristics such as sex, age, hereditary, and race are placed at the centre of the figure, but are influenced by social and community networks which were placed in the next layer. The third layer indicates that individual's health is influenced by the broad health determinants factors such as the general socioeconomic, cultural and environmental conditions. For instance, individual living and working conditions, access to essential goods and services, which is largely determined by a country's overall economic state, labour market conditions, cultural, environmental, and standard of living achieved in a society.

The WHO's conceptual framework for SDH helps to analyse and understand the drivers of health and health inequities, including how determinants of health interact, influence inequities, determine priorities, and target points for intervention. Addressing SDH can improve the health of the population, including reducing health inequities. WHO has identified four areas for intervention: addressing inequities in socioeconomic factors, intermediary determinants of health, the effects of health status on socioeconomic position, and factors related to the health care system. In this report, all the four areas will be addressed.

The report is organised in 7 sections. The first section provides an introduction to the topic of health inequalities and background information on the social, economic, political and demographic profiles of the country. The second section details the data sources and the methods used in the analysis. The rest of the report is modelled along the four layers of the social determinants framework as shown in Figure 1 in Section 1.1.

## **1.2 Socio-Economic Profile**

The Seychelles is an archipelago of about 115 islands. It gained independence from Britain in 1976 but remains a member of the Commonwealth of Nations. In 1979, the country's constitution established a one-party republic. In 1992, a multiparty system took effect. Thus, Seychelles has become one of the most politically stable and democratic country in Africa. Despite the diverse ethnic origins of the population, the society in general has managed to maintain a relative degree of racial harmony. As indicated earlier, ethnic divisions have been neutralized by intermarriages.



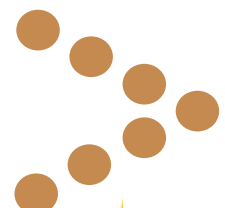
Seychelles' socio-economic progress has been one of the most successful among developing countries. According to the 2010 Census, literacy stood at 91 per cent of the population aged 15 and older and half of the population had completed secondary school. The country has achieved the MDG of gender parity in primary schooling. In 2009, the Education Ministry launched a project to increase literacy among adults who had less schooling opportunities during their lifetime. Despite its small population size, the country plans to open its first university in the near future.

The education system in the Seychelles is good, with an average pupil-to-teacher ratio of 13:1. There are 27 primary schools and 13 secondary schools in the Seychelles, and one university. There are nine colleges for 'post-secondary' education, namely the Polytechnic, the Industrial Training Centre, the Maritime Training Centre, the Farmers' Training Centre, the National College of the Arts, the Seychelles Hospitality and Tourism Training Centre, the Centre for Health Studies, and the National Institute of Education.

The Gini Co-efficient of equality for the Seychelles during the period 1990–1998 was 0.47 and increased to 0.65 in 2007 and currently estimated at 0.66 in 2010. Although Seychelles had less disparity between the rich and poor in the 1990s, there has been growing polarization between the rich and the poor. In addition, a paper commissioned by the African Development Bank identified the growing gender polarization which is working to the detriment of gender cohesion and contributing to a number of social problems confronting men in the Seychelles today (Geisler, 2004)

The Seychelles has one of the world's highest percentages of women in Parliament. There are also initiatives to empower children, and ensure they have appropriate legal rights and representation. The Seychelles workforce comprises only 44,000 people and unemployment rates are low at about 5%. The country's unemployment rate was 4.1% in 2011, down from 4.6% in 2010 and 5.1% in 2009. In 2012, overall unemployment is expected to fall to 3.7%, according to the IMF. Consumer prices rose by 5.1% in November 2011, according to the National Bureau of Statistics (NBS). In 2010, the overall inflation rate was -2.3%, up from the dramatic inflation during the post-depreciation years of 31.8% in 2009, and 37% in 2008. There is a shortage of labour at most levels, and, due to the paucity of tertiary education on the islands, many people leave the islands to further their education and do not return. There are, therefore, insufficient Seychellois graduates to undertake technical positions within the economy.

As a Small Island Developing State (SIDS), Seychelles has not been spared by the various adversities and vulnerabilities faced by island states. Remoteness from major

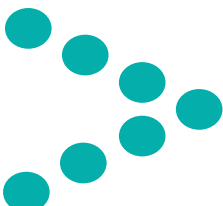


markets and limited natural resources has led to a heavy reliance on external financial flows for economic and social sustainability. Like many other SIDS Seychelles' economy is largely dependent on tourism and fisheries, although recently, there has been considerable effort to diversify, especially in the offshore sector and tanker business, an endeavour to establish the third pillar of the economy.

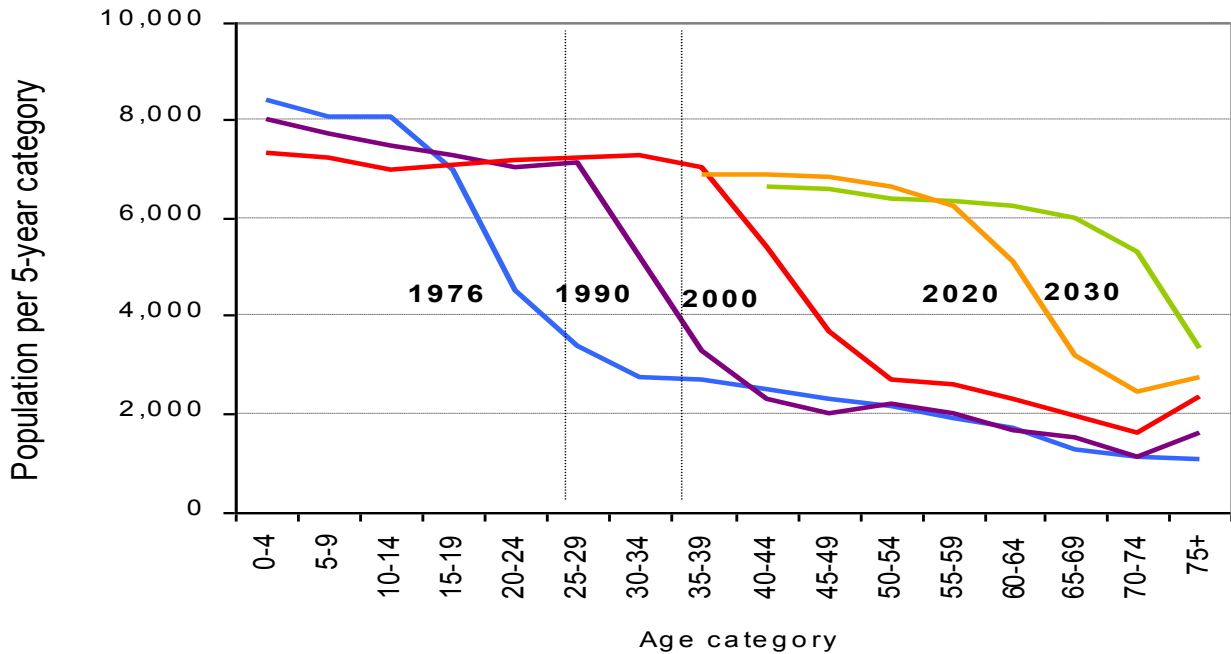
Gross Domestic Product (GDP) has increased by nine fold and the quality of life for the vast majority of Seychellois people has improved remarkably; and the Seychellois enjoys a high standard of living. Today Seychelles stands among the best in Africa. Since the mid-1990s, the Seychelles has been ranked as an upper-middle-income country by UNDP, with per capita income at approximately US \$ 9,108 in 2006, the highest in Sub-Saharan Africa. However, recently Seychelles has experienced a wave of economic difficulties marked by a shortage of foreign currency. As a direct consequence, the country has slipped from its previous ranking of 36th in the Human Development Index (HDI) to 47th in the latest ranking (2006).

### **1.3 Demographic Profile**

The history of the Seychelles reflects a country which is at the end of both the demographic and epidemiologic transition. Both fertility and mortality are at very low levels which are comparable to the developed countries. While the demographic transition has positive impact on population and development relationships, its impact on the diseases patterns due to ageing tends to be negative as shown below.

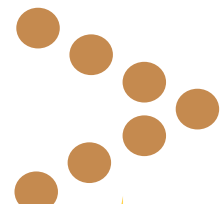


**Figure 2: Demographic Transition Seychelles: 1976-2030**



The diagram clearly demonstrates that as Seychelles goes through the demographic transition, the number of people in five year age groups after age 50 trebles. Thus, the shift to an aging population has implications for the mortality patterns.

Seychelles has a small population, which was estimated at 90,945 in the 2010 census. There were 46,912 males and 44,033 females yielding a sex ratio of 1.07 which is one of the highest in Africa. Some major demographic indicators are presented in Table 1.



**Table 1: Demographic Indicators for Seychelles 1990-2010.**

	1990	1995	2000	2005	2006	2007	2008	2009	2010
Population	69,507	75,304	81,131	82,852	84,600	85,032	86,956	87,298	
Migration Rate			0.9	0.5	2.1	0.5	2.2	0.4	2.8
Life expectancy (average both sexes)	67.7	72	72.7	71.9	72.2	72.9	73.1	72.8	
Under 5 Mortality Rate, per 1,000 live births	14.8	20.2	9.2	11.1	10.9	12.7	14.9	12.7	
Infant Mortality Rate, per 1,000 live births	13.0	18.3	9.9	9.8	9.5	10.7	12.9	10.8	
Immunization (%)	86	97	97	100	100	100	100	100	
Maternal Mortality Ratio, per 100,000 live births	0	68	0	65	0	0	65	0	
Skilled delivery (%)	98	99	99	99	99	100	100	99	
Contraceptive Prevalence Rate	n/a	n/a	n/a	n/a	38	36	35	36	
Adolescent Fertility Rate*	61	59	55	59	54	63	63	73	
Total Fertility Rate			2.1	2.2	2.1	2.2	2.3	2.4	2.5
Prenatal care	n/a	n/a	99.7	99.9	99.8	99.2	99.8	99.8	99.8

The 2010 census estimates the population of Seychelles 90,945 distributed as 46,912 males and 44,033 females giving a sex ratio of 1.07. Seychelles is among the five countries with the highest sex ratio in Africa. The growth rate is low at 0.3%. The elderly population aged 60 years and over is estimated at 13% females and 8% males. Although the census classifies 55.3% of the population as living in urban areas, the size of Seychelles means the 44.6% who are in rural areas live within the precincts of urban areas and thus have access to the same services.

Life expectancy at birth had reached 69 years for males and 77 years for females in 2006 and infant mortality was a low 12 deaths per 1,000 live births. The country is on target to achieve the MDG of halving the under-5 mortality rate by 2015 and definitely it has achieved the MDG on maternal health.

Fertility has been at replacement levels for the last decade. Seychelles has essentially completed its fertility transition, with a total fertility rate at replacement



levels children per woman and a population growth rate of 0.5 per cent per year. However, the levels in the last three years seem to indicate a rebounding of fertility. It would be interesting to monitor these trends and investigate the possible causes of the upward movement of fertility. In countries where this phenomenon has been observed, two possible reasons which are relevant to Seychelles have been presented. First, most of the countries where fertility has improved are notable for their relatively egalitarian approach to gender roles, and the ready availability and affordability of childcare. Second, fertility may also be linked to a more flexible labour market which allows women to move in and out of employment rather than giving up their careers permanently when having a family.

However, despite the marked achievements in the fertility transition, Seychelles experiences high adolescent fertility, which is 54 births per 1,000 females, aged 15 to 19. About 32% of all first pregnancies are occurring among 15 to 19 year olds. Two-thirds of all first pregnancies occur in 15 to 24 year olds. In the recent past the Health Department has expressed concern over the estimated number of illegal abortions.

#### **1.4 Health Care System**

The Ministry of Health is charged with the principal task of providing health care services in Seychelles has the overall responsibility for planning, directing and developing the health system for the benefit of the entire population of Seychelles. Constitutionally, it is the role of the government to provide essential health care services to all its citizens. Currently, the National Health Strategic Framework (NHSF), 2006-2016 provides the strategic direction of the health sector. In NHSF (2006-2016), NCDs are placed at the top in terms of priority because they have the largest burden of mortality in the Seychelles.

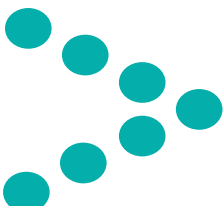
The primary health care system is based on the UK model of general practice. Implementation of this model has resulted in improved health of the population and consequently attainment of Millennium Development Goals. Seychelles has a three-tier health system, consisting of one central referral hospital, 3 cottage hospitals, one rehabilitative hospital, one mental hospital, one youth health centre and 16 district health centres located throughout the country. The government-funded services are complemented by a private service system. In 2006, there were 7 private medical clinics, 5 private dental clinics and 2 pharmacies. Most private practitioners provide primary treatment, referring patients to government-run secondary and tertiary care services when required.



Victoria Hospital is the main referral hospital, which offers some tertiary care, whilst two referral hospitals offer psychiatric and rehabilitative care. Primary and secondary care is provided by health centres which are equitably distributed on the major islands. The majority of highly specialized treatment takes place overseas; such treatment costs SCR5,217,000 in 2005 and has increased to SCR9,871,000 in 2010.

There is approximately 1 doctor per 780 people and 1 nurse serves 400 people. Nurses provide the family planning and maternal and child health services. Almost all nurses are Seychellois, but 75% of all physicians are expatriates. A school of nursing in the capital trains nurses, but there is no medical school and Seychellois doctors are trained abroad. Health workers regularly visit the outlying islands to provide care for the inhabitants, but when the health workers are not on the outlying islands, the inhabitants depend on a radio to communicate with the community clinics. The extended family and traditional healers provide non-medical primary care at the community level.

In addition, other government ministries have health promotion components which complement the efforts of the Ministry of Health. Ministry of Education provides health education in schools and the Ministry of Community Development, Youth, Sports and Culture provide health education among the young people and other specific population groups.





## CHAPTER II: Data Sources and Methods

### 2.0 Introduction

In this chapter, methods of data collection and data analyses used in the study are described in detail. The first section describes the data and the section reviews the measurement of outcome variables and lastly the analytical approaches to measuring inequalities.

### 2.1 Data Sources

Seychelles is one country with efficient data collection and management systems. Thus, availability and quality of the data are high. The advantage of Seychelles is that the population is small and systems have been put in place to record of vital events. However, although there is an efficient vital registration system and periodic censuses, Seychelles has not participated in the Demographic and Health Surveys, which are essential data sources for health inequalities studies. However, Seychelles has participated in the STEPS and Global Youth Surveys, which will be used extensively in this report.

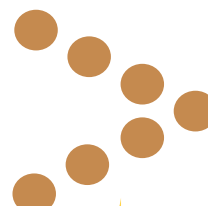
#### 2.1.1 Population and Housing Census 2010

The Population and Housing Census of 2010 collected data on all individuals resident in the Seychelles in March 2006. The data included details of age, sex and other demographic characteristics, household possessions and facilities, and births and deaths in the past year. In addition, Seychelles has a long history of conducting credible censuses.

#### 2.1.2 Vital Registration System (VRS)

The VRS is the national system for the registration of all births and deaths in the Seychelles. All deaths in the Seychelles are registered as required by law, and the

Statistics Unit in the Ministry of Health and National Statistics Bureau compiles the data in electronic format. These data include information on the age and sex of the deceased, the cause of death, which is coded using the WHO International Classification of Diseases, Tenth Revision (ICD-10), the place of death, place of usual residence, occupation and attending physician are recorded in the data base. Thus, these data allow for the analysis of causes of death, inequalities due to place of residence and socio-economic measured by occupation.



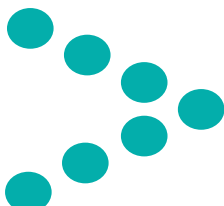
### **2.1.3 HEART Surveys**

The HEART surveys are representative sample survey of adults in Mahé that was conducted three times in 1989, 1999 and 2004. The methodology of the survey followed the STEPwise approach developed by the World Health Organization (core, expanded and optional modules). Detailed data collection and measurement of risk factors like are outlined in the report by Bovet et al (2007). The sampling frame of each survey consisted of a sex- and age-stratified random sample of the total population aged 25–64 years (main island, Mahe in 1989 and 1994, all islands in 2004). Eligible participants were selected from computerized databases derived from population censuses, thereafter regularly updated by civil status authorities. All eligible participants were invited to attend a study centre on selected dates. The surveys were attended by 1081 persons in 1989 (86.4% participation rate), 1067 in 1994 (87.0%) and 1255 in 2004 (80.2%)The instrument was used to collected data on socio-demographics, behavioural, physiological, and biochemical risk factors which are used to identify chronic NCDs. The specific diseases or risk factors for which indicators were collected included ischaemic heart disease, diabetes and tobacco use. Another HEART survey is planned for 2013, so it would be desirable to update this report in the immediate future to reflect any observed changes in the epidemiologic changes in the diseases patterns and related demographic and nutritional transitions.

### **2.1.4 Global School-based Student Health Survey (GSHS)**

The GSHS is a school-based survey conducted primarily among students aged 13-15 years. All 13 public and private schools of Seychelles containing any of the S1- S5 grades were selected to participate in the survey. A two-stage cluster sample design was employed to produce a representative sample of all students in the country attending grades S1, S2, S3, S4, and S5. Based on a listing of all schools and classes, the sample of eligible schools and classes was produced by Centre for Disease Control. All classrooms in each selected school were included in the eligible sampling frame. All students in the sampled classrooms were eligible to participate in the GSHS. For analysis, a weighting factor was applied to each student record to adjust for non-response and for the varying probabilities of selection.

Data collectors were assigned to the participating schools and were responsible for the delivery and collection of all the survey documentation forms, answer sheets and questionnaires. One survey administrator was present in each participating class during the administration of the questionnaire: she or he introduced the



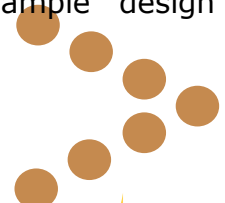
survey to the students and was the only adult present in the class when students completed the questionnaire. Survey procedures were designed to protect student privacy by allowing for anonymous and voluntary participation. Students completed the self-administered questionnaire during one classroom period and recorded their responses directly on a computer scannable one-page answer sheet.

Before completing the questionnaire, students had their weight and height measured with standard equipment and administrators wrote the values on a register. Students were asked to write down their weight and height values in the answer sheet. Overweight and obesity were defined according to the sex and age specific criteria of International Obesity Task Force.

### **2.1.5 Global Youth Tobacco Survey in the Seychelles**

The GYTS is an international school-based survey of tobacco in adolescents aged 13 to 15 years. The survey is sponsored by the World Health Organization and the Centres for Disease Control and Prevention. The GYTS includes grades in which students aged 13 to 15 years are found. In the Republic of Seychelles, this includes the 4 secondary grades S1-S4 (school is compulsory through the S4 level). In Seychelles, there are 12 schools (10 public, 2 private) on the three main islands that teach grades S1-S4. The total enrolment of grades S1-S4 for these 12 schools was 6161. The GYTS sample size estimation showed that 1224 completed interviews were needed from an enrolment of 6161 for a 65% margin of error. The actual number of students targeted for the survey was increased by 20% to adjust for student nonparticipation. All 12 schools were included in the study, and classes were selected proportionally to the total S1-S4 enrolment in each school. When every school is selected (i.e., a census of schools) the probability of selecting a class must be the same in every school; thus, the number of classes selected in each school was proportional to the school enrolment size (i.e., enrolment in S1-S4). In total, all 12 schools agreed to participate (100% school response rate), and 1321 students completed the survey (90.9% student response rate).

The Global Youth Tobacco Survey (GYTS) uses a two-stage cluster sample design that produces representative samples of students in grades associated with ages 13–15 years. The sampling frame includes all schools containing any of the identified grades. At the first sampling stage, the probability of schools being selected is proportional to the number of students enrolled in the specified grades. At the second sampling stage, classes within the selected schools are randomly selected. In the selected classes, all students attending school on the day the survey is administered are eligible to participate. Student participation is voluntary and anonymous using self-administered questionnaires. The GYTS sample design



produces representative, independent, cross-sectional estimates for students aged 13–15 years old.

## 2.2 Outcome Indicators

### 2.2.1 Life Expectancy

This is a widely used and accepted measure for monitoring the evolution of mortality within a population. It can facilitate comparisons between demographic groups that exist within a population, such as between genders. First, we calculate the difference in life expectancy between two categories (usually the extremes) of a demographic or social group of a population, the Life Expectancy Gap. This analysis will only be confined to the life tables available for Seychelles are categorized by gender.

Further analyses of the gender and age differentials have been undertaken using the RePLY (realization of potential life years) method proposed by Tang et al (2007). RePLY-based measures are more informative than conventional measures (such as life expectancy) as they expose inequalities that are concealed by differences in natural mortality risks between age and gender groups. There are three steps for using RePLY to measure health inequalities: (1) separating avoidable and unavoidable deaths for each age-sex group in a population; (2) computing the value of RePLY for each type of death for each age-sex group; (3) constructing health-inequality measures using the computed RePLY. The method requires a benchmark mortality schedule that has the lowest conditional probability of dying by age and sex, and in this case this was derived by:

$$q(x) = \begin{cases} \min q(x, k), k = 1, 2, \dots, K & x < X \\ 1 & x \geq X \end{cases}$$

Where  $K$  = number of countries and in this case  $K=47$  countries in the upper middle income group according to World Bank classification and  $q(x, k)$  = conditional probability that a person in country  $k$  who survives to age  $x$  will die before reaching the next birthday. The reference curves constitute a "frontier" (when viewed from below) for mortality risks. The distance from the x-axis to the frontier is a measure of the unavoidable mortality risks; the distance from the probability curve to the frontier is a measure of avoidable mortality risks.

Therefore, the RePLY for an avoidable death at age  $x$  is equal to  $x$  divided by  $(x + \tilde{e}_x)$ , where  $\tilde{e}_x$  is the life expectancy for a person aged  $x$  in the reference country. Inequalities in RePLY indicate that the overall health outcome of the population can be improved by reallocating resources between subgroups.



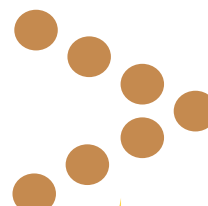
## 2.2.2 Causes of Deaths

The analyses outlined in Section 2.2.1 using the RePLY method helps in identifying whether the mortality profile consists of avoidable deaths. The analysis is taken further to identify which of the causes of deaths are contributing to these avoidable deaths using the multiple decrement life table approach. Considering the Seychelles has very accurate cause of death statistics, the analysis can be taken further to analyse the changes in the contribution of causes of death. However, considering that the numbers of deaths are small in Seychelles, broad causes of death categories are used: communicable, non-communicable and unnatural deaths. The impact of *Cause X* on overall mortality is measured by estimating the number of person-years that could be saved assuming *Cause X*-related mortality was eliminated as a cause of death in this population. The assumption here is that deaths from *Cause X* are avoidable. However, this assumption is correct in the case where non-communicable diseases are concerned, as we assume that the causes can be avoided. The impact is estimated using multiple-decrement life-table techniques. These methods rely on estimating the net effect of competing risks from different causes—that is, from Cause X versus from other causes, under the assumption that different causes operate independently of each other. This assumption will be examined further in the discussion section. A frequently used measure is the cause-elimination life expectancy gain. This is calculated as:

$$g_x^{(-1)} = e_x^{(-1)} - e_x$$

where  $g_x^{(-1)}$  is the gain in life expectancy due to the elimination of the  $i^{th}$  cause.  $e_x^{(-1)}$  the life expectancy in the life table eliminating the  $i^{th}$  cause of death and  $e_x$  life expectancy at the same age in the life table for all causes combined. The value of this measure represents the change in life expectancy under the hypothetical complete or partial elimination of a disease.

However, it well-established that causes-related mortality operates differentially by age, and hence we need to take this effect into account. To ascertain the age groups likely to contribute most to the total difference in life expectancy at birth as a result of the elimination of *Cause X*, we decomposed the total difference in life expectancy into specific age groups, using the procedure proposed by Arriaga (1984). The procedure is represented by the equations below:



For closed age groups:

$${}_n\Delta_x = \frac{l_x^{all}}{l_0^{all}} \cdot \left( \frac{L_x^{-Cause X}}{l_x^{-Cause X}} - \frac{L_x^{all}}{l_x^{all}} \right) + \frac{T_{x+n}^{-Cause X}}{l_0^{all}} \cdot \left( \frac{l_x^{all}}{l_x^{-Cause X}} - \frac{l_{x+n}^{all}}{l_{x+n}^{-Cause X}} \right)$$

For the open ended age group

$${}_{\infty}\Delta_x = \frac{l_x^{all}}{l_0^{all}} \cdot \left( \frac{T_x^{-Cause X}}{l_x^{-Cause X}} - \frac{T_x^{all}}{l_x^{all}} \right)$$

where the superscripts *all* and *-Cause X* indicate, respectively, with and without *Cause X*. The first term at the right side of the equation refers to the direct effect of a change in mortality rates between ages  $x$  and  $x + n$ , whereas the second term refers to the sum of both the indirect and interaction effects of contributions resulting from the number of person-years to be added because of additional survivors at age  $x + n$  exposed to the new mortality conditions. It should be noted that these are hypothetical measures, which help in the quantification of the mortality burden due to specific causes.

### 2.3 Stratification Indicators: Measures of Inequality

For measurement purposes, the typology given by Evans *et. al* (2003) summarize the categories that researchers and policymakers frequently use for assessing differences in health with the acronym PROGRESS, or:

- Place of residence
- Race/ethnicity
- Occupation
- Gender
- Religion
- Education
- Socioeconomic status

In the analyses, the above factors will be considered as the main factors which are linked to health inequalities. However, not all of factors are applicable in the case of Seychelles. For example, the urban/rural differentials in Seychelles are not



apparent. Also, ethnic divisions and cultural diversity have disappeared through intermarriages. Also, because of a health policy which allows for equitable access by paying all the health care costs for every citizen, then inequalities by income might not necessarily affect access. Thus, factors which have policy relevance to Seychelles will be considered.

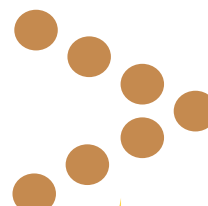
This report is based on the notion that all societies continue to be divided along the 'fault line' of gender, which considerably affects the survival and wellness of both men and women. Researches on gender-related health inequalities are located within two main approaches. The first seeks to understand how culture shapes gender roles and therefore health perceptions, policy and research questions and the second relies on epidemiological measurements of health status, morbidity, and mortality. In this report, the second approach seems more applicable.

## **2.4 Risk Factors for Non-Communicable Diseases**

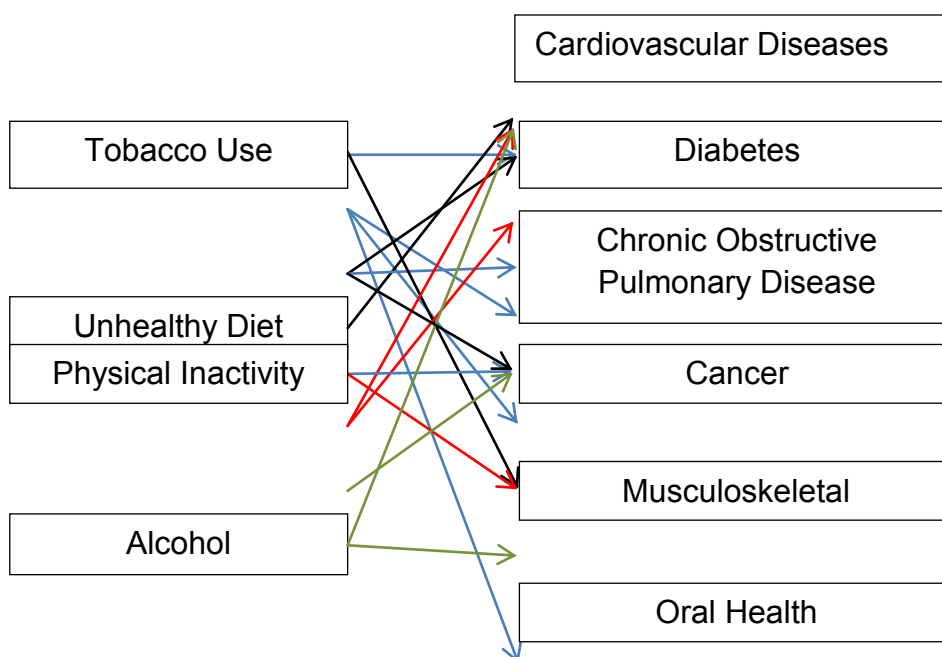
The Health Strategic Framework for Seychelles, 2006-2016 has noted the increasing trends on risk factors of non-communicable diseases. Common examples of diseases

on the increase include stroke, heart attacks, diabetes, cancer, asthma and depression. In Seychelles, the most common NCD are cardiovascular diseases, diabetes, cancers, chronic respiratory diseases and mental illness. Most of the NCD deaths occur before the age of 60. Premature deaths caused by cardio-vascular diseases in the economically productive age group of 35 – 64 are expected to increase. Recent studies indicate that these patterns of unhealthy lifestyle which include lack of exercises, intake of unhealthy foods, smoking, alcohol consumption and drug abuse are already present in children and youth.

The risk factors associated with NCDs are overweight and obesity, raised blood pressure, increased blood glucose levels and non-optimal blood cholesterol levels (particularly raised LDL cholesterol). Tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol are common risk factors for the four priority conditions which are demonstrated in Figure 3.



**Figure 3: Common Risk Factors for Non-Communicable Diseases**



The key behaviours that would reduce risk factors for NCDs are eating a healthy diet, participating in regular physical activity, not using tobacco, and avoiding harmful use of alcohol. Other than tobacco, all modifiable risk factors increased over this period.

Hypertension is the leading risk factor for mortality and is ranked third as cause of disability-adjusted life years. In Seychelles, cardiovascular disease is the leading cause of death.

Diabetes (often called a sugar sickness) is a disorder in which the blood sugar levels get too high, or too low. It's very easy to fall into the habit of eating 'junk' or 'fast-food' and not exercising enough; but the combination of inactivity and an unhealthy diet is putting more and more people in the path of diabetes, also known as the 'silent killer'.

In this report, these risk factors would be examined extensively, as they are avoidable and prevention can improve health at a lower cost than many treatments offered today by health systems.





## 2.5 Measurement of Inequality

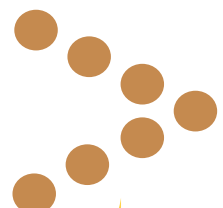
The measures of inequality are complimentary of each other and their applications are dependent on the purpose. Here, the purpose of the analysis is to quantify the magnitude of health inequalities, summary indices like life expectancy at birth are used. These summary indices express the magnitude of the health differences between different sections of the population. One of the main advantages of such a summary index is that it facilitates spatial and temporal comparisons.

The **range** is a summary measure which gives the extreme values between the highest and smallest value. Although the range provides a useful summary of the extreme values, it offers little information about the spread of the distribution and possibly introduces bias if outliers are present in the data. It does not capture the extent of inequality between the intermediate groups nor does it take into account the sizes of the groups being compared which may vary over time. A slightly better and informative approach would be to compare the bottom 10% or 25% with the top 10% or 25% of the distribution. This is widely used in terms of comparing groups of equal size as ratios.

The **Gini coefficient of inequality** is a widely used summary statistic for continuous variables. The Gini coefficient is usually represented mathematically by the area between the **Lorenz curve** and the line of equality. It gives a value which indicates how large or small the inequalities are for a particular population. A Gini coefficient equals 0, if there is perfect equality, and 1 if there is complete inequality. The formula for calculation of the coefficient is as follows:

$$G = \frac{\sum_{i=1}^{n-1} |p_i - q_i|}{\sum_{i=1}^{n-1} p_i}$$

where  $p_i$  represents the proportion of individuals by the level of health and  $q_i$  represents the cumulative proportion of health of these individuals. The Lorenz curve plots the cumulative proportion of health on the Y-axis against the cumulative total proportion of health of individuals ranked in increasing order along the X-axis. When the variable of interest is positive (e.g. the higher the level of the variable, the better the health) the Lorenz curve will lie below the diagonal and above the diagonal when the variable of interest is negative. The Lorenz curve and the diagonal coincide when there is perfect equality in the distribution of the variable of interest. The larger the distance of the Lorenz curve from the diagonal, the larger the inequality. It has to be noted that the Gini coefficient is not additive across groups meaning that a particular value of the coefficient for a population is not equal to the sum of the values for its sub-populations. Furthermore, the Gini



Coefficient is not appropriate for categorical data since it is heavily influenced by the granularity of the variables (for example, five categories of a variable will yield a lower coefficient than 20 categories of the variable). However, a pseudo Lorenz curve can be constructed to accommodate grouped data (e.g. wealth quintiles). In this case, the Lorenz curve plots the cumulative percentage of population in their sub-groups against the cumulative percentage of the variable of interest. The distributional properties of the Gini coefficient are complex and thus it is not straightforward to construct confidence intervals around it.

The **Concentration Index** (CI) was first defined by Kakwani et al (1997). It quantifies the degree of socioeconomic inequality in a health variable. It may be viewed as an improvement on the Gini coefficient in that we can look at the relationship between two variables instead of just a univariate analysis. CI is directly related to **Concentration Curves** (CC) where the cumulative percentage of the health variable is plotted on the Y-axis against the cumulative percentage of the population ranked by their socioeconomic status on the X-axis, beginning with the poorest and ending with the richest. The values of the CI range from -1 to +1. If the CI is zero, then CC will coincide with the diagonal line. This suggests that health is equally distributed across different socioeconomic groups. A value equal to +1 indicates that the health variable, for example healthcare is the highest among the richest (in this case the curve lies below the diagonal) and a value equal to -1 indicates that healthcare is the highest among the poorest (curve lies above the diagonal). As the curve deviates farther from the diagonal, the greater the degree of inequality. Since individuals are ranked by their socioeconomic level and not by the magnitude of the health variable, CC is not strictly a measure of inequality unlike Lorenz curve. The size and sign of CI will depend on the gradient observed between socioeconomic level and health variable which allows comparing socioeconomic inequality in health over time and space.

The formula for the concentration index is

$$C = \frac{2}{n\mu} \sum_{i=1}^h h_i R_i - 1$$

Where  $n$  is the sample size;  $h_i$  is the ill-health indicator for person  $i$ ;  $\mu$  is the mean level of ill-health and  $R_i$  is the fractional rank in the living standards distribution of the  $i^{th}$  person.

The **Index of Dissimilarity** (ID) is based on the pseudo Lorenz curve with the notion that under perfect equality, each group's share of the variable of interest, say



health, would be equal to their population share. Suppose the population is divided into K groups, then ID (absolute) can be expressed as:

$$ID = \frac{1}{2} \sum_{k=1}^K |S_k - p_k|$$

$S_k$  is the proportion with the attribute (disease) among group k in the population and  $p_k$  is the share of group k in the total population. ID can be interpreted as the proportion of cases (disease outcome) that would have to be redistributed to obtain the same disease outcome in all (socioeconomic) groups. When there is complete similarity, ID is equal to zero. ID is not sensitive to the direction of association between socioeconomic status and the health outcome. Furthermore, redistributing disease outcomes does not sit well ethically. Finally, its distributional properties are complex and thus it is difficult to construct confidence intervals around the measure.

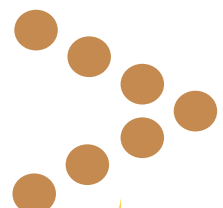
Another measure of inequality is the Chi-Square statistics for goodness-of-fit. This is similar to ID in that it compares the distribution of a disease among the population with the population distribution, if all was equal. The statistic uses the differences between the number of cases that is observed for a particular group (e.g. age-groups) and the number of cases that should be expected if the population distribution across the groups were to hold.

The Chi-square goodness-of-fit test statistic is calculated as follows:

$$X^2 = \sum_{i=1}^k \frac{(n_i p_i - n_i \pi_{0i})^2}{n_i \pi_{0i} (1 - \pi_{0i})}$$

Where  $n_i$  is the number of observations in the  $i^{\text{th}}$  group,  $p_i$  is the observed prevalence in  $i^{\text{th}}$  group, and  $\pi_{0i}$  is the expected prevalence in the  $i^{\text{th}}$  group. For k independent groups this statistic has a  $\chi^2$  distribution based on k degrees of freedom. Although the calculation of this measure is the same as the Chi-Square test of association (which is used to test for differences in proportions with a specific attribute between groups), the two test statistics are based on different hypotheses and the degrees of freedom for a test of association are  $k-1$ .

**Population Attributable Risk (PAR)**, also known as etiological fraction, is a measure which estimates the proportion of disease outcome in the study population that is attributable to the exposure. It is the disease incidence attributable to an exposure that would be eliminated if the exposure were eliminated. To put it in simple terms, PAR is estimated based on the assumption that socioeconomic



inequalities in health can be reduced by lowering the disease incidence of the lower socioeconomic groups to the level as observed in higher socioeconomic groups. PAR is a function of the association between the socioeconomic variable (e.g. income) and the frequency of the health problem (e.g. obesity) and the distribution of subjects across each category of the socioeconomic variable. Attributable Risk (AR) is estimated as the difference between the disease incidence in the unexposed ( $I_u$ ) from the incidence in the exposed ( $I_e$ ). PAR is estimated as  $I_p - I_u$ , where  $I_p$  is the the incidence of a disease in the total population (exposed and unexposed) and  $I_u$  is the incidence in the unexposed. It can be expressed as PAR% which is

$$\frac{I_p - I_u}{I_p} * 100$$

The **Slope and Relative Index of Inequality** are a measures obtained by regressing the health outcome of interest (outcome) variable against an indicator of socioeconomic status (predictor) variable. The **slope index of inequality** is the difference of the regression coefficients between the highest and lowest values of the ranked socioeconomic variable and this measure the absolute inequality. The advantage of the slope index is that it reflects the experience of individuals in the population. However, the index as an absolute measure is sensitive to changes in the mean level of health and to the changes in the distribution of the population among different socioeconomic categories. If the mean level of health increases in the same proportions across the socioeconomic categories, then the relative differences remain constant but the slope index will increase. This has limitations when comparing, for example, the trends in health inequality across different populations if there is unequal reduction in the frequency of a health outcome in some populations than others. To overcome this problem, the **relative index of inequality** is used and this is essentially the ratio of the slope coefficients.

**Relative risks and odds ratios** provide another way of measuring inequalities using the regression approaches when the outcome of interest is non-linear (for example for diabetes where the outcome is 'yes' or 'no' or hypertension 'yes' or 'no'). For most of the multivariate analysis in this study we use logistic regression method which is a non-linear model. Multivariate analyses are important to avoid reaching erroneous conclusions about inequalities. The magnitude of inequalities can be influenced by other sample characteristics (e.g. sex and age of respondents), especially if these are disproportionately distributed in the sample. Thus, in looking at differences in the prevalence of diseases by socioeconomic groups, it is necessary to control for these known characteristics. Another attractive property of logistic regression is that its distributional properties are known and thus we can calculate confidence intervals easily.



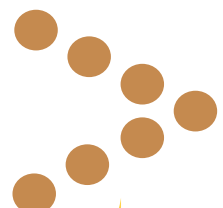
The logistic regression equation is written as

$$\text{Log} (p/(1-p))= a + b_1x_1 + b_2x_2 \dots +b_kx_k,$$

where  $a$  is the constant,  $x_1, x_2, \dots, x_k$  are explanatory variables and  $b_1, b_2, \dots, b_k$  are regression coefficients associated with the explanatory variables. The exponents of logistic regression coefficients are called **odds ratios** (OR). The concept of odds ratios is based on a ratio of two odds as conveying a relationship between the outcome and predictor variables. Let  $p_1$  be the probability of having diabetes among those with less than 4 years of education, and let  $p_2$  be the corresponding probability among those with 13 years of education or more. The odds of having diabetes among those with less than 4 years of education are  $\Theta_1=p_1/(1-p_1)$  and the odds of having diabetes among those with 13+ years of education are  $\Theta_2=p_2/(1-p_2)$ .

The odds ratio,  $\Theta_1/ \Theta_2$  shows the relative association between the risk of having diabetes and the level of education. The magnitude of the odds ratios shows the strength of the association. Often it is helpful to compare groups of individuals with a 'reference category', which is an arbitrarily selected group (in the above example, we could select those with less than 4 years of education as the reference and then every category of education is compared with this reference group).

The odds ratio of the reference group will be 1 (i.e. comparison with itself) and for other groups, an odds ratio which is less than 1 shows that the risk of diabetes for that group is *lower* than the odds for the reference group. An odds ratio greater than 1 shows *higher* odds than the reference group. 95% confidence intervals for the odds ratios are often used to demonstrate statistical significance. Confidence intervals that span the value of 1 are associated with a category that is not statistically different from the reference category. Odds have a one-to-one correspondence with probabilities (i.e.  $p_1= \Theta_1/(1+ \Theta_1)$ ) but the two entities are not equal. The **relative risk** is a special form of the relative index of inequality for non-linear outcome variables. In the above example, the **relative risk** of having diabetes between those with little education and those with higher levels of education is the ratio of the two probabilities,  $p_1/p_2$ .



## CHAPTER III: Mortality and Morbidity Patterns in the Seychelles

### 3.0 Introduction

In this chapter, mortality and morbidity levels, trends and differentials will be presented. Overall mortality indicators and causes of death will be analysed using methods outlined in Chapter II. The deaths recorded in 2011 have been analysed according place of usual residence of the deceased. The results are presented in Table 2.

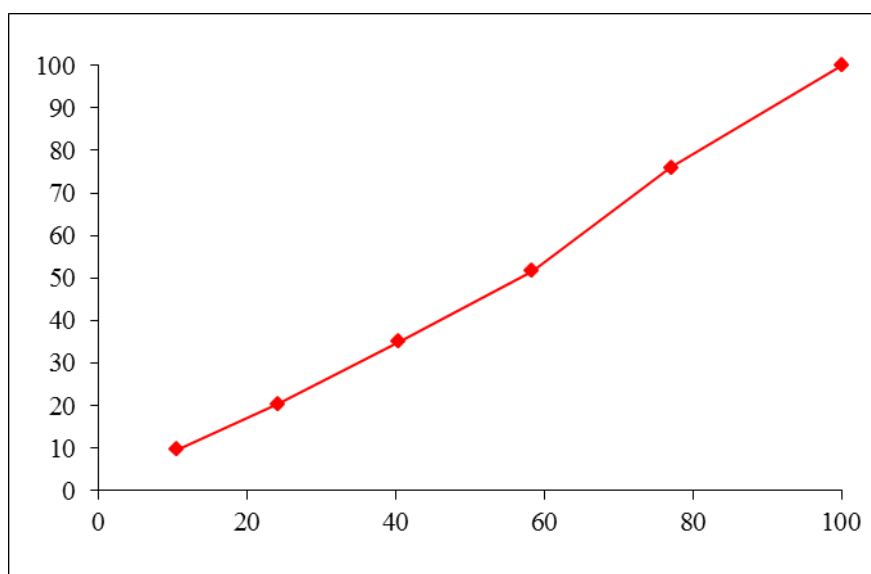
Table 2: Death Rates by Region in 2011

Region	Death Rate (Per 1000)
Praslin	6.0
South Mahe	6.9
West Mahe	7.1
North Mahe	7.1
East Mahe	8.1
Central Mahe	10.0

All regions recorded low crude death rates in 2011. An examination of deaths rates indicates higher mortality rates in Central Mahe and lowest rates in Praslin. However, to test whether there are any spatial variations, indices of inequality are calculated and the Lorenz curve fitted to the data. The results are presented in Figure 4.



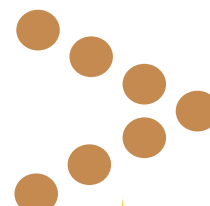
**Figure 4: Lorenz Curve for Region and Mortality Rates**



The results clearly show that there are no spatial variations among the regions in Seychelles. So, it is important to note that there are no mortality risks which are conferred to the population by spatial location. The size of the Seychelles might explain the homogeneity of the regions in relation to access and utilization of health services. Unlike large countries where remote regions tend to have higher mortality, Seychelles does not experience such differentials by region.

### **3.1 Life Expectancy**

The life expectancies for Seychelles for the period 2006-2011 by age are presented in Table 3 below. Here, assessments of the improvements in the survivorship as measured by the current mortality schedules are presented. The life tables used here are derived from actual recorded deaths from the vital registration system. In Appendix A, the gaps in life expectancies at birth between males and females are presented.



**Table 3: Life Expectancies: Seychelles 2006-2011.**

Age Group	Males						Females					
	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
0	68.87	68.90	67.70	68.37	69.66	67.97	75.66	77.66	78.93	77.99	77.42	78.01
1-4	68.31	68.95	68.07	67.87	70.11	67.84	75.64	77.07	78.54	78.01	77.50	77.62
5-9	64.50	65.04	64.15	64.05	66.11	64.25	71.64	73.27	74.75	74.11	73.50	73.85
10-14	59.71	60.15	59.25	59.15	61.11	59.43	66.87	68.52	69.87	69.11	68.50	68.85
15-19	54.86	55.31	54.25	54.24	56.11	54.52	62.46	63.52	64.87	64.23	63.50	63.85
20-24	50.15	50.46	49.25	49.24	51.32	49.73	57.54	58.52	60.06	59.50	58.59	58.85
25-29	45.31	45.91	44.68	44.59	46.50	45.21	52.78	53.75	55.21	54.58	53.93	54.04
30-34	40.64	41.65	40.04	40.14	41.93	40.89	48.01	48.93	50.40	49.76	49.00	49.49
35-39	35.78	36.97	35.35	35.37	37.48	36.51	43.43	44.34	45.40	44.97	44.39	44.75
40-44	31.45	32.74	30.66	30.90	32.91	32.11	38.56	39.54	40.60	40.53	39.74	40.03
45-49	27.19	28.69	26.60	26.96	28.75	28.13	34.12	35.28	36.08	35.77	35.37	35.35
50-54	23.02	24.39	22.75	22.56	24.82	24.19	29.56	31.04	31.57	31.58	30.67	30.92
55-59	19.05	20.95	19.12	18.87	20.74	20.52	25.23	26.44	27.08	27.28	26.56	26.61
60-64	15.48	17.14	15.90	15.51	17.21	16.84	20.85	22.23	22.70	23.18	22.45	22.09
65-69	12.21	14.11	12.97	12.63	14.23	13.86	17.53	18.52	18.36	18.84	18.22	18.52
70-74	9.84	11.04	10.15	9.71	12.13	10.83	13.78	15.07	14.59	15.27	14.35	14.40
75-79	7.03	8.99	7.95	6.35	9.57	8.63	10.90	12.12	11.37	11.26	11.44	11.14
80+	5.07	7.36	7.14	4.96	6.39	6.99	8.37	9.24	8.67	8.23	8.39	8.16

Source : Epidemiology & Statistics Section - Ministry of Health/ National Statistics Bureau

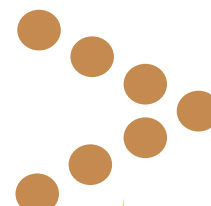


First, the Seychelles has made significant progress in improving the survivorship of the population at all ages. Currently, the life expectancies for males and females are 68 years and 78 years, respectively. The trend for life expectancy for females shows an increasing trajectory over the period while that for males has stagnated and slightly below 70 years. For all the years, the life expectancies at birth for females are higher than that for males. The relative and absolute life expectancy gaps for 2006 and 2011 between sexes are presented in Table 4.

**Table 4: The Gap between Male and Female Life Expectancies at Age x**

Age Group	Absolute Life Expectancy Gap		Relative Life Expectancy Gap	
	2006	2010	2006	2010
0	6.79	10.04	0.91	0.87
1-4	7.33	9.78	0.90	0.87
5-9	7.14	9.60	0.90	0.87
10-14	7.16	9.42	0.89	0.86
15 - 19	7.60	9.33	0.88	0.85
20 - 24	7.39	9.12	0.87	0.85
25 - 29	7.47	8.83	0.86	0.84
30 - 34	7.37	8.60	0.85	0.83
35 - 39	7.65	8.24	0.82	0.82
40 - 44	7.11	7.92	0.82	0.80
45 - 49	6.93	7.22	0.80	0.80
50 - 54	6.54	6.73	0.78	0.78
55 - 59	6.18	6.09	0.76	0.77
60 - 64	5.37	5.25	0.74	0.76
65 - 69	5.32	4.66	0.70	0.75
70 - 74	3.94	3.57	0.71	0.75
75 - 79	3.87	2.51	0.64	0.77
80+	3.3	1.17	0.61	0.86

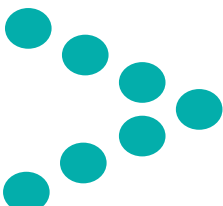
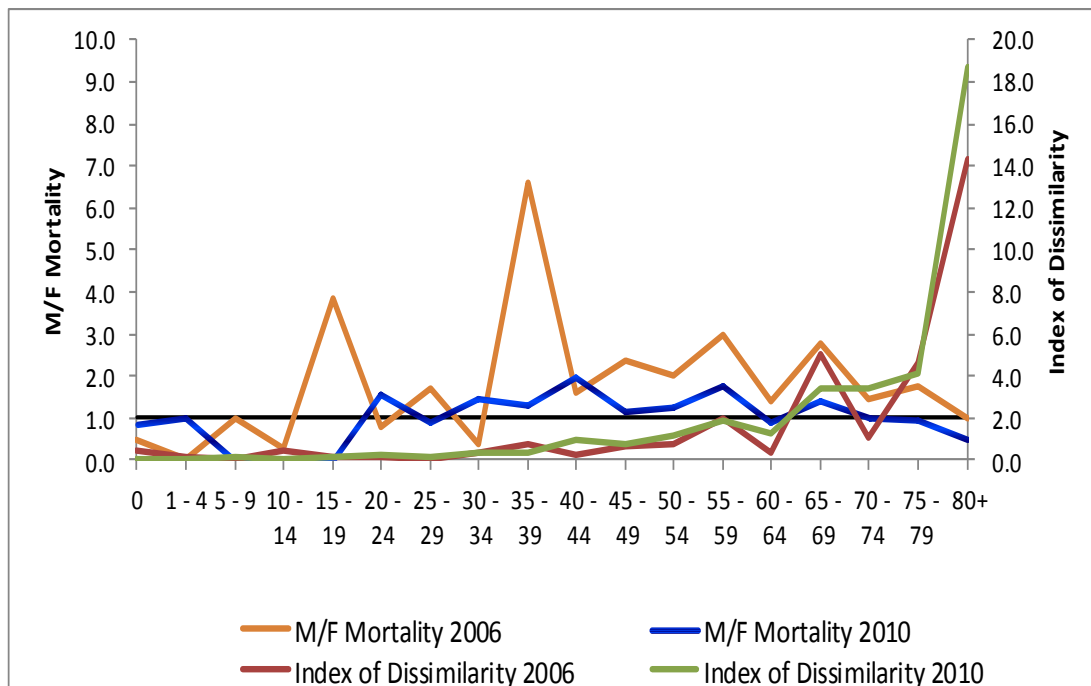
The gap between males and females life expectancies at childhood and young adulthood has been widening. The absolute life expectancy gap between the two sexes in 2006 was 6.8 years and in 2011 it had increased to 10 years. The further



the relative life expectancy gap has moved from 1, the more the gap has been widening between males and females. The magnitude of the differences is indicative of acquired risks relating to different behaviours or exposures (broadly defined), differences in the propensity to recognize illness and to report symptoms of ill-health, and different access to, and use of, health care of men which place males at greater risk of mortality.

The above assertion is examined in greater detail in the following sections. First, excess mortality of males in comparison to females in Seychelles by age are presented in Figure 5. For each age x, the five-year probabilities of dying between age x and age x+5 are used. For age 0 the male/female ratio is based on the infant mortality rate (from age 0 to 1 year) and for age 1, on that of mortality between ages 1 and 5 years.

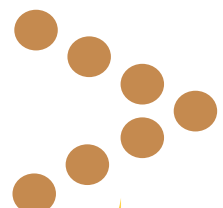
**Figure 5: Age-specific excess male mortality in Seychelles 2011**



Infant and child mortality has been higher for females than males in both 2006 and 2010. Whereas in 2006 excess male mortality for teens and adolescents increased sharply, in 2010 females had higher mortality. In adulthood, male excess mortality became more pronounced. From age group 45-49, the ratio of male to female excess follow a similar pattern for the two time periods although the 2006 ratios are higher. However, male excess mortality has been decreasing over the period.

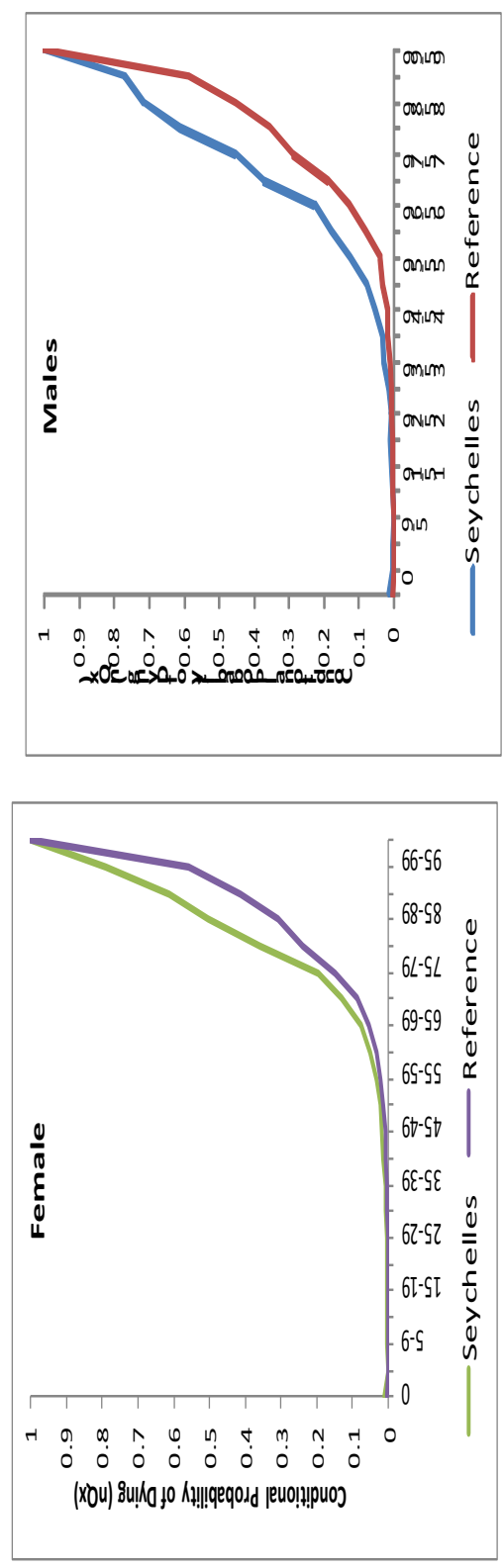
An important observation in the graph has been the decrease in the variation in the ratio and smoothing of the differences over time. The indexes of dissimilarity indicate that gaps between males and females increases with age and are more pronounced at elderly ages.

Second, an extension of the life tables using the RePLY Method, which has been outlined in Section 2.2.1 has been applied to the Seychelles life tables for 2010. RePLY can measure commensurable differences between age and sex groups that are responsive to policy intervention (Tang et al 2006). In Figure 6, the conditional probabilities of survival curves are plotted separately for females and males to allow for differences in their natural mortality risks.





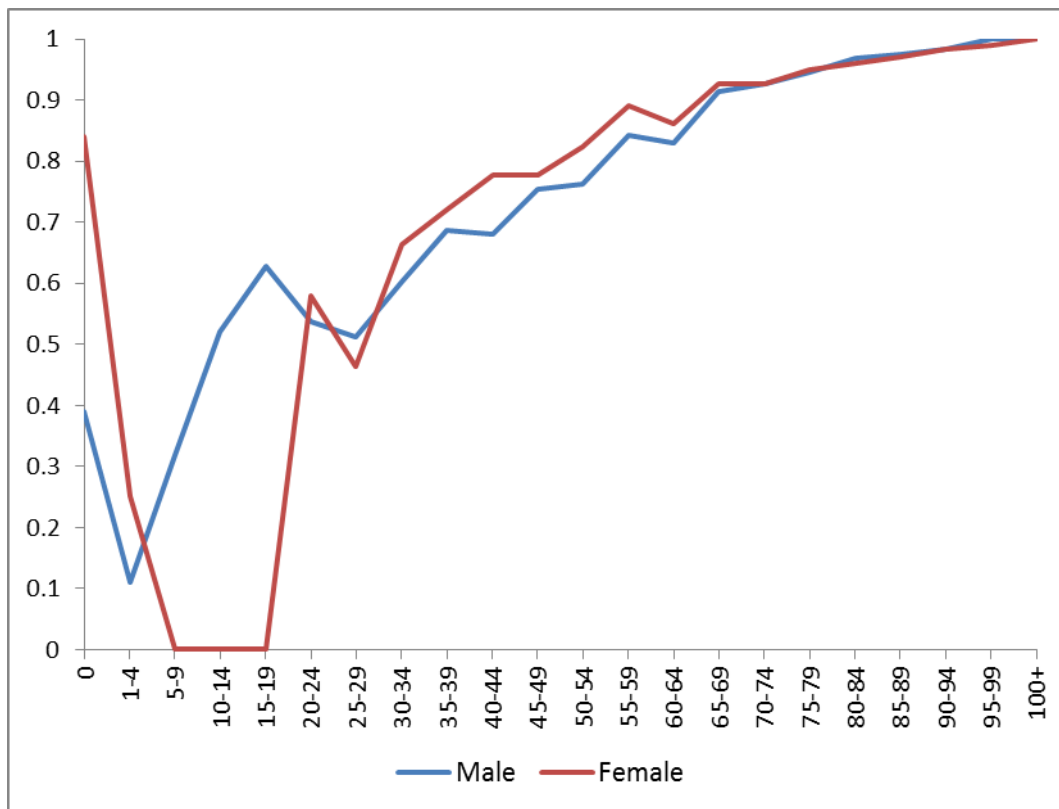
**Figure 6: Conditional probability of dying by age and gender of the reference country and Seychelles 2011**



The differences in the curves in Figure 5 shows the magnitude of avoidable deaths, which when eliminated can improve the survivorship probabilities of the Seychellois population. For males, the gap between the reference and Seychelles start showing at age group 40-49 and widens with increasing ages but converges at very elderly age (90+ years). For females, there are no differences between the reference country and Seychelles indicating that there are no avoidable deaths up to about age 60-64 years. From age 65, avoidable deaths start to increase among females and the widest gaps are at ages 80-90 years. While the effect of avoidable deaths for males is spread all over the adult and elderly ages, for females the avoidable deaths are concentrated in the very elderly age groups. It is clear that males are being affected by risk behaviours which have immediate effect like excessive drinking while females tend to suffer from risk factors which have a cumulative effect like obesity and physical inactivity.

Line plots of both male and female RePLYs against age for Seychelles 2011 are given in Figure 6. The interpretation of Figure 7 shows that the departure of the RePLY value from 1 indicates more avoidable deaths.

**Figure 7: Average RePLY by age at death Seychelles 2011.**



For females, the proportion of avoidable deaths is low among infants indicating that female infants realized almost 85 percent of their potential life years. In the 1–5 age group those females who die have realized, on average, less than a quarter of their potential life years. However, the potential life years for the age group 5-19 are 0, because there were no deaths recorded in these age groups in the Seychelles in 2011. At ages 20-24 years, females realize 58 percent and this drop to 46 percent for women aged 25-29 years. After that there is a gradual increase.

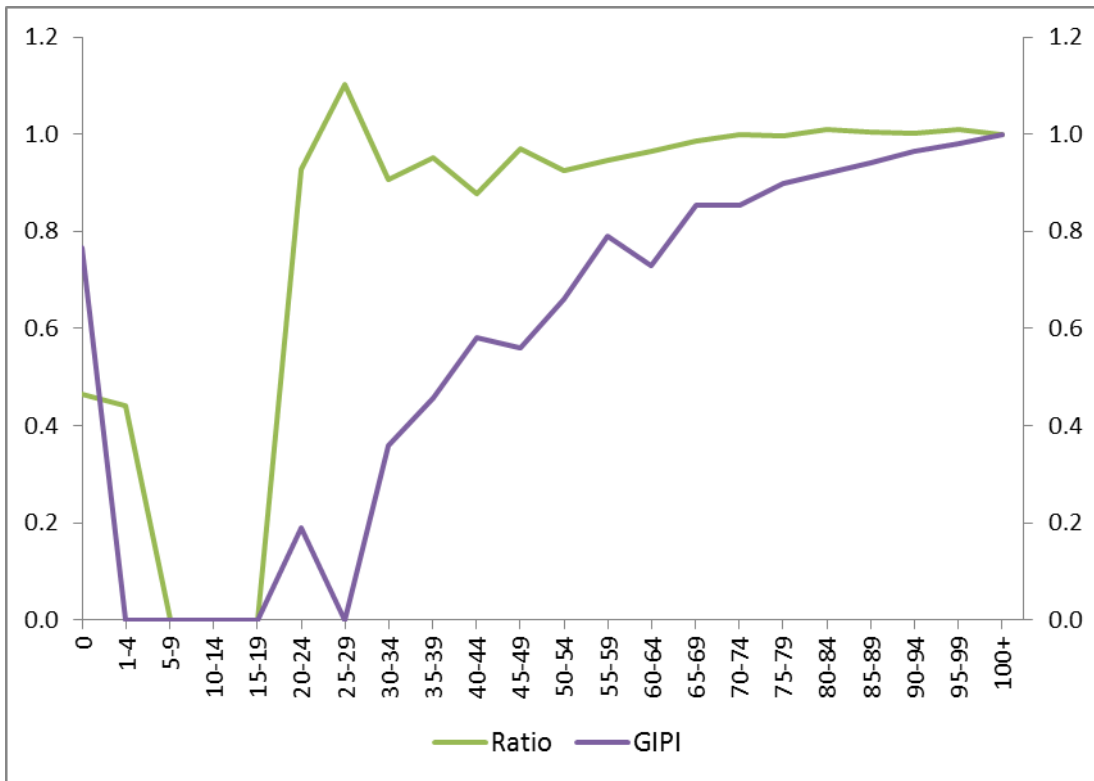
The pattern for males is slightly different. Among male infants, there is a large proportion of avoidable deaths as those who die have realized, on average, less than 39 percent of their potential life years. There is a drop among the 1-4 year males, reaching a level where almost percent of the deaths are avoidable. There are improvement in childhood, with the 5-9 and 10-14 realizing 32 and 52 percent, respectively.

There is a drop among young adults, 20-29 showing an increased loss of 50 percent of potential life years. From age 30-34, there is a gradual increase talking a trajectory which is similar to but lower than the female line. A comparison of the male and female plots shows that females will have higher realization of potential life years than males.

Lastly, line plots of the ratio of male RePLY to female RePLY and gender inequality prevalence index (GIPI) against age is presented in Figure 8. For the first measure, a ratio greater than one indicates gender inequality against females and smaller than one indicates gender inequality against males. The gender inequality prevalence index (GIPI) index is bounded between zero and one; a higher value indicates a greater prevalence of inequality against either females or males.



**Figure 8: Ratio of male to female average RePLY and Average gender inequality prevalence index by age at death.**



First, the ratio of male to female shows that males are worse off in childhood; and at adolescent periods, the experiences are similar for both sexes. However, at ages 25-29 years females have 10 percent more higher mortality than males. In subsequent ages in adulthood, male have higher mortality. After age 65, the differences seem to even off. However, this should be interpreted as there is gender similarity in the realization of potential life years at old ages.

The GIPI summarizes the analysis by providing a measure of gender inequality in realizing potential life years. As shown in Figure 8, gender inequality is most prevalent for those in early infancy and adulthood. Gender inequality tends to increase with age.

The analysis in the section has clearly shown that the gender inequalities exist at infancy and adulthood. However, the pattern is not very clear at childhood, since in the year under consideration, no female deaths were recorded in the ages 10-19.

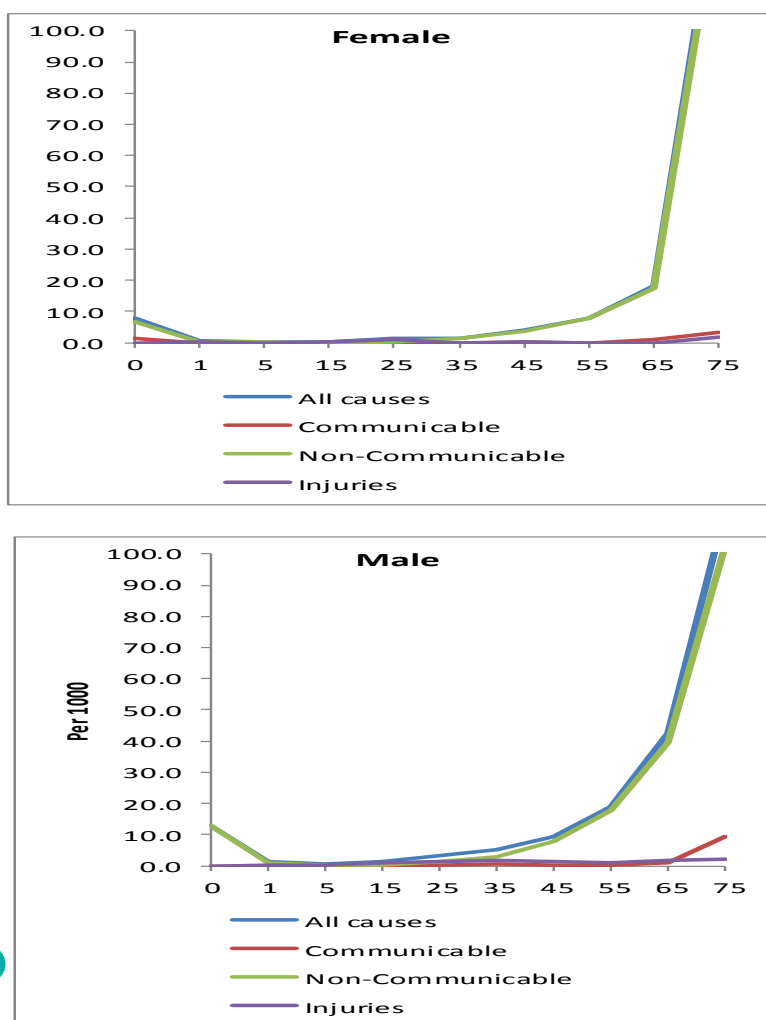


The results show that avoidable deaths exist in all age groups but these are higher for males and therefore realization of potential life years tends to be lower for male.

### 3.2 Cause of Death and Burden of Disease

The results in the previous section have shown that there are deaths which are occurring in this population which could have been avoided. In this section, quantification of the contribution of the causes of death to overall mortality is presented. First, the mortality patterns by cause of death are presented and then the top causes of deaths in the Seychelles are analysed in greater detail. In Fig 9, the age-cause-specific death rates are presented for the broad categories.

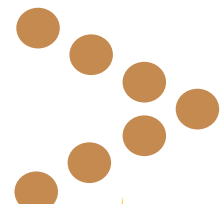
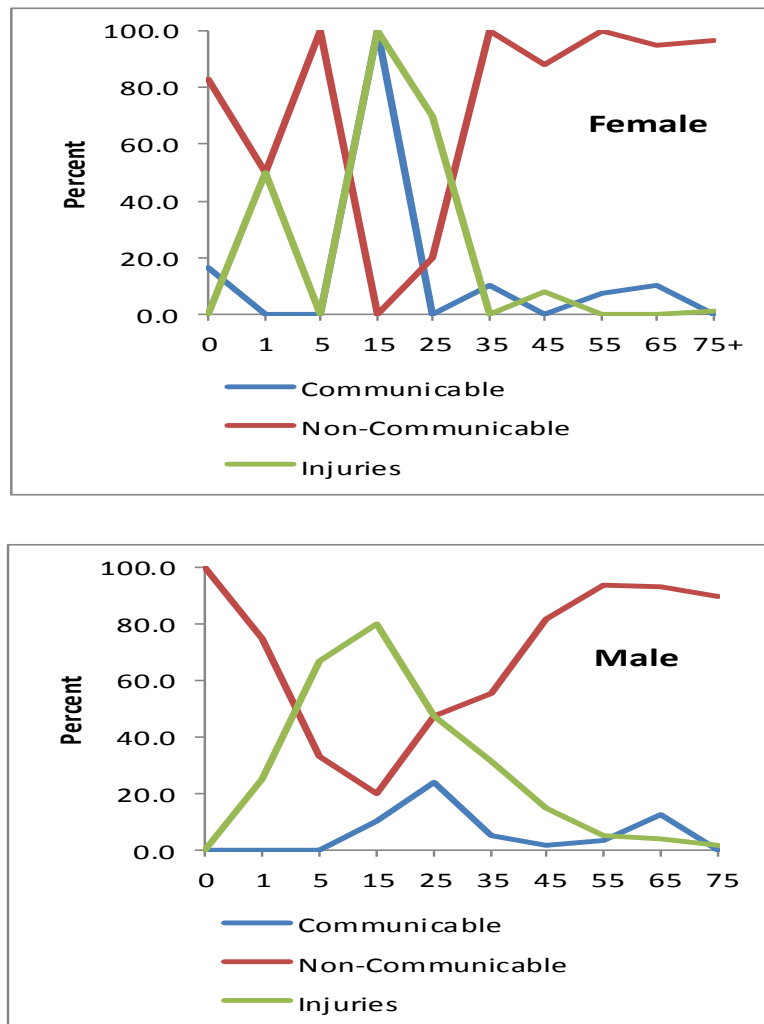
**Figure 9: Mortality Pattern across the Life Span by Cause 2011: Seychelles**





Because of the small number of deaths, broad causes of death categories have been used to look at the cause of death profile in Seychelles. First, it is important to note how in Figure 9, the all-cause mortality schedule closely follows the non-communicable disease pattern for both males indicating the strong influence of NCDs on overall mortality in the Seychelles. Overall mortality is very low for children under 5 years old, low and flat from age 5 up to about age 45, and steadily increasing thereafter for both sexes. Mortality from NCDs is low and flat until about age 35 and then it rises steadily and increases sharply at age 65. Mortality from communicable diseases is flat at very low levels throughout the age range with a slight rise among the elderly. Mortality from injuries is flat at very low levels throughout the age range with a slight rise among the elderly.

**Figure 10: Comparison of Age-Cause-Specific Death Ratios across the Life Span: 2011 Seychelles**



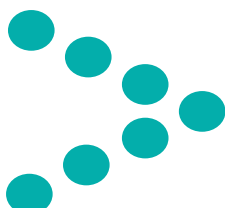
In Figure 10, the age-cause-specific death ratios are presented. For females there is no clear pattern, mostly because of the low numbers of deaths. However, the predominance of non-communicable diseases at childhood, adults and elderly is evident in Seychelles. Among the youth, especially at age 15-19 years unnatural deaths among both males and females are predominant. For males, unnatural deaths span over the age groups 5-29 years. At adult and elderly ages, non-communicable diseases become the predominant cause of death for both males and females. The upsurge of communicable diseases at youth stages for both males and females is worth noting but this is likely due to AIDS-related mortality.

The burden of disease in Seychelles has gradually shifted to non-communicable diseases (NCDs), injuries and mental health. NCDs currently form the main burden of disease, with an upward trend seen over the last 10 years as shown in Table 5.

**Table 5: Main causes of death, 2003–2010**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Deaths by Number</b>	<b>668</b>	<b>611</b>	<b>673</b>	<b>664</b>	<b>630</b>	<b>662</b>	<b>684</b>	<b>664</b>	<b>691</b>
Circulatory System	248	221	251	236	190	213	247	220	250
Neoplasm	100	108	107	103	117	132	132	109	122
Respiratory System	54	61	91	76	78	94	64	89	115
Infectious and Parasitic	28	49	50	52	52	39	45	39	63
External Causes	53	38	34	47	42	46	55	50	37
Other								157	104
<b>Deaths by Percentages</b>									
Circulatory System	37	36	37	30	32	36	33	36	30
Neoplasm	15	18	16	19	20	19	16	18	19
Respiratory System	8	10	14	12	14	9	13	17	12
Infectious and Parasitic	4	8	7	7	6	7	6	9	7
External Causes	8	6	5	6	7	8	8	5	6

Source: National Bureau of Statistics. Seychelles in Figures, 2011 Edition



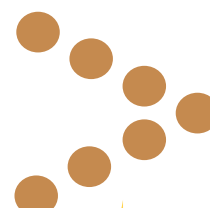
The main causes of disease-related morbidity and mortality in 2010 were mainly cardiovascular diseases (30%), neoplasm (19%), respiratory system disease (12%), infectious and parasitic diseases (7%), external causes (8%) and the remainder from other causes. This shift from communicable to non-communicable diseases has been attributed to epidemiologic transition as well as affluence and changes in lifestyles and habits of the population. However, even within the non-communicable disease category, significant changes have been occurring. The proportional contribution of cardiovascular diseases has been declining.

Last in this section, quantification of the hypothetical numbers of years lost due to each cause are presented using the multiple-decrement life table approach outlined in Section 2.1.2. The numbers of years which are lost due to particular causes at each age are presented in Table 6. It should be noted that the numbers of cases by specific causes by age were too small to perform this types of analyses; otherwise it would have been desirable to show the contribution of cause-specific mortality. However, because of the major contribution of non-communicable diseases and a significant number of deaths by these causes, the analysis was done for this group for all non-communicable diseases combined.

**Table 6: Number of Years Lost Due to Non-Communicable Diseases**

	Non-Communicable	
	Male	Female
0	3.5	1.2
1-4	3.5	1.1
5-14	3.4	1.0
15-24	3.2	1.0
25-34	2.7	0.9
35-44	2.0	0.4
45-54	1.3	0.4
55-64	1.0	0.3
65-74	0.9	0.3
75+	1.0	0.2

The method could only produce stable results for non-communicable diseases which had sufficient numbers of death to allow for calculation of multiple decrement life tables. The effects of eliminating the non-communicable diseases would result in the increase in life expectancy at birth for males by 3.5 years and females by 1.2 years. The elimination of non-communicable diseases would have a significant impact in increasing life expectancy at young age groups.



### 3.2.1 Cardiovascular Diseases

Cardiovascular diseases are a group of disorders of the heart and blood vessels and include:

- coronary heart disease: disease of the blood vessels supplying the heart muscle; cerebrovascular disease: disease of the blood vessels supplying the brain;
- peripheral arterial disease: disease of blood vessels supplying the arms and legs;
- rheumatic heart disease: damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria;
- congenital heart disease: malformations of heart structure existing at birth;
- deep vein thrombosis and pulmonary embolism: blood clots in the leg veins, which can dislodge and move to the heart and lungs.

Heart attacks and strokes are usually acute events and are mainly caused by a blockage that prevents blood from flowing to the heart or brain. The most common reason is a build-up of fatty deposits on the inner walls of the blood vessels. Strokes can be caused by bleeding from a blood vessel in the brain or by blood clots.

According to the WHO (2010) CVD is the leading cause of mortality in Seychelles and accounts to 32 percent of the mortality (WHO 2011). The problems of CVDs in Seychelles were identified by Bovet et al (1991) as far as back as 1989 when they noted the increasingly high rates of the disease. They have remained the highest cause of deaths. However, a recent study by Stringhini *et al* (2012) showed that there has been declining in cardiovascular related mortality rates. The trends from that study are presented in Table 7 below.



**Table 7: Trends in Age-Standardized Mortality for All-Cause Mortality and CVDs**

Men		Total			Yearly	95% CI
Mortality	Age	1989-1991	2008-2010	Change*	Change+	
All causes	<55	370	247	-33%	-2.00%	-2.4 to -1.6%
	55-75	594	420	-29%	-2.00%	-2.4 to -1.7%
	>75	629	417	-34%	-3.00%	-3.3 to -2.6%
All CVD	<55	116	55	-53%	-3.50%	-4.3 to -2.8%
	55-75	288	172	-40%	-2.60%	-3.1 to -2.2%
	>75	345	193	-44%	-4.30%	-4.7 to -3.8%
Stroke	<55	22	20	-1%	0.10%	-1.2 to 1.5%
	55-75	102	59	-42%	-3.20%	-3.9 to -2.5%
	>75	126	63	-50%	-4.50%	-5.2 to -3.7%
MI	<55	17	7	-60%	-2.90%	-4.5 to -1.2%
	55-75	70	30	-57%	-3.70%	4.7 to -2.7%
	>75	30	21	-30%	-1.90%	-3.2 to -0.6%
Other CVD	<55	77	28	-64%	-6.10%	-7.1 to -5.0%
	55-75	116	83	-28%	-1.50%	-2.2 to -0.7%
	>75	189	111	-41%	-4.60%	-5.3 to -4.0%

Women								
Mortality	Age	1989-1991		2008-2010		Total	Yearly	95% CI
All causes	<55	146		122		-16%	-0.50%	-1.0 to 1.0%
	55-75	226		151		-33%	-1.40%	-1.9 to -0.9%
	>75	313		246		-21%	-1.00%	-1.4 to -0.1%
All CVD	<55	42		31		-26%	-1.20%	-2.3 to -0.1%
	55-75	126		75		-40%	-2.40%	-3.1 to -2.7%
	>75	166		139		-16%	-0.70%	-1.2 to -0.1%
Stroke	<55	16		13		-2%	-1.00%	-2.9 to 1.0%
	55-75	50		25		-50%	-4.10%	-5.1 to -3.0%
	>75	75		48		-36%	-2.20%	-3.1 to -1.3%
MI	<55	8		5		-37%	-4.30%	-7.1 to -1.5%
	55-75	27		11		-24%	-4.20%	-5.8 to -2.5%
	>75	15		8		-47%	-3.10%	-5.0 to -1.1%
Other CVD	<55	21		14		-33%	-1.10%	-2.7 to 0.6%
	55-75	49		37		-67%	-0.30%	-1.3 to 0.7%
	>75	78		85		10%	0.80%	0.1 to 1.6%

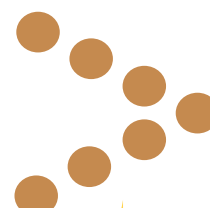
Source: Stringhini et al (2012)

While all-cause mortality has decline by 33 percent for men and 16 percent for females between 1989-1991 and 2008-2010, mortality due to all CVDs has declined by 53 percent for men and 26 percent for females. However, deaths from strokes have only declined by an insignificant 1 and 2 percent for males and females, respectively. Major significant changes are recorded for MI and other CVDs. MI has decline by 60 percent for males and 37 percent for females and other CVDs declined by 64 percent for males and 33 percent for females. However, as indicated by the authors, these changes do not necessarily translate in mortality declines because the effect is being obviated by population aging. This can be seen in the absolute number of deaths which the number of stroke deaths was virtually unchanged (285 cases in 1989-91 and 290 in 2008-10); and the total number of MI deaths decreased (116 cases in 1989-91 and 97 in 2008-10).

The reduction in CVDs depends on preventative interventions and these depend on knowledge about risk factors associated with the disease. A study by Alwan (2009) looked at the relationship between individuals' perception of total CVD risk, factors associated with this perception, and how perceived CVD risk can be compared with actual CVD risk. The results from that study are presented in Appendix B for reference. However, here the major results relevant to social inequalities are highlighted. One of the major findings was that *perception of one's CVD risk was strongly associated with socio-economic status, which may indicate a further disadvantage for individuals with low SES with regard to CVD prevention. More generally, the finding of a poor perception of one's CVD risk is compatible with low uptake of treatment and/or low compliance to treatment for hypertension.* Also, the ability to report a perceived CVD risk estimate was positively associated with education and occupation. Those who reported low perceived CVD risk were more likely to have high educational level, high occupational groups and exercised during leisure time. Thus, education plays a catalytic role in raising awareness and taking the necessary steps and living a healthy life style like changing diet/physical activities.

### **3.2.2 Cancers**

The second leading cause of death in the Seychelles is cancer accounting for about 20 percent of mortality. WHO estimates that the cancer mortality rate for males was 227 per 100,000 for males and 96 per 100,000 for females. Cancer is a generic term for a large group of diseases that can affect any part of the body. Other terms used are malignant tumours and neoplasms. One defining feature of cancer is the rapid creation of abnormal cells that grow beyond their usual boundaries, and which can then invade adjoining parts of the body and spread to other organs. This process is



referred to as metastasis. Metastases are the major cause of death from cancer. The cancer mortality rates by type are presented in Table 8.

**Table 8: Cancer Death Rates Per 100,000**

Rank	Type of Cancer	Rate
1	Prostate Cancer	27.4
2	Breast Cancer	19.0
3	Lung Cancers	15.1
4	Colon-Rectum Cancers	12.9
5	Oral Cancer	11.4
6	Cervical Cancer	7.4
7	Pancreas Cancer	7.0
8	Liver Cancer	6.7
9	Leukaemia	6.5
10	Oesophagus Cancer	5.0
11	Bladder Cancer	4.5
12	Stomach Cancer	4.4
13	Lymphomas	3.6
14	Ovary Cancer	3.3
15	Uterine Cancer	1.6
16	Other Neoplasms	0.8
17	Skin Cancers	0.4

The highest cancer mortality is due to prostate cancer which accounts 27 percent followed by breast cancer which accounts for 19 percent. The other important ones are lung cancer (15.1%), colon/rectum cancer (11.1%) and oral cancer (11.4%). The risk factors of cancers are also avoidable and these include: smoking, unhealthy diets.





The risk factors of prostate cancer in the Seychelles can be drawn from other studies with similar populations as the data in the Cancer Register does not contain any of the variables implicated in prostate cancer. However In one case-control study from South Africa, prostate cancer was associated with high intake of fat, meat, and eggs; eating out of the house; and a low consumption of vegetables (Walker et al. 1992).

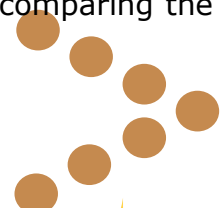
Dietary fat appears to be correlated with the risk of breast cancer (Prentice and Sheppard 1990). Obesity in postmenopausal women has been identified as a risk factor in Europe (Bergstrom et al. 2001) as well as in Sub-Saharan Africa (Adebamowo and Adekunle 1999; Walker et al. 1989). Although traditional diets in Africa are typically low in animal products, especially fat, and high in fibre (Labadarios et al. 1996; Manning et al. 1971), this pattern is being modified by urbanization and Westernization of lifestyles, which may lead to an increase in breast cancer incidence in African populations.

Smoking cigarettes is the single biggest risk factor for lung cancer. It is responsible for about 90% of all cancer cases. Tobacco smoke contains more than 60 different toxic substances, which can lead to the development of cancer. These substances are known to be carcinogenic (cancer-producing). For non-smokers, radon which is a naturally occurring radioactive gas that can seep up from the ground into buildings is the major factor. In addition exposure to certain chemicals and substances that are used in several occupations and industries has been linked to a slightly higher risk of developing lung cancer. These chemicals and substances include arsenic, asbestos, beryllium, cadmium, coal and coke fumes, silica and nickel.

### **3.2.3 Chronic Respiratory Diseases**

Chronic respiratory diseases are chronic diseases of the airways and other structures of the lung. Some of the most common are: asthma, chronic obstructive pulmonary disease, occupational lung diseases and pulmonary hypertension. This category of diseases accounts about 4 percent of the overall mortality. Tobacco smoke second hand tobacco smoke other indoor air pollutants outdoor air pollutants allergens occupational agents. As shown in Figure 3 below the preventable or modifiable risk factors of chronic respiratory diseases are similar and shared for cardiovascular diseases and other NCDs. In this section, air pollution will be considered in detail and all the other factors will be dealt with in greater detail later sections. The pollution figures are presented in Table 9.

According to the Ministry of Environment and Natural Resources (2007), the total annual release of dioxins and furans in Seychelles for the year 2003 is estimated to be 5.4 gTEQ, of which 4.1 g TEQ or 75% are emissions to the air. By comparing the



results PCDD/PCDF inventories in other countries with the UNEP toolkit, values of total release range from a minimum of 1.4 (Brunei) to a maximum of 2111 (Argentina). Many countries including our neighbouring island Mauritius range between 20 and 100 gTEQ .

Seychelles’ per capita emissions to air for the same year is 51 µg TEQ/ inhabitant, which would be above the average as usual values for many countries range between 0 and 20 µgTEQ/ inhabitant. Table 9 shows the largest single sources (i.e. individual sources with highest emissions) of dioxins and furans, which have been identified in the inventory. Therefore, policies and actions for reducing emissions should focus on these areas.

**Table 9: Pollution Figures by Source: Seychelles**

Ministry of Environment and Natural Resources, Republic of Seychelles (2007) National Implementation Plan Stockholm Convention on Persistent Organic Pollutants

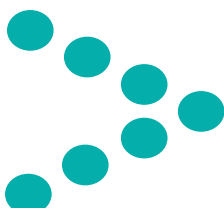
Source	g TEQ/a	% Contribution
Medical/Hospital Waste Incineration	3.45	85.6%
Uncontrolled Domestic waste burning	0.36	9%
Hazardous waste incineration (waste oil and fuel oil sludge at PUC)	0.2	5%
Transport (Road vehicles)	0.02	0.5%

The two main sources of emissions of dioxins and furans are:

- Medical/Hospital Waste Incineration
- Uncontrolled Domestic waste burning

Other sources such as road vehicles and other transports are relatively less important. The main release route for dioxins and furans is air and the other secondary release routes are residue (of uncontrolled combustion processes) and products (compost). Water and land have not been identified as major release routes.

However, it has to be established whether the air quality at the current levels poses any health problems to the general population.



### 3.2.4 Diabetes

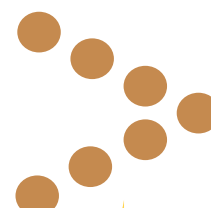
Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels. Data from the HEART Surveys presented by Faeh (2007) showed that in 2004 diabetes prevalence was 10.2% overall (95%CI:8.6–11.9); men: 10.2% (7.7–12.7), women: 10.3 (8.0– 12.6). Thus, the prevalence between men and women is equal. A comparison of the 1989 and 2004 surveys showed that the prevalence of diabetes (fasting blood glucose >7 mmol/l or treatment, or both) increased from 6.2% to 9.6% in men and from 6.1% to 9.2% in women. Half of all DM cases in the population could be attributed to excess weight. The table below shows the relationship between obesity and diabetes in the Seychelles.

**Table 10: Relationship between categories of body mass index (BMI) and diabetes**

	Men			Women			All		
	Prevalence (%)	Odds ratio*	PAF (%)	Prevalence (%)	Odds ratio*	PAF (%)	Prevalence (%)	Odds ratio*	PAF (%)
Overweight (BMI: 25-29kg/m <sup>2</sup> )	37 (33-41)	2.1 (1.9-2.2)	26 (16-36)	33 (30-37)	2.6 (2.3-3.0)	20 (12-26)	35 (32-38)	3.5 (3.2-3.8)	23 (14-31)
Obesity (MBI ≥30kg/m <sup>2</sup> )	15 (12-18)	2.6 (2.4-2.9)	17 (11-23)	35 (32-29)	4.5 (4.0-5.1)	36 (25-45)	25 (23-28)	3.3 (2.0-5.5)	26 (15-36)
Overweight or obesity (BMI≥25kg/m <sup>2</sup> )	52 (48-56)	2.2 (2.1-2.4)	43 (29-55)	68 (64-72)	3.6 (3.2-4.1)	56 (41-67)	60 (57-63)	2.6 (2.4-2.8)	49 (35-61)

Source : Faeh et al (2007).

The first observation is the strong association between diabetes with excess body weight. The second observation is that the proportional increase in the odds ratios as body weight increases, with the odds of those who are obese being higher than those who are overweight. Third, the findings from this study indicate the prevalence of overweight and obesity was significantly higher in women than in men. The proportion of all DM cases in the entire population (PAF) that could be attributed to excess weight was 49% (95%: 35%–61%). By using lower cut off values to define the reference BMI category, the proportions of all cases of DM in the population that are attributable to excess weight increased to 58% (95% CI: 56%–60%) for a BMI cut off set at ≥ 24 kg/m<sup>2</sup> and to 73% (71%–74%) for a BMI cut off set at ≥23 kg/m<sup>2</sup>. The study provides incontrovertible evidence of the association between body weight and diabetes.

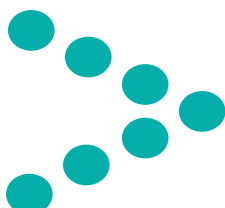


### 3.2.5 Hypertension

The first study of hypertension in Seychelles by Aubert et al (1998) and the results presented in Appendix D shows the age-standardized prevalence of hypertension (screening blood pressure [BP]  $\geq 160/95$  mm Hg or taking antihypertensive medication) was 36% in men and 25% in women aged 25 to 64 years. Among hypertensive persons, 50% were aware of the condition, 34% were treated, and 10% had controlled BP (i.e., BP  $< 160/95$  mm Hg). Most persons, whether non-hypertensive, unaware hypertensive, or aware hypertensive, had good basic knowledge related to hypertension determinants and consequences, possibly an effect of a nationwide cardiovascular disease prevention program over the last years. However, favourable outcome expectation, positive attitudes, and appropriate practices for hypertension and relevant healthy lifestyles were found in smaller proportions of participants, with little difference between aware hypertensives, unaware hypertensives, and non-hypertensives. Furthermore, hypertensive persons with other concurrent cardiovascular risk factors affecting the overall heart risk knew well the detrimental effects of these other factors but reported making little actual change to control them (particularly regarding overweight and sedentary habits).

The age and sex-specific prevalence of high blood pressure (BP) has been assessed in 3 more recent independent population-based surveys in 1989, 1994, and 2004 (Danon-Hersch N, 2007). The results are presented in Appendix E for reference. In 2004, the age-standardized prevalence of hypertension (BP  $\geq 140/90$  mm Hg or under treatment) was 44% in men and 36% in women (Danon-Hersch N, 2007). Among hypertensive persons, 55% of men and 75% of women were aware of having hypertension, 49% of men and 72% of women were treated, and 12% of men and 30% of women had BP controlled (BP  $< 140/90$  mm Hg). Prevalence of high BP, but also awareness and control, were therefore higher in Seychelles than in most populations reviewed by Addo et al. (2007). There is, however, a secular decline in the age-standardized prevalence of high BP, (Danon-Hersch N, 2007) and vital statistics indicate a consequential decline in stroke mortality during the past 15 years.

The study by Danon-Hersch et al (2007) further highlights the following results. *"Between 1989 and 2004, mean BP (mm Hg) decreased slightly (from 133/87 to 131/86 in men and from 127/82 to 124/81 in women), with little change in the age-standardized prevalence of high BP (BP  $\geq 140/90$  or current treatment; from 45% to 44% in men and from 34% to 36% in women). During this same time period, there were marked increases in awareness (from 42% to 64%), treatment (22% to 59%), and control (3% to 20%) among participants with high BP. The prevalence of*

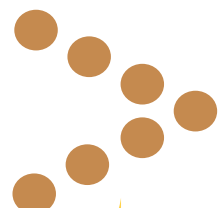


*overweight (BMI  $\geq 25$  kg/m<sup>2</sup>) increased from 39% to 60%. Furthermore, the linear relationship between BMI and BP was markedly weaker in 2004 than in 1989, irrespective of antihypertensive treatment and age, and among both lean and overweight participants. Among untreated persons, a BMI increment of 1 kg/m<sup>2</sup> was associated with an elevation of 2.0/1.5 mm Hg of systolic/diastolic BP in 1989 but only 1.3/1.0 mm Hg in 2004”.*

### **3.2.6 Communicable Diseases**

All communicable diseases, maternal, perinatal and nutritional conditions contribute 19 percent of all the deaths in the Seychelles. In this category, septicaemia is the main cause of death. It is an infectious disease. Data from the Vital Registration shows that 12 of the 22 fatal cases of septicaemia occurred in the elderly (75+ years). Also, the death rates due to septicaemia were higher for males than females (29.4 vs 21.3 per 100,000 population). The risk factors of septicaemia have been identified in other studies as “age, male sex, history of diabetes, history of cancer requiring hospitalization, smoking one pack of cigarettes per day or more, not drinking alcohol in the year prior to baseline, disability in activities of daily living, cognitive impairment, and missing cognitive testing score” (Salive et al 1993).

However, there are other communicable diseases which are exerting burden on morbidity in the Seychelles which are worth noting. These are presented in Table 11.



**Table 11: Selected Communicable Diseases in Seychelles, 2002-2011**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Diarrhoea	4435	4585	4584	4984	6089	4631	3055	1966	1796	1165
Conjunctivitis	1951	1857	1525	1367	2022	14736	1704	1728	6426	2760
Chikungunya	0	0	0	258	8984	1008	7	0	0	1
Dengue	0	5	405	0	1	0	0	0	0	7
Influenza like syndrome				736	1172	424	1815	4648	1941	2974
Leptospirosis	52	35	35	26	46	58	40	51	42	15
Tuberculosis	29	10	13	11	22	10	6	15	13	17
Meningitis	9	14	5	8	5	6	43	11	8	10
Malaria (imported)	3	10	15	3	4	11	13	11	3	4

**Source: Health Information and Statistics Section of the Department of Health, 2011**

Some vector-borne diseases have assumed public health importance in the country in the recent past. In 2004 the country faced a dengue epidemic which has now been completely controlled. In 2006 a chikungunya epidemic swept through the Indian Ocean islands, including Seychelles. Malaria is not endemic; since 2002 a total of 46 imported cases have been reported mainly among the 15–44 years age group, who had travelled out of the country. Although the malaria vector was last seen on an outlying island in 1930, in the absence of an effective entomological surveillance and early warning system, the number of imported malaria cases is enough to establish transmission if the mosquito vector were to ever be reintroduced.

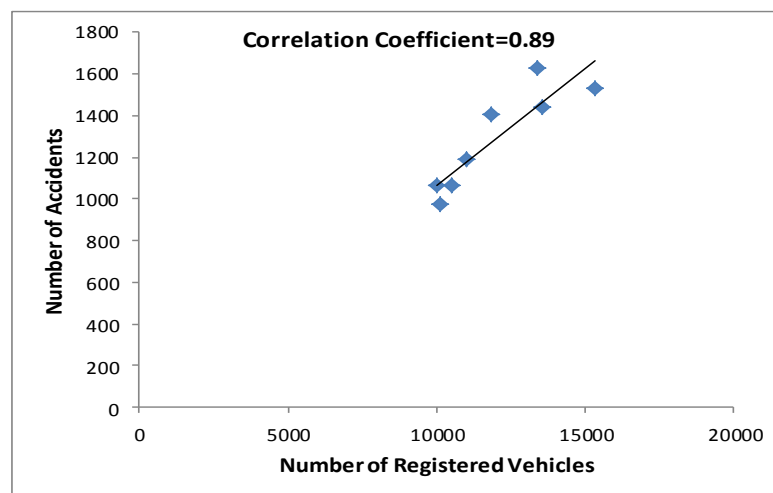
Rodent-borne leptospirosis occurs in isolated or time-limited outbreaks. Infrastructural deficiencies produce ecological conditions for rodent-borne transmission. Rodent control with case management is the main focus of leptospirosis management in the country. An isolated case of meningococcal meningitis in early 2007 was rapidly contained. Emerging diseases (e.g. dengue, chikungunya) and other new diseases posed by globalization such as avian influenza and SARS are also potential threats, and point to the need for stronger epidemiological surveillance and strengthened laboratory capacities in the context of the International Health Regulations (IHR), and close collaboration with the Indian Ocean Epidemiological Surveillance Network. There is a need to develop contingency plans for pandemic influenza.



### 3.2.7 Violent and Accidents Deaths

Road traffic accidents, drowning, suicides, assaults, homicides, accidental burns and falls accounted in 2010 for 7 percent of all deaths showing a slight decline from the estimated prevalence of 8 percent in 2003. Road traffic accidents are the major contributors of unnatural deaths. In Figure 10, the relationship between number of vehicles and number of accidents is examined.

**Figure 11: Relationship between Number of Cars and Traffic Accidents in the Seychelles 2003-2010**



A very strong positive relationship exists between the increase in the number of registered cars and number of accidents in the Seychelles. A correlation coefficient of 0.89 indicates a very strong positive correlation. It is important to note that while the number of vehicles has been increasing, there has not been any corresponding widening of roads. The terrain of the Seychelles and congestion of the built environment preclude such an expansion. The number of vehicles per square kilometre has increased from 23 to 30 between 2007 and 2010.

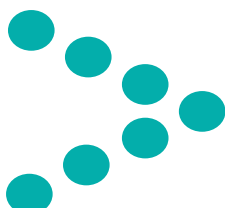
### 3.3 Risk Factors for Non-Communicable Diseases

#### 3.4 All Risk Factors for Non-Communicable Diseases

In the table below, the correlates of CVD are presented. As indicated in Figure 3, the major risk factors of cardiovascular are tobacco use healthy diet, smoking, heavy



drinking and obesity. Relative socioeconomic inequalities in cardiovascular diseases are shown in Table 12. The results presented here are from a study by Stringhini (2012) which looked at risk factors of cardiovascular disease by socioeconomic status. It should be noted that these risk factors are applicable to all the other NCDs with the shared risk factors.





**Table 12: Age-adjusted prevalence of risk factors of cardiovascular disease by various characteristics according to gender and year of survey**

SES	1989					1994					2004					P
	High	Mid	Low	Δ	High	Mid	Low	Δ	High	Mid	Low	Δ				
	MEN															
Current smoking	31.4	48.2	64.9	33.5	22.4	37.1	51.9	29.6	16.5	29.1	41.7	25.2	0.472			
Heavy drinking	18	30.4	42.7	24.7	5.3	20.4	35.6	30.3	3.7	14	24.4	20.6	0.547			
Obesity	10	5.8	1.6	-8.4	14.1	9.1	4.1	-10	21.3	16.7	12.1	-9.2	0.959			
Diabetes	13.9	9.6	5.3	-8.6	10.4	8.1	5.7	-4.7	7.2	11	14.9	7.7	0.004			
Hypertension	44.8	49.1	53.4	8.6	61.9	56.8	51.7	-10.2	48.9	49.1	49.4	0.5	0.223			
High cholesterol	22	15.8	9.5	-12.5	38.1	28.9	19.7	-18.4	24.7	24.4	24.1	-0.5	0.095			
<b>WOMEN</b>																
Current smoking	14.2	12.3	10.5	-3.8	5.1	7.1	9.1	3.9	1.7	3.4	5.1	3.4	0.262			
Heavy drinking	2.7	3.3	4	1.3	0.7	1.7	2.7	2	1	0.7	0.4	-0.7	0.349			
Obesity	17.5	22.4	27.3	9.7	18.1	26.7	35.3	17.3	28.6	34.8	40.9	12.2	0.752			
Diabetes	6.8	7.9	9	2.2	6.3	7.2	8.1	1.8	6	10	14	7.9	0.045			
Hypertension	38.4	39.9	41.4	3	38.4	40.2	42	3.7	42	40.8	39.6	-2.5	0.715			
High cholesterol	25.7	26.4	27	1.2	37.7	35.8	33.9	-3.9	27.8	27.9	28.1	0.3	0.798			

Stringhini (2012)

There are major differentials in smoking levels between males and females, so that analysis was performed separately. Low social status were more than twice likely to smoke than those in high social groups and relative inequalities in smoking remained stable over the study period despite the prevalence rates declining in all social groups. Also, although heavy drinking decline in all social groups, the relative inequalities tended to increase for heavy drinking. However, for obesity, the inequalities tended to decrease. For diabetes, those in high class had a higher prevalence than the low class in 1989, but in 2004 pattern had reversed. Hypertension remained substantially high in all social groups with very insignificant differences among social groups. For high cholesterol, in 1989 there was clear class differences in favour of the poor, but in 2004 there were no class differences as the prevalence rates among the poor had substantially increased to the same level as the rich.

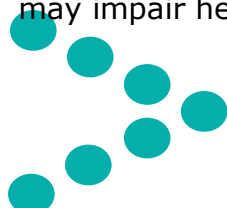
For females, the pattern changed between the first and third survey. While women in high social status used to smoke more than those in low class, the pattern reversed in 2004. The pattern for obesity showed a widening of the gap between the rich and the poor and substantial increase all in all social groups. There were minor differences for hypertension and high cholesterol between the social groups.

The above analysis was taken a step further by computing the prevalence ratios of the lowest versus the highest SES group. The results are presented in Appendix C in 2004, the association between high SES and obesity was no longer significant (PR=0.58, 95%CI=0.33; 1.02 for lowest vs. highest SES group). The SES gradient in diabetes reversed over the study period with a prevalence ratio (comparing participants of low vs. high SES) of 0.41 in 1989 and 1.87 in 2004 (p for interaction between SES and year of survey=0.026). In 1989, hypercholesterolemia was found more often in men of low vs. high SES but a SES gradient was no longer present in 2004.

Also, from Appendix C it can be seen that among women, the socioeconomic gradient (comparing low vs. high SES) in smoking reversed from 0.74 in 1989 to 2.65 in 2004, although SES differences were not statistically significant. There was no clear pattern in SES differences in heavy drinking, hypertension and high cholesterol. Social inequalities in obesity and diabetes remained stable (obesity and diabetes were associated with low SES).

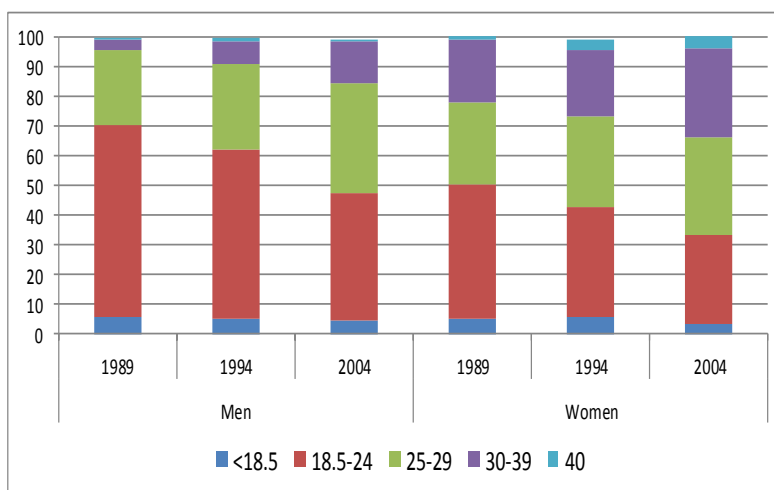
### **3.5 Obesity**

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height that



is commonly used in classifying overweight and obesity in adult populations and individuals. BMI provides a useful population-level measure of overweight and obesity. It is the same for both sexes and for all adult age groups. Obesity and its co-morbidities have serious health consequences for many Seychellois. The resultant burden of disease contributes to the increasing cost of health care, both at government level as well as in the private sector. The problem of obesity in Seychelles was identified as far back as 2002 when a study by Stettler found that 12.6% of the children were overweight and 3.8% were obese. In this section, obesity in both children and adults are presented. First, analysis of obesity among adults is presented using data from the Heart Study (STEPS). The differentials by gender are presented in Figure 13.

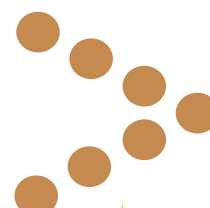
**Figure 12: Prevalence of Adult Overweight and Obesity**



**Seychelles Heart Study 1989, 1994 and 2004**

The overall prevalence of overweight (BMI >25) and obesity (BMI >30) in Seychelles is high, with more than 29% and 52 % of men in 1989 and 2004, respectively being classified as overweight or obese. The prevalence rates are even higher for females recording 52 percent and 67 percent in 1989 and 2004, respectively. The link between socio-economic development and the nutrition transition leading to increased obesity in the Seychelles has been hypothesized as the main cause of the increasing trends in the same study by Bovet (2008).

The differentials in obesity by socio-economic status were analysed by Bovet et al (2008) and the results from that analysis are presented in Table 13.



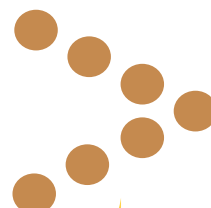
**Table 13: Multivariate analysis of overweight(BMI =>25) and smoking, education and occupation: Seychelles 2004.**

Men						
	OR	95% CI	OR	95% CI	OR	95% CI
<b>Smoking</b>						
Never	1		1		1	
Ex-smoker	1.62	1.50 - 1.75	1.5	1.38 - 1.62	1.65	1.52 - 1.78
Current smoker	0.7	0.66 - 0.75	0.65	0.61 - 0.70	0.71	0.66 - 0.76
<b>Occupation</b>						
Labourer	1				1	
Intermediate	2.11	1.97 - 2.27			2.01	1.87 - 2.16
Professional	2.19	1.99 - 2.42			1.91	1.71 - 2.14
<b>Education</b>						
Up to primary			1		1	
Secondary			1.72	1.57 - 1.89	1.48	1.35 - 1.63
Post-secondary			1.92	1.73 - 2.13	1.54	1.37 - 1.73
<b>Women</b>						
	OR	95% CI	OR	95% CI	OR	95% CI
<b>Smoking</b>						
Never	1		1		1	
Ex-smoker	1.28	1.11 - 1.46	1.21	1.06 - 1.39	1.23	1.07 - 1.41
Current smoker	0.5	0.43 - 0.57	0.53	0.45 - 0.61	0.5	0.43 - 0.58
<b>Occupation</b>						
Labourer	1				1	
Intermediate	0.65	0.61 - 0.70			0.76	0.70 - 0.81
Professional	0.48	0.44 - 0.52			0.63	0.57 - 0.70
<b>Education</b>						
Up to primary			1		1	
Secondary			0.63	0.56 - 0.70	0.73	0.65 - 0.83
Post-secondary			0.39	0.34 - 0.43	0.55	0.47 - 0.63

Source: Bovet et al (2008)

The association between obesity and SES is direct in men, but inverse in women. In the 2004, men who were in the professional and intermediate occupations were almost twice more likely to be overweight than those in manual labour. However, for women the reverse pertains with those in intermediate and professional occupations less likely to be overweight than the women in manual labour. The same trend can be observed for education. For males, those tertiary and secondary education were more likely to be overweight than those with primary or no education while among females there was an inverse relationship. It is interesting to note that the ex-smokers were more likely to be overweight than those who have never smoked. Conversely, current smokers were less likely to be overweight compared to non-smokers.

In order to assess whether the people are aware of the issue of obesity, an assessment of self-perception of one's own body weight is undertaken. Results in Table 12 show the odds ratios (OR) for perceiving one's weight as too high according to SES among overweight/ obese individuals. All odds ratios are adjusted for sex, age, and actual weight status.



**Table 14: Association Between high self-perceived weight and socio-economic status among overweight and obese persons 2004**

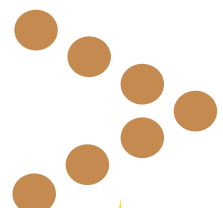
Variables	Education			Occupation			Income			All 3 SES Indicators		
	N	OR	P	OR	P	OR	P	OR	P	OR	P	
<b>Sex</b>												
Men	300	1		1		1		1		1		
Women	482	2.13	0	2.39	0	2.26	0	2.36	0	2.36	0	
<b>Age</b>												
25-44	323	1		1		1		1		1		
45-64	459	0.85	0.42	0.55	0.001	0.52	0	0.72	0.11	0.72	0.11	
<b>Body mass index</b>												
Overweight	437	1		1		1		1		1		
Obese	345	5.2	0	5.38	0	4.93	0	5.39	0	5.39	0	
<b>Education</b>												
Primary	248	1						1		1		
Secondary	360	1.88	0.002					1.54	0.055	1.54	0.055	
Post secondary	174	4.26	0					2.46	0.009	2.46	0.009	
<b>Occupation</b>												
Labourer	320			1				1		1		
Intermediate	336			1.6	0.017			1.35	0.157	1.35	0.157	
Professional	126			4.01	0			2.27	0.018	2.27	0.018	
<b>Income</b>												
Low	258					1		1		1		
Intermediate	445					1.18	0.376	0.88	0.52	0.88	0.52	
High	79					2.73	0.002	1.21	0.598	1.21	0.598	

**Source: Alwan et al (2010)**

The association between high self-perceived weight and gender was significant for the entire stratification variables by education, income and occupation. Females who were overweight or obese were more likely than males to perceive correctly. Age was not a significant predictor in all models. The last model which includes the all the three socio-economic variables shows that income became insignificant and education (OR = 2.5; 95% CI: 1.3-4.8) and occupation (OR = 2.3; 95% CI: 1.2-4.5) remained significantly associated with perception of having a weight that was too high. Strong associations were also found for sex (OR 2.4 for women vs. men) and actual weight status (5.4 for obese vs. overweight). These results suggest independent effects for education and occupation, as well as for female sex and for being obese.

Next, an examination of child obesity is presented. One of the steepest increases in child obesity has been recorded in Seychelles where the prevalence 'overweight' or 'obesity' increased from 8.7% to 13.5% in boys, and from 11.8% to 18.6% in girls from 1998 to 2004 ( $P < 0.001$ ) (Bovet, 2006). The prevalence of 'obesity' increased from 2.1% to 5.2% in boys and from 3.1% to 6.2% in girls ( $P < 0.001$ ). Using CDC criteria, the prevalence of 'at risk of overweight' and 'overweight' increased by similar proportions. The shift towards higher values over time was larger in the upper than the lower tail of the BMI distribution (Bovet, 2006).

The correlates of child obesity are shown in two steps. First, the results at the start of the surveillance of the school-based surveys are presented in Table 15.



**Table 15: Multivariate analysis of potential risk factors for children at the early stages of transition**

	Overweight			Obesity		
	OR	95% CI	P-value	OR	95% CI	P-value
Female Gender	1.5	1.07 - 2.10	0.02	1.26	0.72 - 2.19	0.4
First year weight gain (kg)	1.46	1.27 - 1.67	<0.001	1.59	1.29 - 1.97	<0.001
<b>Grade</b>						
Kindergarten	1			1		
4th grade	1.25	0.83 - 1.88	0.3	0.98	0.50 - 1.92	0.9
7th grade	2.03	1.31 - 3.16	0.001	1.57	0.77 - 3.21	0.2
10th grade	1.48	0.71 - 3.07	0.3	1.21	0.36 - 4.11	0.8
<b>Highest of two parents occupation</b>						
Non-manual skilled	1			1		
Intermediate skilled	0.96	0.63 - 1.46	0.9	0.84	0.45 - 1.56	0.6
Unskilled	0.74	0.45 - 1.21	0.2	0.3	0.12 - 0.74	0.01
Other/unknown	1.45	0.78 - 2.70	0.2	0.31	0.07 - 1.38	0.12
Maternal BMI (kg/m <sup>2</sup> )	1.07	1.03 - 1.10	<0.001	1.09	1.04 - 1.14	<0.001

**Stettler (2002)**



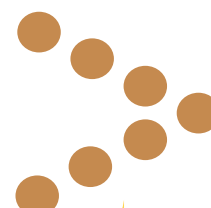
Girls were more likely to be overweight and obese than boys. Weight gain during the first year of life was positively associated with overweight and obesity. The seventh-grade children had significant probabilities of being overweight or obese and had the highest odds ratio. Also, those in Grade 10 were more likely to be overweight and obese compared to the reference group. However the occupation of the parents did not seem to have an effect. Maternal weight had a positive effect with those children whose mother had high body mass indexes more likely to be obese or overweight.

Second, an assessment of changes between 1998 and 2004 on child overweight and obesity with the associated risk factors is made. The results are presented in Table 16.

**Table 16: Association between excess body weight (overweight or obese), calendar years and low levels of physical exercise in school children**

Variables	Measurement	Odds Ratio	Confidence Interval	P-Value
Boys				
Calendar year	1989	1.00		
	2004	1.07	1.04-1.11	0.001
Walk <30 min/day	Yes	1.13	1.00-1.27	0.047
	No	1.00		
Exercise <= once per week	Yes	1.42	1.25-1.60	0.001
	No	1.00		
Girls				
Calendar year	1989	1.00		
	2004	1.06	1.04-1.09	0.001
Walk <30 min/day	Yes	0.95	0.86-1.04	0.263
	No	1.00		
Exercise <= once per week	Yes	1.21	1.10-1.33	0.001

Excess weight (a combination of 'overweight' and 'obese') was associated with calendar years; low frequency of physical exercise at leisure time, and, for boys, walking for less than 30 minutes to/from school. Comparisons between the two time periods show that the probability of being overweight and obese had increased.



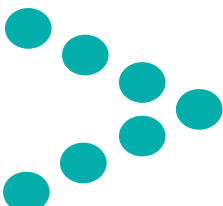
show that the probability of being overweight and obese had increased. Having exercise less than once per week was associated with a 1.4 times (40%) greater risk of excess body weight in boys and 1.2 times (20%) greater risk in girls. However, the effect of walking was only significant for the boy with those who did less walking most likely being overweight and obese.

### **3.6 Tobacco Use**

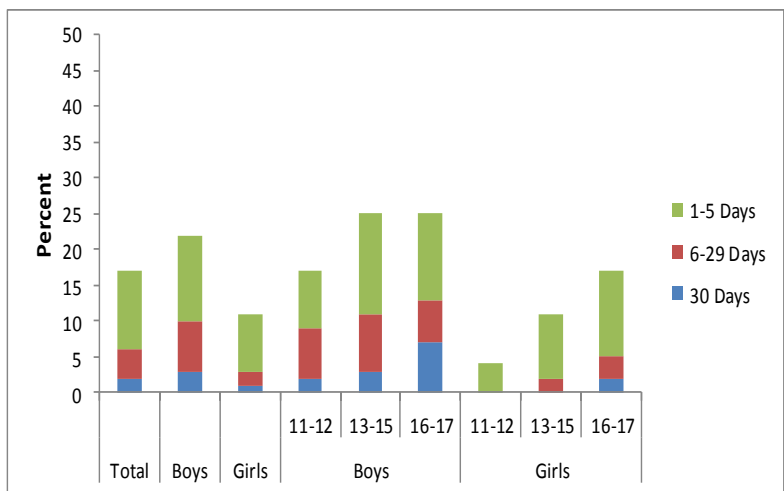
In any population smoking patterns differ between youths and adults. Two studies show the differential patterns of these two groups in the Seychelles. Bovet et al (2008) showed: that the prevalence for smoking decreased markedly between 1989 and 2004 among adults (with a much higher prevalence in men than women), but a study by Faeh et al (2006) shows that the prevalence remains fairly high among youths (with only a small gender difference). Thus, in the analysis which follows the two groups will be treated differently.

Among adults, both smoking prevalence (number of smokers) and consumption (number of cigarettes smoked) in Seychelles have been on the decrease. Aggregate cigarette consumption decreased by 26% between 1993 and 2000. Although Seychelles has some of the most stringent tobacco laws (Tobacco Products Control Act 2009) in the world, smoking rates remain moderately high with 21% of men consuming cigarettes, slightly lower than Namibia's 36% and South Africa 25 percent. Seychelles has similar prevalence rates to other developing countries, with approximately 21 percent of men and 3 percent of women who smoke. Although the global prevalence of smoking has decreased over the past decades, this decrease has mostly been among higher socioeconomic groups as shown in Section 4.1.

Smoking among the youth has emerged as the new social and health problem in Seychelles and the prevalence figures show unrelenting levels. The latest Global School-Based Student Health Survey (2007) show that 23 percent boys and 11 percent girls had smoked in the month preceding the survey. Among the smokers, almost half had started smoking at the age of 11.



**Figure 13: Prevalence of cigarette smoking during the past 30 days, by frequencies**



The Global School-Based Student Health Surveys do not contain any questions which can be used to directly measure the socio-economic status of the children who smoke. However, inferences can be drawn from the finding that cigarettes smoking was associated with poor knowledge by parents of what their child was doing with his/her free time, which is an indicator of poor parenting. Another study by Bovet et al (2006) established a strong correlation between missing school and high risk behaviour like smoking. They attribute such behaviours to absent students who may have marginalized themselves and/or are more defiant toward social norms. The researchers were given circumstantial evidence by the school authorities that reflect that a substantial proportion of absent students (perhaps up to half of them) had been attending school poorly or not at all (particularly at S4 level) and/or were suspended for disciplinary reasons, that is, major misbehaviours. In addition this is indicative of systemic problems related to poverty, which may include the keeping of children at home to avoid expenses linked to their being sent to school, namely bus fares, snacks during break time and lunch, as well as not being aware of their children fail to attend school.

### 3.7 Harmful Use of Alcohol and Drugs

The issue of alcohol abuse, especially among males has received wide attention in the Seychelles. A search of the history of the Seychelles shows that this problem is not new but has taken different dimensions at each stage of socio-economic development. During the colonial period, alcoholism was prevalent, partly because



the plantations used drinks as payments and incentives. Among the working classes drinking tended to be solitary. In recent times, excessive drinking has been linked to social problems and the low social status.

**Table 17: Age-standardized trends in body mass index and alcohol consumption, 1989–2004**

	Men			Women			Total		
	1989	2004	P	1989	2004	P	1989	2004	P
Alcohol Intake (ml/day) mean SD	71 (86)	40 (62)	**	9 (29)	4 (13)		40 (81)	22 (61)	
0	25	39		72	82		48	61	
1-29	19	22		20	14		19	18	
30-74	23	24		5	3		14	14	
75-119	14	7		2	1		8	4	
≥120	20	7		1	0		11	4	
All alcoholic beverages									
Percent drinkers	75	61	***	30	18		52	39	
mean alcohol per drinker	94.8	65.9	***	30.5	20.4		77.5	55.5	
Commercial alcoholic beverages									
Percent drinkers	71	58		26	18		49	38	
mean alcohol per drinker	40.1	41.7	ns	16.7	17.7		33.7	36.2	
Homebrews									
Percent drinkers	37	12	***	8	1		23	6	
mean alcohol per drinker	114.7	135.4	ns	44.3	41.5	ns	104.8	126.1	ns

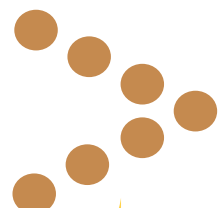


The mean alcohol intake per day decreased substantially for both sexes, for males from 71 to millilitres per day. There has been a significant increase among those who have zero intake of alcohol. Considering all alcoholic beverages, there was a decline in the percentage of drinkers and the amount consumed. However, for commercial alcohol beverages, while there has been a decline in the proportion drinking, the mean amount of alcohol consumed per person has remained the same. Homebrew drinkers had higher ethanol intake from homebrews than drinkers of commercial drinks had from commercial drinks, and these mean alcohol intakes did not change substantially between 1989 and 2004. However, the prevalence of drinkers of homebrews decreased markedly between 1989 and 2004, which contributed to a large decrease in total alcohol intake in 2004 vs. 1989.

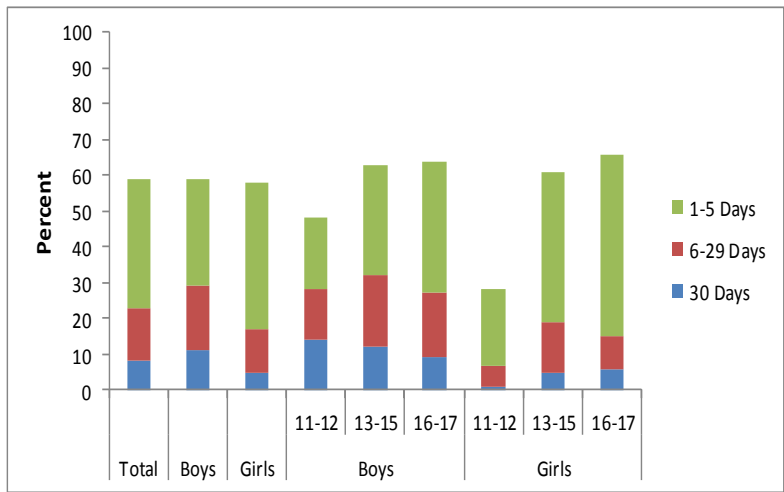
A study on vendors and users of *Baka* and *Lapire* conducted in 2005 by the MHSB confirmed that these local home brews were preferred by low-income, less educated, single, older men with children, who visit local sheds to drink and socialise on a daily basis. Also, the intake of baka has been associated with male labourers would traditionally stop by the yard of a seller of toddy or baka, purchase a bottle, drain it, and go on their way. Men may also meet with neighbours or workmates near a shop, at a home-brew seller's, on the beach or on the roadside and have a few beers or some home-brew while chatting or playing dominoes (Bovet, 1998).

While the consumption of alcohol has been declining, there is circumstantial evidence that the use of drugs has been increasing and the pattern changing towards more hard drugs. The Drug and Alcohol Council has reported that drug consumption trends are changing from the use of marijuana to heroin and poly-drugs (cocktails of ecstasy, heroin, cocaine and phencyclidine). The records of the Mont Royale Rehabilitation Centre recorded primary substance abuse shifting from 47% cannabis in 2006 to 50% heroin in 2008 amongst male patients, with a minority of female patients (12% and 14% respectively).

The consumption of alcohol by the youth has been increasing. The prevalence of alcohol consumption among school youths are presented in Figure 15.



**Figure 14: Prevalence of d drinking during the past 30 days**



The high prevalence of taking alcohol among school students is clear in the survey, where 59% of all students had at least one drink on at least one day during the past 30 days. The overall prevalence was similar in boys and girls (overall 59% boys and 58% girls). Drinking frequency increased with age.

### 3.8 Physical Inactivity

Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure. Physical inactivity (lack of physical activity) has been identified as the fourth leading risk factor for global mortality (6% of deaths globally). Moreover, physical inactivity is estimated to be the main cause for approximately 21–25% of breast and colon cancers, 27% of diabetes and approximately 30% of ischaemic heart disease burden. Physical activity includes exercise as well as other activities which involve bodily movement and are done as part of playing, working, active transportation, house chores and recreational activities. As with other risk factors, analyses are performed separately for adults and children. Measures of physical activity among adults in the Seychelles are presented in Table 18.

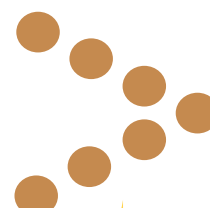


**Table 18: Age-standardized trends in body mass index categories of physical activity in 2004**

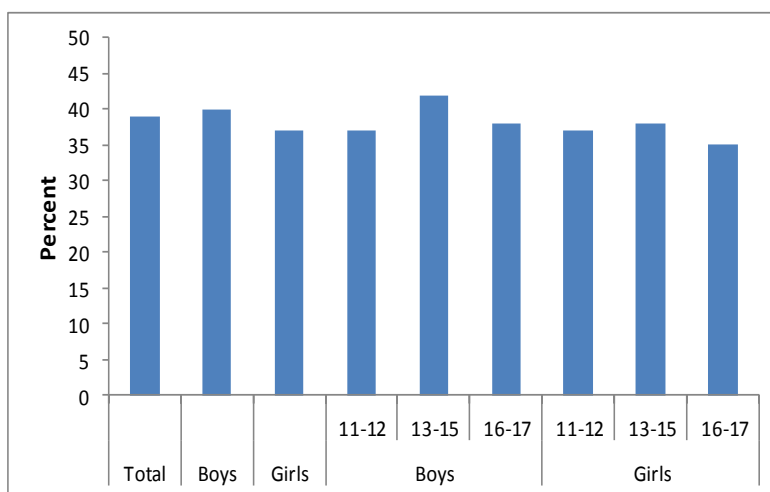
Physical Activity	Men	Women	Total
Physical activity at work			
Percent reporting activity	61	62	61
Median MET min/week	2880	2880	2880
Walking to places			
Percent reporting activity	57	71	64
Median MET min/week	700	600	600
Physical activity during leisure time			
Percent reporting activity	41	41	41
Median MET min/week	1200	600	720
Any physical activity (percent)			
Low (<600)	19	17	18
Moderate (600-2999)	36	43	40
High (>3000)	45	40	42

Approximately 80% of men and women were classified as having either moderate or high physical activity. However, the largest part of this reported physical activity was related to physical activity at work and only 41% of men and women reported physical activity during their leisure time.

Among the youth, an assessment of physical activity at schools. Physical activity habits acquired during childhood and adolescence are likely to be maintained throughout the life span and, inversely, sedentary behaviour adopted at a young age is likely to persist into adulthood



**Figure 15: Percent who had two classes of Physical Education Per Week.**



Physical activity in school is low as only 39% of all students declared to have had at least two classes of physical education each week. Boys were more likely to engage in physical activity at schools than girls.

The relationship between physical inactivity and different activities like watching TV, playing computer games among youth was established. The results are presented in Table 19.





**Table 19: Association between sitting for more than 3 hours per day by various variables**

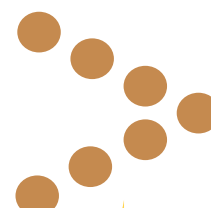
		Odds Ratio	Confidence Intervals	P-Value
Age	11-12 years	1.0		
	13-15 years	1.9	1.4-2.5	0.000
	16-17 years	2.7	1.8-3.9	0.000
Watching TV	<1 hour per day	1.0		
	> 1 hours per day	4.9	3.8-6.3	0.000
Computer Games	<3 hours per day	1.0		
	>3 hours per day	3.6	2.8-4.6	0.000
Walking to and from school	=>30 min per day	1.0		
	<30 min per day	1.7	1.2-2.3	0.000

**GSHS (2007)**

The results clearly show that as age increases, the youth are likely to spend more hours sitting. The children aged 13-15 years are twice more likely to spend more than 3 hours per day sitting than the 11-12 year olds, and the 16-17 year olds are almost three times more likely to be spend more than 3 hours per day sitting. Doing more than 3 hours or sitting activities per day was five times associated with television watching more than 1 hour per day, and three and half times with playing computer day more than 3 hours per week and walking or riding a bicycle less than 30 min per day.

**3.9 Food Consumption Patterns**

One of the important risk factors of non-communicable diseases shown in Figure 3 is unhealthy diets. According to Bonham et al (2009), dietary patterns in Seychelles are in a state of transition, with a move towards a Western-style diet as evidenced by higher fat and lower fish intakes. There are also trends toward more varied foods likely related to a substantially broader supply. The patterns of fruit and vegetable consumption among males and females are shown in Table 20.



**Table 20: Fruit and Vegetable Consumption among Adults**

Fruit and vegetables (%)	Female	Males	Total
<3 portions per day	65	63	64
3-4 portions per day	33	33	33
≥5 portions per day	2	4	3

The prevalence of men and women reporting the recommended amount of ≥5 portions of fruit and vegetables per day (in 2004) was very low. Only 2-4 percent reported eating the required amount of fruits and vegetables.

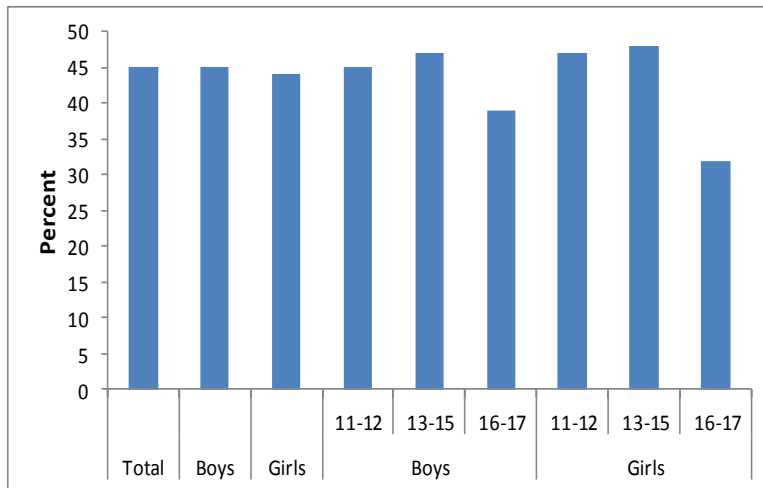
The report by Marques-Vidal (2008) showed the following results: *consumption of fish (5+/week) decreased from 93% in 1989 to 74% in 2011 ( $p<0.001$ ). During the same period, the following consumptions increased: meat (5+/week), 25% to 51%; fruit (1+/week), 48% to 94%; salty snacks (1+/week), 22% to 64% and sweet snacks (1+/week), 38% to 67% ( $p<0.001$  for all). Home-brewed alcoholic drinks (1+/week) decreased from 16% to 1% ( $p<0.001$ ), while the consumption of wine (1+/week) increased from 5% to 33% ( $p<0.001$ ).*

*Between 2004 and 2011, rice (2/day) decreased from 62% to 57%, tea (1+/day) decreased from 72% to 68% and poultry (1+/week) increased from 86% to 96% (all  $p<0.01$ ), while no change was found for vegetables (70.3% to 69.8%,  $p=0.65$ ). Cardoso et al (2009) concluded that Seychelles has been experiencing nutrition transition characterized by a decreased consumption of staple traditional foods (fish, polished rice and tea) and of inexpensive homebrews and increased consumption of meat, poultry and snacks. (Cardoso et al 2012).*

Among children, the prevalence rates for vegetable consumption are provided in Figure 17.



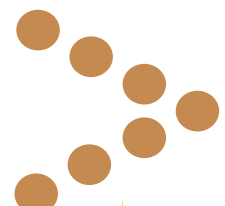
**Figure 16: Prevalence of students who ate five or more fruits or vegetables per day during the past 30 days**



**GSHS Report 2007**

Several factors have been identified as affecting consumption of healthy foods. The first factor to be taken into account is cost. The components of a healthy diet are unaffordable (and often unavailable) to low income groups and people with a low income may therefore select a relatively less healthy diet.

Second, the rigours of modern life have changed food production and consumption patterns. Working longer hours and being away from home for longer periods of time, as well as precooked foods being more available and affordable, have led to a change in dietary behaviour. The commuting distances of employed city dwellers frequently result in choices of easy-to prepare foods and snacks away from home, which are generally refined and high in fat content. Most importantly, supermarkets now share at almost all of food sales. Supermarkets are the leading sellers of processed, higher fat, added sugar, and salt-laden foods. Lastly, intensive food advertisements for high-sugar, high-fat commercial food products have been more successful in determining food choices than public health messages.



## CHAPTER IV: Structural Determinants of Health

### 4.0 Introduction

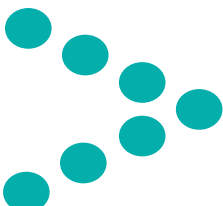
In this section, social determinants of health which are particularly important in the Seychelles are presented.

### 4.1 Waste Disposal

One of the most important social determinants of urban health is waste management. This component is especially important in island countries like Seychelles, where the population is concentrated in small space, there is limited availability of land space and reduced the choice of appropriate options for sound management of waste are limited. In Seychelles, solid waste generation is about 0.39 kg (1994 estimate) per person per day and it is estimated that this will likely increase to 0.53 by 2015 (UNDP 2000). However, an assessment by Martin (2009) estimated the amount of solid waste produced per capita in Seychelles at 625kg per year. This may be partly attributed to the high dependence on packaged imported goods and increasing consumerism. Over 60% of the waste is biodegradable, but mixed with most other forms of waste. Waste is collected in 240L bins in public bin sites, provided by the contractor. Many such sites are short of bins as they need to be replaced on a frequent basis.

Solid waste collection and disposal is undertaken by private companies under contract with the Government of Seychelles, and supervised by the Landscape and Waste Management Agency (LWMA). On Mahé and La Digue, the contractor is STAR Seychelles, on Praslin, the Praslin Development Fund.

Solid waste on the island of Mahé is disposed of at a sanitary landfill site at Providence which is situated on reclaimed coral fill land. This landfill is almost full and an alternative location, also on reclaimed land is being prepared in 2010 with funding from Government of Seychelles and the European Union under the 9th EDF. A new lined landfill was built at Anse Royale in 2000 but this project has now been abandoned and is only being used for a small amount of inert waste such as glass. The other populated islands of Praslin and La Digue also have designated sanitary landfill sites. However, illegal dumping and littering in forests, roadsides and wetlands continues to be a problem on all three islands though may have reduced somewhat since 2004.



Waste collection and disposal on Mahé is contracted to STAR Seychelles, a private company under contract with the LWMA. Waste from residences is collected from public bins along the main roadsides, while hotels and other industries have contracts with the LWMA for commercial waste collection. Since 2004, new bin sites have been installed. A consignment of new bins to expand public bin sites and replace broken equipment is expected in early 2010. New machinery such as waste compactor trucks have improved the efficiency of the collection system, but problems still remain with availability of bin sites and collection schedules.

An existing fine for littering under the Environmental Protection Act was increased in 2007 and a new green police force was created under the Department of Environment to enforce it and other environmental laws. Littering does still occur, but is cleared up regularly by road cleaners and beach cleaners contracted by LWMA, who also clear out roadside drains of litter, leaves and other waste. A new Environmental Engineering section under the DOE was created to help deal with issues of drainage.

The capital of Victoria is cleaned daily with waste collection from public bins occurring twice daily. The greatest challenges are establishing and maintaining an efficient residential waste collection and disposal system. In Seychelles, the Environmental Protection Act, which includes waste management and control of toxic and hazardous substances, was enacted in 1994. It aims to provide a comprehensive mechanism for pollution protection and the improvement of waste handling practices. In 1995, related regulations giving more detailed guidance were approved. In Seychelles, an authority was created to manage solid wastes. The authority, called the Solid Waste and Cleaning Agency (SWAC), is responsible for solid wastes and hazardous wastes management in the country. It operates through the management of contracts for collection and management of the landfills.

There has been little change in the sanitation situation since the last report in 2004. Seychelles strategy in the EMPS was to have the parastatal company, Public Utilities Corporation (PUC) provide central sewage treatment in highly populated areas and individual treatment systems in areas of lower density. In 2009, the management of PUC was contracted to Coffely, a subsidiary company of SUEZ, and the new management is committed to improving the sanitation in Seychelles. The Planning Authority ensures that all developments outside the sewerage networks have their own systems but it is estimated that only about 60% of these work effectively (Gonzalves & Mussard, 2009), likely largely due to the rocky terrain which is unsuitable for soak-away pits. Only about 18% of potential connections on Mahé are online, primarily because most residents already have their own individual system and do not want to incur the sanitation fee. There is no incentive or legislation by



GOS to ensure that residents within clearly designated areas that can connect to central sewage treatment actually do connect to the system.

Wastewater from ships is collected from ships by PUC and other local companies who have recently entered the market.

Mahé has two central sewage treatment plants, one at Providence and one at Beau Vallon. Plans to build new plants on Praslin and at Anse Royale Mahé have not yet been implemented due to lack of funds, although PUC currently has plans to expand its' central sewerage network and facilities (Gonzalves & Mussard, 2009).

The plant at Providence collects sewage from Victoria and surrounding areas that are online, which represents mostly businesses. Most residents have their own system. The major hotels in Beau Vallon are now connected to the sewage treatment plant at Beau Vallon which has improved water quality in the sea nearby. The treatment plants were functional but very inefficient until the end of 2009 when the new PUC management implemented a recovery plan of both plants, which are now functioning at 75% efficiency. PUC plans to continue maintaining and improving the plants. However, it is critical that more residents be encouraged or forced to connect to both plants in order to ensure that they run at maximum capacity and efficiency.

Water tests in some areas reveal that there is faecal contamination in several rivers and coastal areas, most likely the result of ineffective sewage treatment at household level.

## **4.2 Trade**

One of the most influential frameworks for analysing the relationship between trade and health has been proposed by Blouin et al (2009) and it is presented in Appendix G for reference. They have identified four key factors that link trade policy (liberalization) to social determinants of health: (1) income, (2) inequality, (3) economic insecurity, and (4) unhealthy diets and behaviours. The brief application of this framework to Seychelles is presented with reference to tobacco. The trend of tobacco importation is presented in Table 21.



**Table 21: Amount and Percentage Changes in Cigarette Importation in Seychelles**

Values	Date	% to previous period	% to the same period of previous year
1,080,239	2008	208.92%	208.92%
517,071	2007	68.81%	68.81%
751,437	2006	112.72%	112.72%
666,624	2005	131.27%	131.27%
507,836	2004	82.34%	82.34%
616,773	2003	91.54%	91.54%
673,772	2002	134.18%	134.18%
502,148	2001	109.87%	109.87%
457,052	2000	148.74%	148.74%
307,282	1999	88.45%	88.45%
347,417	1998	105.11%	105.11%
330,513	1997	129.84%	129.84%
254,556	1996	60.1%	60.1%
423,554	1995	185.69%	185.69%
228,101	1994		

**Source: United Nations 2010**

Importation of cigarettes has been increasing in Seychelles and it has almost quadrupled from 1994 to 2010. The recent liberalization of tobacco-related trade through bilateral, regional, and international trade agreements has significantly reduced tariff and nontariff trade barriers. The elimination or reduction of these barriers has almost certainly increased competition in tobacco-product markets leading to reductions in the relative prices of these products and increases in their advertising and promotion. The same scenario is reflected for the importation of transfats, alcohol and fizzy drinks.

### **4.3 Marketing**

The only compelling evidence available in the Seychelles on the link between advertising and risky behaviour has been presented by Viswanathan et al (2008). Reporting on results from the Seychelles Global Youth Tobacco Survey (2002), as a measure of direct advertising, 62.3% of the students had seen ads for cigarettes in

newspapers or magazines in the month prior to the survey (Table 2). For indirect advertising, 18.2% of the students reported that they have an object (i.e., t-shirt, cap, book bag, etc) with a cigarette brand logo on it. In the report they argue although cigarette advertising is banned in Seychelles, that the youth might be seeing these adverts on imported newspapers, cable TV and internet, which are difficult to regulate.

In the Global Youth Tobacco Survey, among current smokers, 23.4% usually bought their cigarettes in a store, with the rate for boys (34.3%) significantly higher than for girls (10.8%). Of those current smokers who bought cigarettes in a store, 77.1% had not been refused purchase because of their age in the month prior to the survey. Slightly less than 1 in 10 (7.6%) of all students had ever been offered free cigarettes by a cigarette company representative.

#### **4.4 Globalization**

Globalization is an important determinant of NCD epidemics since it has direct effects on risks to populations and indirect effects on national economies and health systems (Yach & Beaglehole 2003:903). According to Ebrahim et al (2007). "International trade, population migration, changes in living conditions (i.e., consumption transition, nutritional transition), and changes in production, marketing, and availability of consumer goods (i.e., production transition) have brought about continuous and rapid changes in the human environment."

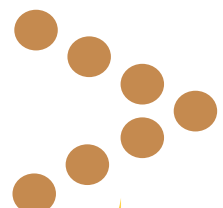
Globalization, which can be characterized by intensified social, political, economic, and environmental interactions, is closely linked to CVD. Liberalization of trade favours tobacco use and the adoption of several unhealthy dietary patterns (e.g. increased consumption of fatty foods and carbonated drinks - 'coca-colonization'). On the other hand, improved economic growth benefits health, including among the poor. Liberalization of trade can result in improved dietary patterns, e.g. consumption of less animal products and more fresh fruit and vegetables in Hungary after markets became liberalized in the early 1990s. Global political public health tools can be created to counter transnational political or economical influences. The Framework Convention for Tobacco Control, which is currently being drafted by the member states of the World Health Organization, is an example. By calling for strengthened tobacco control measures and legislations in signatory states, this international legally binding treaty will help decrease tobacco use worldwide.

The following observation by Reardon and Berdegue (2002) cannot be true anywhere than in Seychelles. *Globalization and economic liberalization has fuelled much of this change in the food culture, resulting in the inculcation of qualitatively imbalanced*





*and calorically excessive diets. Capital market liberalization and enormous capital flows in the form of foreign direct investment (FDI) into agribusiness in the areas of retail marketing, food services and food processing has not only resulted in the phenomenal growth of supermarkets, but also revolutionized processed food products both for domestic consumption and for export and trade. Almost all foodstuffs in grocery stores and supermarkets are imported. Seychelles import consists of 90% of foods that the people consume.*



## CHAPTER V: Reproductive Health Issues

There are four reproductive health issues which are of concern in Seychelles: gender based violence, teenage pregnancy, Hepatitis C and HIV and AIDS.

### 5.1 Teenage Pregnancy and Abortion

Teenage pregnancy, however, has become a big problem in Seychelles, with 32% of all first pregnancies occurring in 15 to 19 year olds. Two-thirds of all first pregnancies occur in 15 to 24 year olds.

**Table 22: Trends in Teenage Fertility and Pregnancy Rates**

Year	Teenage Fertility Rate Per 1000 Women	Teenage Pregnancy Rate Per 1000 Women	Teenage pregnancies as % of reported pregnancies at all ages	Percentage of reported teenage abortions among reported teenage pregnancies	Abortion Rate (%)
1999	39.5	67.1	18.7	32.5	2.2
2000	34.9	58.8	16.0	33.5	2.0
2001	37.0	55.9	15.9	28.5	1.6
2002	40.4	53.0	14.6	23.7	1.3
2003	42.1	56.8	17.0	24.9	1.4
2004	35.9	49.1	15.3	26.9	1.3
2005	40.5	53.7	15.4	23.8	1.3
2006	38.2	52.1	15.1	25.6	1.3
2007	43.6	58.3	15.6	23.9	1.4
2008	44.8	61.6	16.0	27.0	1.7
2009	48.1	67.3	16.8	27.7	1.9
2010	76.0	101.0	26.6	23.3	2.4
2011	93.7	123.2	29.3	22.7	2.8



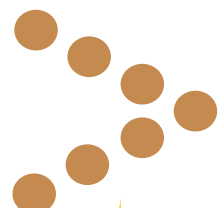
The increases in teenage fertility and pregnancy rates have been phenomenal, reaching the highest levels ever recorded for developed countries. However, abortion rates declined for a time and have rebounded to highest rates ever recorded in the Seychelles.

According to the Youth Health Centre's Annual Report for 2009, reproductive health (RH) issues such as teenage sexuality, unwanted pregnancies and abortions amongst adolescents still remain a huge challenge in Seychelles. This is in spite of free health preventive services for both males and females. The report goes on to note that in spite of some positive moves such as the reinforcement of the peer education programme and outreach programmes which have increased the number of visits, the centre suffers from staff shortage especially for mental health services and adequate space for providing counselling services.

The MDG 2010 Status report notes that 'Access to contraceptives for under 18's continue to be a problem, as numerous local conferences and seminars, with very specific recommendations, have been unable to address the issue in a meaningful and effective manner'.

Although the Ministry of Education has a Teenage Pregnancy Support Policy (2005), the policy is narrowly focused on reintegration in schools. It does not provide for comprehensive support for mother and child. Once reinstated, many young parents drop out of school because of lack of financial /moral support e.g. for child care etc. A study of teenage mothers in the Seychelles 2004-2008 conducted by the Seychelles Association of Women Professionals (SAWOP) revealed that only 5 out of 37 pregnant teenagers returned to school after delivery and 27 out of the 37 were neither in education or employed at the time of the interviews. Reasons given for not returning to education were 1) lack of finance, 2) shame and embarrassment 3) Inadequate information on the policy 4) parental expectation of motherhood 5) lack of motivation.

Consequences of teenage fertility are numerous. As stated in the Seychelles 2010 MDG status report, teenage pregnancy and subsequent unemployment is usually the start of the cycle of vulnerability and disadvantage if not outright poverty. For the mother, it means an economic burden (raising money for the child), often stopping school. The high rate of teenage pregnancies has far reaching consequences among the poorest and most disadvantaged groups in the country. The majority of these pregnancies are neither planned nor wanted. The mother often leaves school, thus ending her opportunities for personal development, making her vulnerable to poverty, exploitative sexual relationships and violence as well as low self-esteem.



Interventions on teenage pregnancy need to be addressed under gender equity and equality strategies.

## 5.2 HIV & AIDS

Seychelles has one of the lowest prevalence rates of HIV on the African continent. HIV has a low prevalence of less than 1% in the general population. The trends are shown in Table 5.

**Table 23: Trends in HIV Prevalence**

Year	2005	2006	2007	2008	2009	2010
New Cases	45	42	26	44	52	33
Number of Tests Done	7,806	8,330	8,656	9,826	8,773	5,427
% of Positive Results	0.58	0.50	0.50	0.46	0.59	0.60

**Source: MoH, 2011**

The prevalence has remained below 1 percent in the last five years. According to data collected from tests conducted throughout 2011, the modes of transmission are as follows: 86% is heterosexual and 14% is homosexual.

However, the peculiarities of the pattern are that most of the cases are concentrated epidemic in high-risk groups, commercial sex workers, injecting drug users and men who have sex with men. The prevalence rate among men who have sex with men was 13.2% and among injecting drug users was 5.8%. The concentration in these groups indicates strong financial incentives in these groups. In the latest study on the assessment of the status of Prostitution in Seychelles commissioned by the Department of Social Development (2011), it was established that the different age groups (18+ and 20+) that almost 80% were involved in prostitution as a means of secondary income or as a way of earning a living, 20% to finance their drug habits, and they mainly happened in socially unstable and poor neighbourhoods like Les Mamelles and Corgate Estate.

HIV has also been linked to injecting drug users and men who have sex with men who are also likely to be low social status. Significantly higher percentages are HIV-positive in these groups compared to the general population and the HIV prevalence does not show signs of decrease in most-at-risk populations. A report by a non-governmental organization, FAHA (2011) quoted a rapid assessment conducted by



UNAIDS in 2008 has identified two main categories of MSM: the MSM with a homosexual identity (or gay) and the MSM being bisexual (having sex with men, and still having a female partner). MSM who are bisexual are more difficult to identify and to reach with appropriate interventions due to stigmatization associated with their practices, yet the assessment showed that they possibly represent the majority of MSM community in Seychelles.

In the Integrated Biological Behavioural Surveillance Survey-Round I (2011) among the 59.1% that had ever been tested for HIV, 44.4% reported having been tested within the last year and among that proportion. For those who never had an HIV test (n=64), the most commonly cited reason for never doing so was because they felt that they were not a risk for HIV (31.4%), 18.8% because they were afraid someone would find out that they had taken the HIV test, and 12.3% because they did not want to change their behaviour if positive or because they were afraid of getting their results. Other risky behaviours reported in the survey include inconsistent condom use and the primary reasons they did not use the condom was because it was not pleasurable for the respondent, condoms not being available and the condom not being pleasurable for the partner.

The role of rape, especially by intimate partner in HIV transmission needs further investigation. The report by the Gender Secretariat showed 8 women reported to having contracted HIV/AIDS and 21 women reported to becoming pregnant as a consequence of being raped by an intimate partner. These are significant numbers considering the size of the study sample and the small size of the national population. (Gender Secretariat, 2009).

The main issue for concern is increase in causes of AIDS-related mortality. Table 6 shows the number and percentages of causes of AIDS-related mortality from 1993 to 2011.



**Table 24 Table 6: Number and percentage of causes of AIDS-related mortality**

Respiratory Causes	AIDS and Sepsis	CNS	Cancers	Drug Adverse Reactions	Cardiovascular Causes
30	22	18	17	4	3
32%	23%	19%	18%	4%	3%

**(Source: MoH, 2011)**

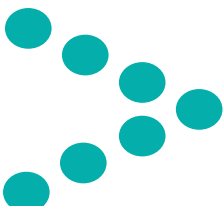
The most common cause of death is respiratory failure followed by AIDS and sepsis. Other common causes include cancers of the oesophagus, cervix, rectum and liver amongst others.

### **5.3 Gender-Based Violence**

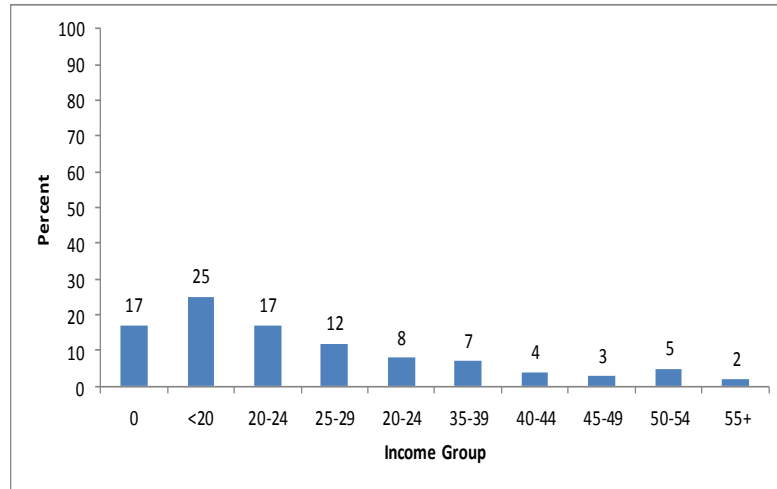
The data from the Family Tribunal and Police indicate a sharp rise in cases of domestic violence. In the whole of 2006 the Family Tribunal registered 172 cases of spousal violence, 95% of which were registered by women. In 2007 this grew to 226 cases, indicating a 31% increase in the number of cases being registered in one year and possibly by now these cases could have doubled if that trend persisted. The number of cases of domestic violence reported to the Police has more than doubled from 122 in 2000 and 266 in 2006. A national survey conducted by the Gender Secretariat showed the following main findings:

- 42% of women and 36% of men admitted to having experienced emotional abuse by an intimate partner
- 27% of women and 23% of men have experienced moderate physical violence
- 28% of women and 26% of men admitted to being a victim of severe physical violence, and
- 11% of women admitted to having been raped by an intimate partner

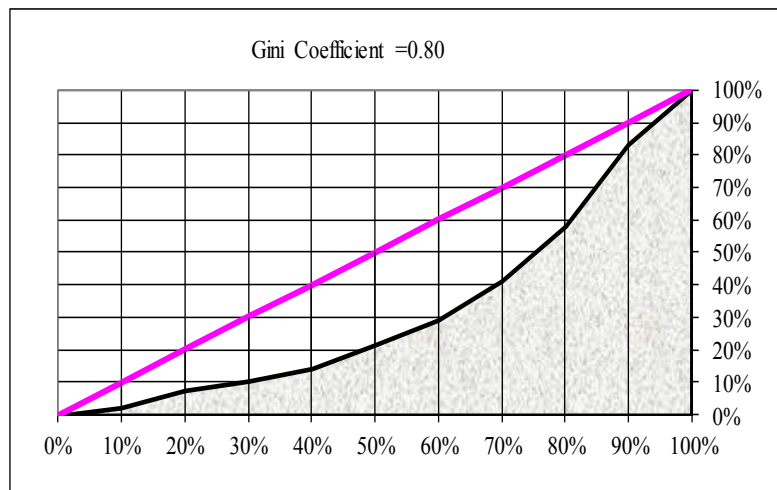
Of interest to this report is the inequalities in gender based violence according to social status. The data from the national survey was further analysed by income level. A Lorenz Curve was fitted to the data and the Gini coefficient calculated. The results are presented in Figures and 10.



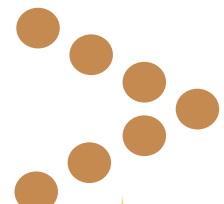
**Figure 17: Percentage of Women who have been ever abused by Income Group**



**Figure 18: Lorenz Curve: Income and Ever Abused**



The above two graphs indicate the high prevalence of abuse of any type (emotional, sexual or physical) among women in low income groups. In Figure 19, almost two-thirds of the women reporting some form of violence are in the three lowest income groups. In Figure 10, the gini coefficient of 0.8 shows high inequality with an inverse

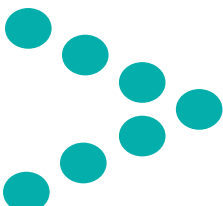


relationship. As income levels decrease, there is an increase in abuse. While the reasons which expose low status women to abuse need to be further investigated, it can be conclusively reported that low economic status exposes women to gender-based violence. However, one study by Geisler (2009) has identified a number of issues which need further investigation. The study identified underachievement and under participation of boys as compared to girls in primary and secondary state schools has been highlighted in national examination reports and school behaviour and participation statistics which manifest in high rates of alcoholism and drug consumption among men. However, these issues need further investigation. This call for the Gender Secretariat to undertake a qualitative study of extreme cases of domestic violence focusing on face-to-face interviews with victims and aggressors, sourced from Family Tribunal, Probation and Police as proposed in National Strategy on Domestic Violence 2008-2012.

#### **5.4 Hepatitis C**

According to the Global AIDS Response report, there is cause for concern as there are now new dynamics in the development of pandemic. There has recently been a dramatic rise in the number of persons detected with the Hepatitis C virus. In 2002, there were two HCV cases. No new cases were detected between 2003 and 2007. In 2008, there were eight new HCV cases, 32 cases in 2009 and 52 cases in 2010. There are eight cases of HIV and HCV co-infection. All the new HCV cases from 2008 are among IDU. The prevalence of HIV and Hepatitis C as recorded in the RDS survey is alarming, with "... HIV prevalence among IDU in the Seychelles was 5.8%. Only 0.7% of IDU were found to be infected with Syphilis and 0.1% infected with Hepatitis B. However, 53.5% of IDU were infected with Hepatitis C." In the MSM sample from the RDS survey 2011, the prevalence of HIV was 13.2 and Hepatitis C was 41.9%. Moreover, amongst those who tested positive for HIV, 20.6% were co-infected with Hepatitis C.

The facts that the disease is prevalence in certain groups reflect the economic, social, psychological and behavioural drivers of the epidemic. The social and economic drivers of these high risk behaviours in the Seychelles are linked to poverty. A report for the Africa Development Bank by the Geisler (2009) links these to a wider issue of men's disempowerment. This manifest into academic underachievement of boys, the growing problem of domestic violence which affects both women and men as victims, alcoholism amongst older men, substance abuse (especially heroin) amongst young men and a rising incidence of male suicide are some manifestations of a growing malaise among men that give cause for concern. The 10 years difference in life expectancy between men and women suggests that





men live unhealthy lifestyles and neglect health care. However, the study recommends research into understanding issues surrounding this concept.

## **CHAPTER VI: Other Important Health and Social Issues**

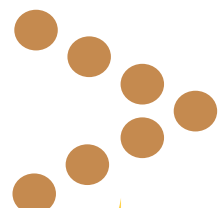
In this section, other social and health issues which have an impact on health in the Seychelles are presented.

### **6.1 Drug and Substance Abuse**

In the preceding sections, the issue of drugs and substance abuse has been mentioned and here the issue will be considered in detail. The problem of drugs is so severe that it has been declared a national disaster and the current president has made it a personal commitment to fight drug trafficking and substance abuse and has established NDEA. Drugs and substances abuses are important social determinants of health and they are avoidable. Here that analysis will be undertaken at two levels. The first level is to examine drug and substance abuse among young adults and the second level looks at adolescents.

The Seychelles is also currently experiencing major difficulties in relation to drug abuse amongst young adults, especially since the explosion of heroin on the local market in 2005. With this problem, some young people have simply opted out of the job market, no longer seeking gainful and meaningful employment, preferring instead to do quick day jobs for which they are paid immediately so that they can purchase drugs. Alternatively, some of them have become involved in criminal activities, getting involved in the criminal justice system, reducing even further their opportunities to engage themselves in the formal economic activities of the country.

In some cases, they become unemployable – having no work ethics, no sense of responsibility to the job and no loyalty to the company or organisation and getting involved in petty thieving at every opportunity.



**Table 25: Number of Children Seen in Drug Rehabilitation and Yearly Growth Rates (Expressed in Percentage in Brackets).**

Age Group	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	TOTAL
0 - 14	6	0	8 (33)	0	9 (13)	0	2 (-78)	3 (300)	25 (1150)	4 (33)	77
15-19	9	3	5 (-44)	1 (-66)	21 (320)	2 (100)	51 (143)	5 (150)	45 (-12)	5 (0)	147
<b>Total</b>	15	3	13 (-13)	1 (-67)	30 (130)	2 (100)	73 (143)	8 (300)	70 (-4)	9 (13)	224

**Source: MDG Status Report 2010**

The data from Centre Mont Royal show that male youth are having more psychological problems than females. Boys are more than 10 times as likely as girls to be seeking treatment for using illegal drugs, such as cannabis and heroin. It is important to note that the emphasis is on treatment rather than on actual prevalence in the general population, as it is treatment data from the rehabilitation centre, Centre Mont Royal which have been used for this analysis.

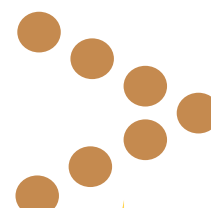
At a population level, data from the GSHS were used to examine the associations between substance use (cigarette smoking, alcohol drinking, and cannabis use) and psychosocial characteristics at the individual and family levels among adolescents of the Seychelles Alwan et al (2011). The results are presented in Table 26.



**Table 26: Stepwise multivariate association between risk behaviours and psychosocial characteristics in boys and in girls**

Variable	Boys				Girls			
	Alcohol use		Cannabis use		Alcohol use		Cannabis use	
	Odds Ratio	P	Odds Ratio	P	Odds Ratio	P	Odds Ratio	P
Age (year)	1.2	0.003	1.2	Ns	1.4	0	0.8	Ns
Felt sad or hopeless $\geq$ 2 weeks in a row in past 12 months	-		-		1.6	0.023	-	
Often felt lonely in past 12 months	-		-		-		-	
Was so worried about something that could not sleep at night in past 12 months	-		3.6	0.001	-		-	
Seriously considered attempting suicide in past 12 months	-		2.7	0.002	1.8	0.051	-	
Parents rarely/never understand problems	-		-		-		-	
Parents rarely/never check homework	-		-		2.3	0	-	
Parents rarely/never know what child is doing	1.5	0.046	1.9	0.02	-		-	
Pocket money $\geq$ 25 rupees per day	-		-		-		-	
School absence without permission $\geq$ 1 day in past 30 days	2.3	0	2.5	0.001	2.6	0	33.2	0
Intraclass correlation	0		0		0.08		0.26	
Sample size	429		515		551		624	

Source Alwan et al (2011)

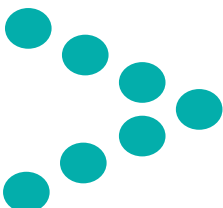


The gender difference may be partly attributed to socio-cultural norms that tend to stigmatize girls who engage in substance use and/or to larger innate risk taking by males than females. We found that sadness, loneliness, insomnia due to worrying, and suicidal ideation were associated with poor parenting practices. Among girls, "parents not checking their children's homework" was also associated with substance use. A consistent association between substance use and "parental understanding of adolescents problems" is reported in this study. Overall, while parental support and good parent-child communication seem to protect children against substance use, parental monitoring (i.e., parents knowing the whereabouts of their child and checking their child's homework) seemed to be the strongest protective characteristic against these risk behaviours.

We also found that the substance use was associated with pocket money, truancy, and having less than two friends. In our study, pocket money was the closest available indicator of socioeconomic status. In line with previous studies, we found that adolescents who had more pocket money than their peers tended to engage more often in the considered risk behaviours. This may relate to increased purchasing power, self-efficacy, independence, and means to interact socially.

Truancy (as measured by missing school without permission) was strongly associated with all three risk behaviours. This association was particularly strong among girls regarding cannabis use (OR = 33, 95% CI: 6.9-160.6), although this finding is based on few cases. While truancy may merely be a marker of other personal risk behaviours and/or underlie an unstable family environment, this characteristic may also reflect increased opportunities to engage in substance use during the unsupervised time out of school. We previously found, in another study among children in Seychelles, that students who were absent from school during a school survey engaged more often in substance use than those present.

Having less than two close friends generally increased the likelihood of substance use. In other studies, the association between popularity among peers and substance use in adolescents has been inconsistent. While some reports show that 'popular' teenagers tend to have higher rates of risk-taking behaviours (possibly because a larger social network can increase the opportunities for engaging in risk behaviours), other studies suggest that being popular actually protects against adopting risk behaviours. These findings seem consistent with our observation that loneliness increases substance use, suggesting that social isolation may be a source of stress and boredom, and can lead to increased risk behaviours.



## 6.2 Mental Health

Mental health, namely, depression, anxiety, stress, isolation, and hostility are among the psychological and emotional factors that are common in Seychelles and they can potentially increase risk of cardiovascular disease. The leading diagnosed mental health problems in Seychelles are mental and behaviour disorders due to other substance (drugs) and alcohol uses, and schizophrenia and delusional disorders. In 2008, male discharges were at 71.7% as compared to women at 28.3%. The main causes of male discharges was due to mental and behavioural disorders which accounted for 32.2% whilst the main cause of women discharges was due to schizophrenia and delusional disorders which accounted for 30% of their discharge.

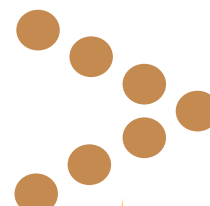
## Chapter VII: Health Systems, Policy and Financing

Health systems and policies are important determinants of health because they influence the type and quality of health care available to a population. Health care financing and provision strategies shape the patterns of health care access, use and experience of care, influencing its potential to intervene in the translation of differential exposure and vulnerability into health inequity. Health care features also influence the differential consequences resulting from health care use and ill health. Through both pathways health care can feed back into social stratification.

### 7.1 Health Systems

The importance of health care access to health care equity is well established. It can be defined as the 'degree of fit' between clients/patients and health care provision (Pechansky and Thomas 1981), emphasizing the combined influence of supply and demand side factors over the extent of access achieved by any health system (Thiede et al. 2007). The three main dimensions of access are:

- availability, covering factors such as geographical location, transportation availability, as well as organisational factors such as opening hours or waiting time to appointment;
- affordability, combining concern for the costs of seeking care, households' ability to manage these costs and their impacts on household livelihoods; and
- acceptability, that is, the social and cultural distance between health care systems and their users, encompassing the fit between lay and professional health beliefs, patient-provider engagement and dialogue and the influence of health care organisational arrangements on patient responses to services (Gilson 2007a).



These access dimensions affect who uses and benefits from health care, and, together with the quality of service provision (Dahlgren and Whitehead 2007; Peabody et al. 2006), the impact of health care on health equity. Empirical evidence demonstrates that availability and affordability commonly influence whether and which population groups use health care, as well as when groups seek care in an illness episode, with implications for illness severity and treatment effectiveness (Dahlgren and Whitehead 2007; Dixon et al. 2003; Hausmann-Muela et al. 2003; Palmer 2007; Shaikh and Hatcher 2004). Acceptability also influences opportunities for effective diagnosis and treatment, patient adherence with advice or treatment, and self-reported health status (Gilson 2007; Wallerstein 2006).

The level of fees charged to patients influences both access and whether or not health care offers financial protection against the cost burdens of ill-health. In Seychelles, user fees for all health care are covered by the state and hence this factor should not cause differential access. Client satisfaction with health services in the Seychelles are presented below.

**Table 27: Components of Client Satisfaction at the Point of Delivery**

Service Staff		Support Staff	
Reception	4.1	Reception	3.4
Helpfulness	4.2	Phone	2.9
Waiting Time	3.9	Helpfulness	3.3
Information and Response	4.2	Professionalism	3.3
Respect	4.3	Personal Manner	3.5
Confidentiality	4.3	<b>Overall Rating</b>	<b>3.4</b>
<b>Overall Rating</b>	<b>4.3</b>		

**Data from Client Satisfaction Survey (2006)**

The results show high satisfaction with the services provided by health care workers in the facilities. However support staff likes transportation and house-keeping received lower scores.



## 7.2 Health Policy

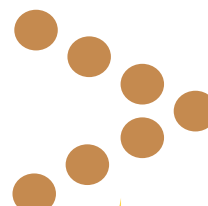
Parliament as the policy-making is key institution for addressing social determinants of health (SDH) for the promotion of health equity through its multiple functions of representation, oversight and legislation on behalf of their constituents. The legislative function of parliament entails the enactment of laws that provide for the interests of all people in the country. The Health Strategic Framework (2006–2016) is based on the principles on the “Right to Health Care: Health for All and Health by All,” inscribed in the Seychelles Constitution and the Health Policy Declarations of the Government of Seychelles.

The development of health over the past two decades has followed the Primary Health Care (PHC) approach. Within 30 years Seychelles has developed its physical health infrastructure and enhanced its human resource capacity in a very efficient way using the PHC principles. Equity is the fundamental principle in the financing and organization of the healthcare system in Seychelles.

However, Seychelles does not have an integrated or topic-specific policy/programme/action plan which is currently operational for non-communicable diseases and the related risk factors. There are other policies related to NCDs which have been operations and are showing positive effect. As discussed earlier, the Tobacco Control Act has started to yield significant reductions in smoking prevalence. A National School Nutrition Policy has been adopted and includes a ban on sugar-sweetened soft drinks in schools and it restricts the sale of other foods of low nutritional value.

## 7.3 Health Financing

Public spending on health as a percent of government expenditure was estimated at 11% in 2009. This was an increase from the 8.4% reported in 1995, however, it is below the Abuja target of allocating at least 15% of total government expenditure to health provision.



**Table 28: Expenditure on Health by Sources**

Year	Total expenditure on health as a percentage of gross domestic product	General government expenditure on health as a percentage of total expenditure on health	Private expenditure on health as a percentage of total expenditure on health	General government expenditure on health as a percentage of total government expenditure	External resources for health as a percentage of total expenditure on health	Social security expenditure on health as a percentage of general government expenditure on health	Out-of-pocket expenditure as a percentage of private expenditure on health	Private prepaid plans as a percentage of private expenditure on health
2010	3.40	91.87	8.13	9.11	4.16	1.18	67.70	22.96
2009	3.29	92.72	7.28	9.03	6.23	1.19	67.70	22.96
2008	3.33	92.49	7.51	7.71	2.07	1.68	69.27	25.53
2007	3.45	92.06	7.94	7.72	2.97	2.24	70.12	24.83
2006	3.99	93.42	6.58	7.79	3.69	2.62	81.13	15.68
2005	4.16	93.20	6.80	8.95	2.96	2.98	96.75	
2004	5.14	91.97	8.03	10.22	3.23	3.32	97.79	
2003	4.80	89.90	10.10	12.17	3.73	3.96	98.25	
2002	4.38	87.14	12.86	6.77	4.37	4.79	98.50	
2001	4.64	85.14	14.86	8.33	4.33	4.86	98.69	
2000	4.82	82.70	17.30	7.29	4.31	5.00	98.96	
1999	5.29	84.00	16.00	7.77	4.14	4.73	98.94	
1998	5.23	84.24	15.76	7.50	2.09	4.96	98.94	
1997	5.85	86.25	13.75	8.49	0.00	4.39	98.94	
1996	5.34	87.61	12.39	7.82	1.87	4.76	98.94	
1995	5.19	85.15	14.85	8.38	0.93	4.44	98.94	

**Source: World Health Observatory Data Repository**



The government has a strong commitment to the provision of health services, as evidenced by the provision of the highest government sectoral allocation to the health sector. This allocation amounted to 10.3% and 10.5% of the GDP in 2004 and 2006 respectively.

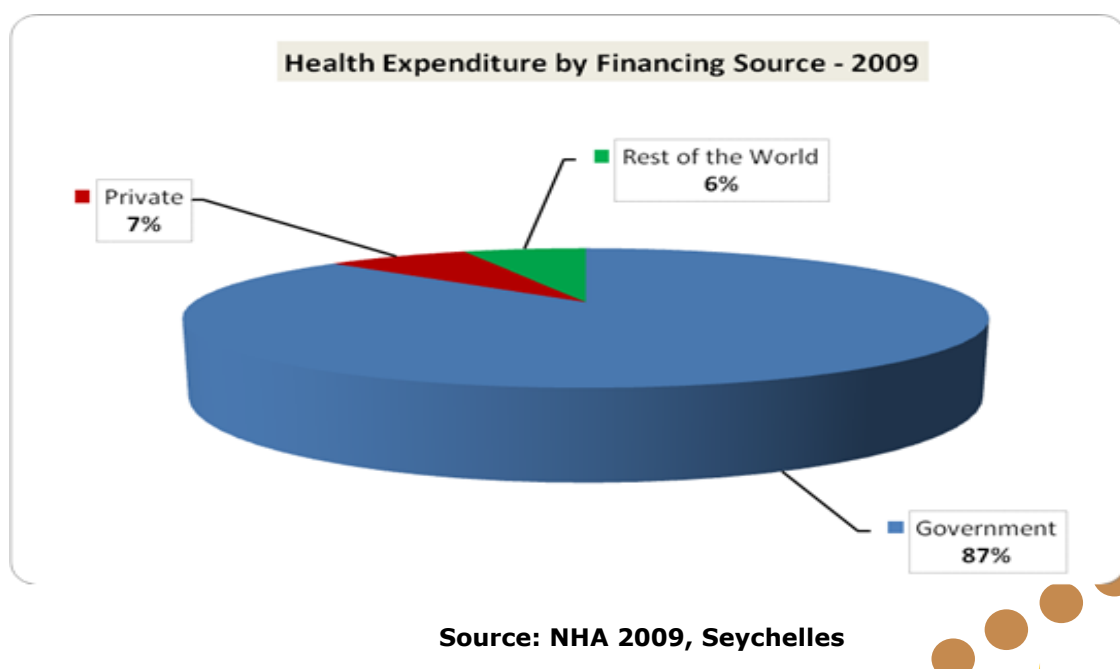
#### 7.4 Out of Pocket Expenditure

Private expenditure on health varied between 16.2% and 25.8% between 1995 and 2009 while government spending was between 75.3% and 84.7% in the same period. Government expenditure on health decreased from 84.7% in 2006 to 76.8% in 2009.

In 2000, Out-of-Pocket payments accounted for 16% of total expenditure on health and were higher than the 15% cut off mark, the threshold for the occurrence of catastrophic expenditure. After 2000, the Out-of-Pocket payment percentage dropped to below 15%, implying that the likelihood of catastrophic expenditure may have decreased significantly, as a result of increasing government allocation and donor funding.

The latest estimates for Out-of-Pocket expenditure have been extrapolated to 2009: extrapolation was made based on data collected for daily expenses recorded in the diaries, and on the main questionnaire of the households canvassed during the Household Expenditure Survey of 2006/2007. The survey was conducted by the National Statistics Bureau. Data collected during all periods were then converted to yearly estimates at household level. The results are presented in Figure 21.

**Figure 19: Health Expenditure by Source**



The current estimates show that private funds which constitute out of pocket expenditure on health constitute only 7 percent. Thus, Seychelles is well below the threshold of catastrophic health expenditure of 15 percent. Table 27 gives a breakdown of the out of pocket expenditure by type.

**Table 29: Out of Pocket Expenditure by Type - 2009**

Type	Out of Pocket Expenditure (SCR)	Percentage (%)
Overseas treatment	5,698,220	31.1
Private doctors	4,663,913	25.4
Dental care (private)	1,204,670	6.6
Medicines and appliances (private)	6,780,452	37.0
<b>Total out-of-pocket</b>	<b>18,347,256</b>	<b>100.0</b>

Source: NHA data, Seychelles 2009

Of the total OOP expenditure of SCR 18,347,256, 37 percent was spent on pharmaceuticals and appliances, 31 percent on overseas treatment, 25 percent on private doctors and 7 percent on dental care. From the pattern of spending, it can be seen that most of the people who spend on health care out of their pockets are likely to be the rich people who can afford these expenditures. Thus, if this spending is mostly from high class households, then out of pocket health expenditure will have very little catastrophic effect, that is, the effect on poor households will be very minimal. Again these figures raise couple of important issues: first, households are paying substantial amount for overseas treatments; second, given the fact that health services are free at the point of use in all public health facilities, it will be important to understand the spending on private doctors.

## CHAPTER VIII: Review of National and Global Responses to NCDs

Seychelles has made significant progress in addressing its health issues. These responses are showing results. However, in order to assess what needs to be done and what changes the current strategies, there is a need to review the current strategies and interventions. In this section, we review the current approaches.



## 8.1 National Responses to Non-Communicable Diseases

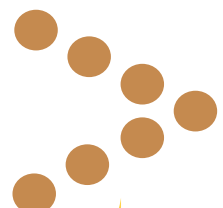
In response to the growing issues surrounding non-communicable diseases, the Government of Seychelles established Unit of Prevention and Control of Cardiovascular Disease within the Ministry of Health.. Also, various interventions by the Ministry of Health at legislative, policy, health-service management, and community levels to prevent and control non-communicable diseases have been implemented but with varying degrees of success.

The Seychelles became a part to the WHO Framework Convention on Tobacco Control on November 12, 2003. It was the first country in the African region to ratify the treaty. Consistent with the treaty's obligations, Seychelles set up a National Committee for Tobacco Control in 2000 to prepare comprehensive tobacco control legislation. A Tobacco Control Bill, which has been commended by the WHO for its comprehensiveness, was adopted by the National Assembly on June 16 2009 and came into force on August 28 2009.

The main provisions of the Seychelles Tobacco Control Act are:

- A total ban on smoking in enclosed public places, workplaces and public transport;
- A total ban on direct and indirect tobacco advertising, promotion and sponsorship;
- Rules for the display of health warnings on tobacco packets;
- A ban on sales by and to minors;
- Rules for business reporting;
- Measures against illicit trade in tobacco products;
- Setting up a National Tobacco Control Board.

Seychelles has been hailed as a global leader in development and implementation of appropriate legislation for tobacco control. The Seychelles Tobacco Control Act (2009) has created one of the most effective policies of this type worldwide. The Act protects children and adolescents by banning advertising and assures the rights of non-smokers to a smoke-free environment. In addition, tax on tobacco increases every year as part of the policy for reducing use thereof. Seychelles is one of the few countries that have additional information regarding smoking on the Cancer Registry, enabling the attributable burden of tobacco over time to be monitored. Thus, data from the Cancer Registry can be used to effectively show the link between certain types of cancers and smoking.



Although it is too early to assess the impact of Tobacco Control Act on mortality, assessments which have been done on compliance show great success. The study by Viswanathan (2011) shows high compliance in the hospitality industries as there are strict enforcements in the venues. However, compliance on selling of tobacco products to youth seems to be low. A study by Viswanathan (2008) showed that among current smokers, 23.4% usually bought their cigarettes in a store, with the rate for boys (34.3%) significantly higher than for girls (10.8%). Of those current smokers who bought cigarettes in a store, 77.1% had not been refused purchase because of their age in the month prior to the survey.

However, prior to the enactment of the Tobacco Control Act, several interventions have been undertaken, which include health education programmes, policy prohibiting all tobacco advertising and smoking in health and education premises, high tax on tobacco products and a programme for smoking cessation. It can be hypothesised that the apparent stabilisation or decrease in the death rates of the number of smoking-related cardiovascular and respiratory diseases could be an early sign of the effectiveness of the interventions, while the decrease in the incidence of lung cancer could be consistent with an increase in quitting rates among current smokers.

Control of alcohol use through legislation has had little effect in reducing the rate of alcohol abuse. The Licenses Act 1998 was formulated mainly to reduce the socioeconomic effect of alcohol abuse in Seychelles, to promote the development of a responsible and sustainable liquor industry, and to prohibit advertising of alcohol to children. Alcoholic beverages are heavily priced through taxes that increase every year. A report by WHO (2004) has shown that Seychelles the beer-cola ratio is 3.58, wine-cola ratio 16.94 and spirits-cola ratio 12.78. Other control measures include restricted trading hours and an age limit of 18 years for legal purchasing of alcoholic beverages.

In collaboration with the University Institute of Preventive Medicine of Lausanne in Switzerland, The ministry of Health has introduced population-based and individual-based interventions: The population based interventions include (Bovet, 2002):

- Sustained mass media campaigns, largely through the radio and one channel national television. Healthy lifestyles are promoted, including the need to abstain from smoking, to adopt healthy dietary patterns and to practice physical activity regularly. In this tropical small island state, the campaign also largely stresses the benefits of locally available products such as fish and tropical fruits and vegetables.



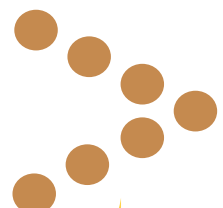
- High profile events are organized every year for World No Tobacco Day, Diabetes Day and Heart Day. These internationally sponsored events are favourably received by the mass media, which permits to produce a wide range of health education programs inexpensively.
- A national committee on tobacco control has been set up and is working towards the development of a national tobacco control program including appropriate legislation.
- National policies for healthy nutrition and for physical activity for all are being developed.
- Training programs aim at updating health professionals on the need and means for CVD prevention and health promotion.

Various activities also focus on persons at high risk:

- Screening programs in work places and public places permit to detect persons with high blood pressure and with diabetes. Proper counselling and health talks are subsequently administered to promote healthy lifestyles. This also provides opportunities to discuss with workplaces' managements concrete options for improving the working environment and to enable workers to adopt healthier lifestyles.
- Routine screening for overweight and high blood pressure among children provide credence and support to the integration of health education programs within the normal school curriculum.
- A 'Heart Health Club' program is held regularly in many health centres throughout the country. These clubs gather a dozen of patients with hypertension and/or diabetes over an afternoon to provide them with in-depth information on CVD, the need to adopt healthy lifestyles and to comply with prescribed treatment.
- Standards are being set for the clinical management of the main CVD, including the development of locally sound guidelines for the diagnosis and treatment of hypertension, diabetes and blood lipid disorders.

## 8.2 Global Responses to NCDs

The World Health Organization, which Seychelles is a member state, has set up a Technical Working Group on Non-communicable Disease Targets and they have drafted the following recommendations to radically reduce NCDs through a set of



time-bound and evaluable commitments. Seychelles can adopt the targets below or prepare its own as was done by South Africa to set its own using its own home-specific situation. It should be noted that the technical team was guided by available evidence in designing the targets.

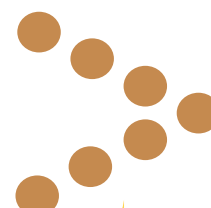
**Table 30: Targets for achievements for NCDs by 2025**

<b>Outcome targets</b>	<b>Indicators</b>	<b>Data Sources</b>
<b>Premature mortality from NCDs</b> 25% relative reduction in overall mortality from cardiovascular disease, cancer diabetes, and chronic respiratory disease	Probability of dying between ages of 30-70 from, cardiovascular disease, cancer, diabetes and chronic respiratory disease	Civil registration system, with medical certification of cause of death, or survey with verbal autopsy
<b>Diabetes</b> 10% relative reduction in prevalence of diabetes	Prevalence of diabetes among persons aged 25+ years	Survey (with measurement)
<b>Tobacco smoking</b> 40% relative reduction in prevalence of current daily tobacco smoking	Prevalence of current daily tobacco smoking among persons aged 15+ years	survey
<b>Alcohol</b> 10% relative reduction in per capita consumption of alcohol; and 10% relative reduction in prevalence of heavy episodic drinking	Per capita consumption of pure litres of alcohol among persons aged 15+ years; and prevalence of heavy episodic drinking among persons aged 15+ years	Official statistics and reporting systems for production, import, export, and sales or taxation data; and survey
<b>Dietary salt intake</b> Reduction of mean population intake of salt to < than 5 grams per day	Mean population intake of salt per day	Survey (with measurement)
<b>Blood pressure/ Hypertension</b> 25% relative reduction in prevalence of raised blood pressure	Prevalence of raised blood pressure among persons aged 25+ years	Survey (with measurement)
<b>Health system targets</b>		
<b>Prevention of heart attack and stroke in primary care</b> 80% coverage of multidrug therapy for people aged 30+ years with a 10 year risk of heart attack or stroke ≥ 30%,m or existing cardiovascular disease	Multidrug therapy of people aged 30+ years with 10 year risk of heart attack or stroke ≥ 30%, or existing cardiovascular disease	Survey, health facility data

<p><b>Cancer prevention in primary care</b> Cancer prevention and early detection scaled up to achieve: 70% of women between ages 30-49 screened for cervical cancer at least once; 25% increase in proportion of breast cancers diagnosed in early stages; &lt;1% prevalence of Haig carriers among children aged ≤ 5 years (a risk factor for liver cancer)</p>	<p>Prevalence of women between ages 30-49 screened for cervical cancer at least once; Proportion of breast cancers diagnosed in early stages (I &amp; II); Prevalence of HBsAG carriers among children aged ≤5 years</p>	<p>Survey (with measurement); health facility data; population based on cancer registry</p>
<p><b>Policy approaches to dietary risk reduction</b> Total elimination of partially hydrogenated vegetable oil (PHVO) from the food supply by 2020; and no marketing of food high in saturated fats, trans fatty acids, free sugars, or salt to children</p>	<p>Policies that eliminate PHVO in food, and policies with enforcement mechanisms that restrict marketing foods high in saturated fats, trans- fatty acids, free sugars, or salt to children</p>	<p>Policy review</p>

### 8.3 Tackling Risk Factors for Non-Communicable Diseases in Seychelles

The World Health Organization introduced interventions that have been identified as cost effective at the population level. These are presented in Table 31 and are based on the 'best buy' concept that is defined as intervention for which there is compelling evidence that is not only highly cost-effective but also feasible, low-cost and appropriate to implement within the constraints of the local health system.



**Table 31: Cost-Effective Interventions for Non-Communicable Diseases**

	Disease/Risk Factor	Intervention	Cost of Intervention (low=<\$1) (High=>\$2)	Health Impact DALYs per 1m popn) (Small=<100) (Large=>1,000)	Cost Effectiveness (\$ per DALY averted)	
<b>Risk factors</b>	Tobacco use	Exercise duty on tobacco products	Low	Large	Very Cost-Effective	
		Smoke-free workplaces	Low	Modest	Quite Cost Effective	
		Packaging, labelling and awareness countermeasures	Low	Modest	Very Cost Effective	
	Harmful use of alcohol	Comprehensive advertisement bans	Low	Modest	Very Cost Effective	
		Exercise duty on alcohol beverages	Low	Modest	Very Cost Effective	
	Unhealthy diets and physical inactivity	Reduce salt intake	Low	Large	Very Cost Effective	
		Food taxes (fats) and subsidies (fruit and vegetables)	Low	Modest	Very Cost Effective	
		Physician counselling	High	Large	Very Cost Effective	
	<b>Non-communicable diseases</b>	Diabetes	Glycemia control	High	Large	Quite Cost Effective
		Cardiovascular diseases	Hypertension drug treatment	Low	Large	Quite Cost Effective
Treatment 1st stage breast cancer			Low	Modest	Very Cost Effective	
Cancer		Cervical cancer screening (PAP smear) and treatment	Low	Modest	Very Cost Effective	
		Inhaled corticoid steroids for asthma	Low	Small	Very Cost Effective	



In Seychelles, Bovet (2012) mention population-wide interventions to promote healthy diet, physical activity, healthy environment and no smoking or alcohol abuse. These measures have proved to be the most effective and are recommended in this document. They include:

- Strengthen tobacco control, particularly among young people and decrease passive smoke exposure of children in the home.
- Support smoke-quitting programmes.
- Promote healthy eating patterns that are low in fat and sugar and high in fruit and vegetables, in part, by addressing access, through intersectoral programmes involving the agricultural sector.
- Reduce salt in foods.
- Reduce trans-fat in foods.
- Restrict access to alcohol (through addressing physical availability and pricing) and extend alcohol control legislation (particularly in the areas of alcohol marketing, and drinking and driving).
- Promote physical activity at schools and workplaces, and through urban planning for active commuting and access to safe public green space.
- Reduce exposure to biomass pollutants through electrification of households.
- Control air pollution, including review of and enforcing legislation related to polluted places of work.
- Media and communication strategies to prevent NCDs.

It is imperative that urgent steps be taken to implement these interventions. However, at the same time, efforts to reduce inequalities in income, employment and educational achievement have an important role to play in averting the NCD epidemic.

## **CHAPTER IX: Discussion and Recommendations**

### **9.1 Discussion**

The important thing is to determine whether there has been a definitive break in the growing trend in favour of females and whether in the future the life expectancies of the two sexes may be expected to converge or whether there may at least be a stabilization of the existing gap. The answer to this question depends on the origin of



the differences in mortality by gender and the explanations are biological, medical, social, cultural and environmental. Greater success now than in the past in combating the causes of male deaths, together with the advances in gender equality, which also imply sharing the stresses of modern life, may well lead to greater gender equity as far as mortality risks are concerned.

Overall, these results suggest that the Seychelles is moving away from a pattern of higher NCD burdens in richer people, which may be typical of many developing countries, to one in which these are higher in poorer and more disadvantaged people. This second pattern is one that is common in developed countries. However, the smoking and drinking trends exhibited by the current youths indicate higher burden of non-communicable diseases in the future if the prevailing levels are not reduced.

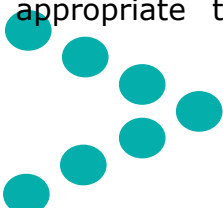
## **9.2 Recommendations**

The report has clearly demonstrated that the health of people of Seychelles is not determined by biological and genetic factors only but also by gender-based behaviour, socio-economic status, income levels, education and social support systems. Thus, the responsibilities to address the social determinants of health in Seychelles lie in all sectors although the health sector has an important role in leading and supporting intersectoral collaboration and community actions to improve population health and well-being.

In making recommendations in this report, we take cognisance of the fact that a National Strategic Plan on Non-Communicable Diseases is already underway and hence the results from this report will help in guiding this process. The recommendations from this report will thus be operationalized in the strategic plan and a plan of action developed which specifically outlines the activities to be undertaken, the allocation of responsibilities for implementation and the monitoring and evaluation framework. This report will also provide the context on which the National Strategic Plan on NCDs will be developed.

### **Recommendation 1: Best Buys Approach forms the Basis of the National Strategic Plan on Non-Communicable Diseases.**

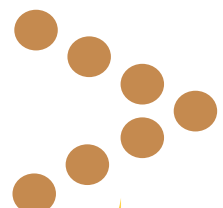
These are a set of evidence-based interventions which are both cost-effective and feasible. The suite of best buys identified by World Health Organisation is presented in Table 31. Best buys are defined as an intervention for which there is compelling evidence that is not only highly cost-effective but is also feasible, low-cost and appropriate to implement within the constraints of the local health system.



Estimating the costs of implementing the package of best buys for Seychelles is a crucial next step. Such calculations need to take into account population estimates, numbers at risk, demographic and socio-economic factors, infrastructure and the structure and capacity of health systems. Thus, the National Strategic Plan on NCDs should go through a rigorous and evidence-based identification of the best buys. The assessment should consider four key criteria: i) health impact; ii) cost-effectiveness; iii) cost of implementation; and iv) feasibility of scale-up. In addition, because of the availability of good quality longitudinal data, Seychelles can provide adequate settings for monitoring and evaluating the impact of implementing the best buys.

## **Recommendation 2: Ministry of Health Plays a Crucial Role in Leadership and Advocacy**

- Raising awareness of the social determinants of health by:
  - ◇ Disaggregated data by major stratifiers need to be collected in order to monitor future trends in health inequality. Also, data which are collected at the health facilities need to be computerized.
  - ◇ One monitoring system for NCDs has to be developed, starting with linking all the data on individuals and households with demographic, socio-economic and health factors. In this context, the Ministry of Health needs to invest in a strong Health Management Information System (HMIS)
  - ◇ monitoring and reporting of health determining social, economic and environmental conditions and trends and the reach of health services activities in terms of equity issues.
  - ◇ Promoting awareness of the Social Determinants of Health Support Package and key areas of action to planners, managers and policy makers. Advocating for health promoting policies and programs in non-health sectors (eg. health promoting schools, child care centres and workplaces).
  
- Coordinating health planning activities
  - ◇ Engaging communities and partners in planning, implementing and evaluating initiatives to address health determinants which have.
  - ◇ Using public health planning (or community health planning) to coordinate efforts within health services and with other agencies and sectors at the local level.



- Extending health impact assessment functions
  - ◇ Extending the application of health impact assessment to include a focus on the social determinants of health and to assess the health impacts of policies and programs.
- Strengthening community and intersectoral action
  - ◇ Working through district task force to enhance and integrate existing services and structures.
  - ◇ Developing, implementing and evaluating programs which build social capital, people's sense of control and resilience.
  - ◇ Protective factors
- Developing organisational capacity
  - ◇ Providing resources to support integration of services and activities.
  - ◇ Building workforce capacity including developing skills and methods in addressing the social determinants of health.
  - ◇ Continuing research to further develop our understanding of the causal pathways and intervention points

### **Recommendation 3: Health in all Policies (HiAP)**

HiAP highlights the important links between health and broader economic and social goals in modern societies, and it positions improvements in population health and reductions in health inequities as high priority, complex problems that demand an integrated policy response across all sectors. This strategy considers the effects of policies on social determinants as well as the beneficial impact of improvements in health on the goals of other sectors. Implementing HiAP approach would require activating and fully involving non-health sector leaders through the formation of intersectoral partnerships. The building blocks essential for HiAP are:

- Strong alliances and partnerships with mutual interests and shared targets and accountability
- Whole-of-government commitment by engaging the head of government, cabinet, and, or, parliament, and administration leadership



- High-level policy processes
- Consultative approaches for stakeholder advocacy and endorsement
- Pool intellectual resources, integrating research and sharing field experience
- Feedback mechanisms - evaluate & monitor at the highest level
- Allowing experimentation and innovation for new governance models integrating social, economic and environmental goals.

The work should start by evaluating all the existing policies on how they have integrated health and how such activities are being implemented. For example, Seychelles has an excellent School Nutrition Policy, so there is need to see how schools are enforcing the policy.

#### **Recommendation 4: Tackle the Inequitable Distribution of Power, Money, and Resources**

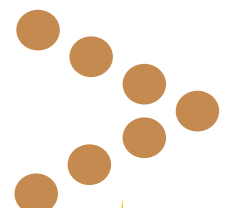
Although health services are free in Seychelles, there is a need to reinforce the primary role of the state in the provision of basic services essential to health and the regulation of goods and services with a major impact on health (such as tobacco, alcohol, drugs and food). Pricing policies to increase healthy food choices should be considered and there is need to engage the economic and commercial sectors. Examples can be drawn from other countries where taxes derived from tobacco and alcohol sales are channelled towards the health sector.

#### **Recommendation 5: Addressing Structural Determinants**

There is growing recognition that globalization is affecting all facets of life including health. Policymakers and health professionals need to be aware that the global economy affects the health of populations and understand how risks associated with trade liberalization can be mitigated.

#### **Recommendation 6: Constituting a Coordination Mechanism**

Addressing the SDH requires assigning a multi-disciplinary team that will be set for managing the activities and coordinating the support of and to other sectors. Studies indicate that inter-sectoral cooperation and coordination is a key strategy that enables a significant gain in improving population health status as the multiple causes of health and illness i.e., the social and economic determinants of health lies outside the control of health sector. The health sector alone cannot achieve a



significant and lasting change in the health of the population of Seychelles. Hence coordinating of health related activities at different sectoral (ministerial) level, under the lead of the assigned body or committee will help to effectively and efficiently tackling the SDH. This body will strengthen the inter-organizational cooperation and coordination that involve joint planning on all health related issues, and more importantly, doing so helps to illuminate duplication of activities and service gaps in population health needs. In turn, the committee will have focal persons in all private and public sectors. The focal persons will be responsible for the following activities:

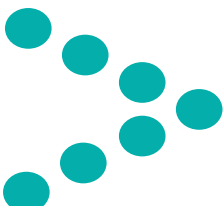
- Rising awareness about SDH
- Strengthening community action
- Advocate for tackling the SDH in national development plans.
- Review the programs in each sector activity that are tailored to address the social and economic factors in line with the core objectives of the sector.
- Promote cooperation of among stakeholders.
- Recommend on technical and policy issues to sector or donor.
- Regular reports to Ministry of Health

**Recommendation 7:** Identification of the Contribution of Each Sector to the Social Determinants of Health

Important public and private sectors will be identified which have relevance to the implementation of the National Strategic Plan on NCDs. These sectors will be engaged in the Plan of Action as they will play an important role in implementing the activities.

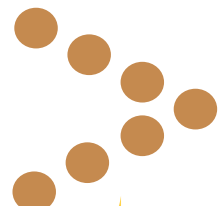
**Recommendation 8:** Media Plays an Important Advocacy Role

The media will play a crucial role in highlighting people who are excluded from the main health care system. Also, media can be used to spread the interventions which will be outlined in the Strategic Plan.



## REFERENCES

- Addo J, Smeeth L, Leon DA. Hypertension in sub-Saharan Africa. A systematic review. *Hypertension*. 2007; 50: 1012–1018
- Adebamowo CA, Adekunle OO: Case-controlled study of the epidemiological risk factors for breast cancer in Nigeria. *Br J Surg* 1999, 86:665-668
- Alwan H, et al. (2009) Association between weight perception and socioeconomic status among adults in the Seychelles. *BMC Public Health* 2010, 10:467.
- Arriaga E.E. (1984). Measuring and explaining the change in life expectancies. *Demography*, 21, 83-96.
- Aubert L., et al. Knowledge, attitudes and practices on hypertension in a country in epidemiologic transition. *Hypertension*. 1998; 31: 1136-45
- Baum, F. (2007) Cracking the Nut of Health Equity: top down and bottom up pressure for action on the social determinants of health, *IUHPE Promotion and Education*, Vol XIV (2) [available on the WHO CSDH website]: [www.who.int/social\\_determinants/](http://www.who.int/social_determinants/)
- Bergstrom A, et al., Overweight as an avoidable cause of cancer in Europe, *Int J Cancer*, 2001;91(3):421–30.
- Blouin C, Chopra M, van der Hoeven R. Trade and social determinants of health. *Lancet*. 2009 published online Jan 22.
- Bovet P., et al (1991). High prevalence of cardiovascular risk factors in the Seychelles (Indian Ocean). *Arterioscl Thrombos* 1991; 11:1730-1736 (open access) <http://atvb.ahajournals.org/cgi/reprint/11/6/1730>
- Bovet P., Shamlaye H., Paccaud F. *Epidemiology and prevention of cardiovascular disease in the Seychelles islands* . CVD Prevention (Futura Publishing). 1999; 2: 261-72.
- Bovet P. Tackling cardiovascular disease in the Seychelles: prevention is better than cure. *Insights Health* (ID21, UK). 2001(Mar): 3-4.
- Bovet P., et al. Marked increase in the prevalence of obesity in children of the Seychelles (Indian Ocean), 1998-2004. *Int J Ped Obes*. 2006; 2: 120-8.



Bovet P., et al. Decreasing stroke and myocardial infarction mortality in a country of the African region. *Circulation* 2007; 38; 535 [abstract].

Bovet P., et al. Prevalence of overweight in Seychelles: 15-year trends and association with socio-economic status. *Obes Rev.* 2008; 9: 511-17.

Bovet P., et al. Divergent 15-year trends in traditional and metabolic risk factors of cardiovascular diseases in the Seychelles. *Cardiovasc Diab.* 2009; 8: 34.

Bovet P, et al. (2012) Association between obesity indices and cardiovascular risk factors in late adolescence in the Seychelles. *BMC Pediatrics* 2012, 12:176 doi:10.1186/1471-2431-12-176

Bovet P, Paccaud F. Cardiovascular disease and the changing face of global public health: a focus on low and middle income countries. *Public Health Reviews.* 2012;397-415.

Cardoso I, et al. (2012) Nutrition transition in a middle-income country: 22-year trends in the Seychelles. *European Journal of Clinical Nutrition* , (19 December 2012) | doi:10.1038/ejcn.2012.199

Dahlgren G, Whitehead M 1991. Policies and Strategies to Promote Social Equity in Health. Stockholm, Institute of Futures Studies. Department for Education and Skills 2004. Five Year Strategy for Children and Learners

Chiolero A. , et al. Discordant trends in high blood pressure and obesity in children and adolescents: a school-based study in a rapidly developing country. *Circulation* 2009; 119: 558-5.

Danon-Hersch N., et al. Decreasing relationship between body mass index and blood pressure over time. *Epidemiology.* 2007; 18: 493-500.

Dixon, A., et al. (2003). Is the NHS equitable? A review of the evidence. London School of Economics Health and Social Care Discussion Paper Number 11. London: London School of Economics and Political Science.

Ebrahim S, et al. Globalization of behavioral risks needs faster diffusion of interventions. *Prev Chronic Dis* [serial online] 2007 Apr [date cited]. Available from: [http://www.cdc.gov/pcd/issues/2007/apr/06\\_0099.htm](http://www.cdc.gov/pcd/issues/2007/apr/06_0099.htm).





Evans T, Brown H (2003) Road traffic crashes: operationalizing equity in the context of health sector reform. *Injury Control and Safety Promotion* 10: 11–12.

Faeh D., et al. Clustering in smoking, alcohol drinking and cannabis use in adolescents in a rapidly developing country. *BMC Public Health*. 2006; 6: 169(e).

Faeh D, et al. Prevalence, awareness and control of diabetes in the Seychelles and relationship with excess body weight (2007). *BMC Public Health* 2007; 7:163 (open access) <http://www.biomedcentral.com/1471-2458/7/163>

Kakwani Nc, Wagstaff A, Doorslaer Ev (1997) Socioeconomic Inequalities in Health: Measurement, Computation and Statistical Inference. *Journal of Econometrics* 1997, 77(1):87-104

Geisler (2009) Gender Socialization in the Home: Its Impact On Boys' Achievement in Primary and Secondary Schools. Africa Development Report.

Gender Secretariat, 2009 Survey on Domestic Violence. Republic of Seychelles  
Gilson, L. (2007a). Acceptability, Trust and Equity. In G. Mooney and D. McIntyre (Eds.) *The economics of health equity*. Cambridge: Cambridge University Press.

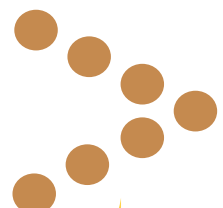
Gilson, L. (2007b). The political management needs of health policy change intended to promote equity. Paper prepared for the Health Systems Knowledge Network of the World Health Organization's Commission on Social Determinants of Health.

Gonzalves, C. & S. Mussard. (2009). Water, sanitation and waste. In Tortell P. & A. Jean-Louis, Report on the review of the Environment management plan for Seychelles (EMPS) 2000-2010. pp.127-169.

Hausmann-Muela, S., Muela Ribera, J., and Nyamongo, I. (2003). Health seeking behaviour and the health system response. Disease Control Priorities Project Working Paper No.14. Available at: <http://www.dcp2.org/file/29/wp14.pdf> (accessed 27 June 2012).

Kelliny C., et al. Metabolic syndrome according to different definitions in a rapidly developing country in the African region. *Cardiovasc Diab*. 2008; 7: 27.

Krieger N. A glossary for social epidemiology. *J Epidemiol Community Health* 2001; 55:693-700.



Labadarios D, et al. Traditional Diets and Meal Patterns in South Africa. *World Review of Nutrition and Diet*. 1996;79:70–108.

Manning E. et al. Dietary Patterns in Urbanised Blacks. *South African Medical Journal*. 1971;48:488–98.

Marques-Vidal P, et al. (2008). Body fat levels in children and adolescents: Effects on the prevalence of obesity. *European e-Journal of Clinical Nutrition and Metabolism* 3 (6):e321-e327.

Marques-Vidal P, et al. Secular trends in height and weight among children and adolescents of the Seychelles, 1956-2006. *BMC Public Health* 2008 May 19;8(1):166.

Martin (2009) National Assessment Report Republic of Seychelles (2004-2009) 5-Year Review of Progress Made in Addressing Vulnerabilities of SIDS through Implementation of the Mauritius Strategy for Further Implementation (MSI) of the Barbados Programme of Action (BPOA). Prepared for UN-DESA and the Government of Seychelles

Ministry of Environment and Natural Resources, Republic of Seychelles (2007) National Implementation Plan Stockholm Convention on Persistent Organic Pollutants.

National Health Accounts (2009) NHA 2009, Seychelles

Palmer, N. (2000). The use of private-sector contracts for primary health care: theory, evidence and lessons for low income and middle-income countries. *Bulletin of the World Health Organization*, 78(6), 821-829.

Palmer, N. (2007). Access and Equity: evidence on the extent to which health services address the needs of the poor. In S. Bennett, L. Gilson and A. Mills, eds. *Health, Economic Development and Household Poverty*. London: Routledge.

Palmer, N., et al. (2004). Health financing to promote access in low income settings – how much do we know? *The Lancet*, 364, 1365-1370. Reardon and Berdegue (2002).

Prentice RL, Sheppard L. Dietary fat and cancer: consistency of the epidemiologic data, and disease prevention that may follow from a practical reduction in fat consumption. *Cancer Causes and Control*. 1990; 1:81-97; discussion 99-109



Rio Political Declaration on Social Determinants of Health (2011)

Regional Committee of African Ministers of Health Regional Strategy for addressing the key determinants of Health in the African Region (2010)

Salive ME, et al. (1993) Risk factors for septicemia-associated mortality in older adults. Public Health Rep. 1993 Jul-Aug;108(4):447-53

Shaikh, B., and Hatcher, J. (2004). Health seeking behaviour and health service utilisation in Pakistan: challenging the policy makers. Journal of Public Health Management, 27, 49-54. Stettler (2002)

Stringhini S, et al. (2012) Age and Gender Differences in the Social Patterning of Cardiovascular Risk Factors in Switzerland: The CoLaus Study. PLoS ONE 7(11): e49443. doi:10.1371/journal.pone.0049443

Tang KK, Petrie D and Rao P (Measuring health inequalities between genders and age groups with realization of potential life years (RePLY). Bulletin of the World Health Organization, September 2007, 85 (9).

(UNDP 2000).

Viswanathan B., et al. Linking Global Youth Tobacco Survey (GYTS) data to tobacco control policy in the Seychelles. Prev Med . 2008; 47: S33-37

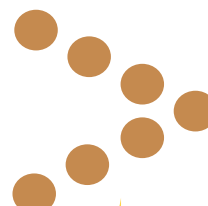
Viswanathan B, et al. Tobacco Control (2011). doi:10.1136/tc.2010.041590

Walker A. R. P., et al. Characteristics of Black Women with Breast Cancer in Soweto, South Africa. Cancer Journal. 1989;2:316-19.

Walker A. R. P., et al. Control Study of Prostate Cancer in Black Patients in Soweto, South Africa. British Journal of Cancer. 1992;65:438-41

Wallerstein, N. (2006). What is the evidence on effectiveness of empowerment to improve health? Copenhagen:WHO Regional Office for Europe (Health Evidence Network).

WHO (2004) Commission on the Social Determinants of Health (CSDH): note by the Secretariat, Document number EB115/35.



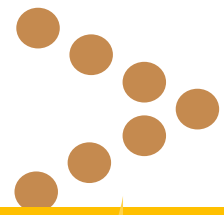
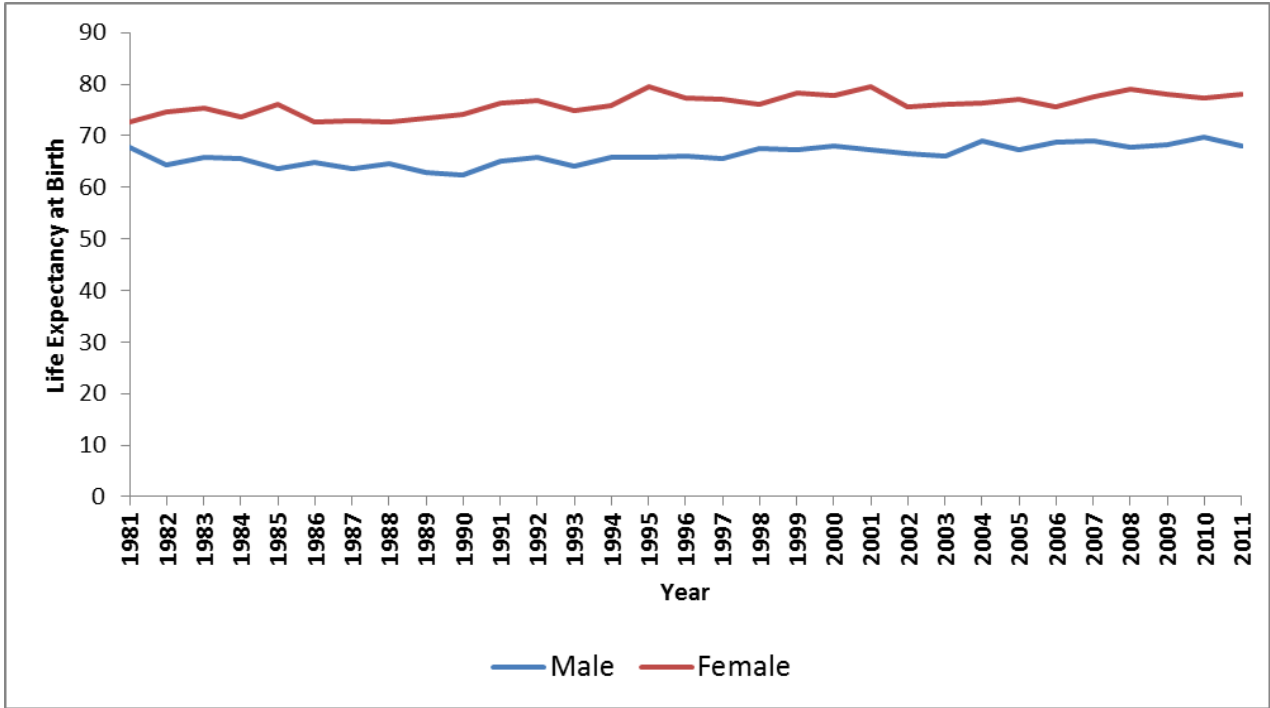
WHO CSDH (2007) Achieving Health Equity: from root causes to fair outcomes, Interim Statement, Commission on Social Determinants of Health

World Health Organization. (2008) Action Plan for the Global Strategy for the Prevention and Control of Non-Communicable Diseases, 2008-2012. Geneva: World Health Organization; 2008.



### Appendix A:

### Life Expectancy at Birth Gaps by Sex: 1981-2011.



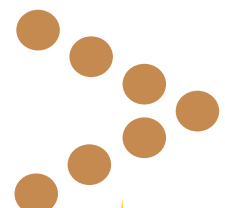
## Appendix B

### Association between selected characteristics and perceived cardiovascular risk

Variable (reference category)	Reports a value when asked about perceived CVD risk (476 of 816 participants)		Reports high CVD risk (138 of 476 participants)		Reports low CVD risk (150 of 476 participants)		P
	n	OR	P	OR	P	OR	
Sex							
Men	374	Reference					
Women	442	1.04	NS	1.2	NS	0.63	0.018
Age (years)							
40-54	485						
55-64	331	0.69	0.009	1.6	0.019	0.65	0.039
Education							
Up to primary	369						
Secondary	346	1.6	0.006	0.62	0.048	1.2	NS
Post secondary	101	8.6	0	0.43	0.009	1.9	0.025
Salary							
Low	310						
Intermediate	412	1.4	0.026	0.79	NS	0.94	NS
High	86	4.7	0	0.56	0.098	1.1	NS
Occupation							
Labourer	369						
Intermediate	319	1.6	0.006	0.51	0.005	1	NS
Professional	128	8.7	0	0.36	0.001	1.5	NS
Smoking							
Non smoking	684						
Regular smoking	132	0.7	0.065	1.1	NS	0.86	NS
Body mass index (<25kg/m <sup>2</sup> )	256						
Overweight	299	1.2	NS	2	0.014	0.53	0.006
Obese	261	1	NS	2.8	0	0.34	0
Physical activity at leisure time	722						
> 1000 MET min/week	94	1.7	0.024	0.53	0.058	1.8	0.033
Fruit and vegetable intake	231						



(<2 portion/day							
2-3 portion/day	496	1.3	NS	0.61	0.04	1.2	NS
≥4 portions/day	89	2.9	0	0.43	0.021	1.1	NS
Treatment (none)	464						
Blood pressure lowering	329	1.2	NS	2.7	0	0.36	0
Lifestyle:impact on health (little)	226						
Some	397	1.7	0.003	1.1	NS	0.55	0.019
Much	193	4.8	0	1.3	NS	0.6	0.064
Action on PA/nutrition (none)	259						
Unsustained action	135	2.2	0	1.1	NS	0.48	0.029
Sustained action	422	2.4	0	0.61	0.045	0.99	NS



## Appendix C

**Table: Relative inequalities in the prevalence of risk factors for cardiovascular diseases according to gender and year of survey**

SES	1989			1994			2004			P <sup>b</sup>
	PR <sup>a</sup>	95%CI	PR <sup>a</sup>	95%CI	PR <sup>a</sup>	95%CI	PR <sup>a</sup>	95%CI		
<b>MEN</b>										
Current smoking	1.82	(1.37;2.41)	2.17	(1.51;3.11)	2.28	(1.53;3.40)	2.28	(1.53;3.40)	=0.385	
Heavy drinking	2.12	(1.39;3.24)	4.11	(2.37;7.12)	4.11	(2.13;7.93)	4.11	(2.13;7.93)	=0.051	
Obesity	0.19	(0.06;0.64)	0.30	(0.12;0.76)	0.58	(0.33;1.02)	0.58	(0.33;1.02)	=0.212	
Diabetes	0.41	(0.18;0.94)	0.49	(0.18;1.32)	1.68	(0.83;3.42)	1.68	(0.83;3.42)	=0.026	
Hypertension	1.12	(0.87;1.44)	0.75	(0.60;0.95)	0.95	(0.77;1.18)	0.95	(0.77;1.18)	=0.075	
High cholesterol	0.43	(0.22;0.85)	0.50	(0.31;0.78)	0.98	(0.62;1.57)	0.98	(0.62;1.57)	=0.061	
<b>WOMEN</b>										
Current smoking	0.74	(0.38;1.44)	1.80	(0.69;4.71)	2.65	(0.80;8.72)	2.65	(0.80;8.72)	=0.143	
Heavy drinking	1.49	(0.37;6.05)	3.28	(0.42;25.55)	0.37	(0.03;4.48)	0.37	(0.03;4.48)	=0.340	
Obesity	1.54	(0.95;2.50)	1.86	(1.20;2.89)	1.42	(1.05;1.92)	1.42	(1.05;1.92)	=0.589	
Diabetes	1.41	(0.57;3.47)	1.30	(0.50;3.36)	1.87	(0.92;3.79)	1.87	(0.92;3.79)	=0.430	
Hypertension	1.02	(0.80;1.31)	1.05	(0.78;1.42)	0.95	(0.79;1.14)	0.95	(0.79;1.14)	=0.851	
High cholesterol	1.04	(0.68;1.59)	0.85	(0.61;1.17)	1.01	(0.74;1.38)	1.01	(0.74;1.38)	=0.468	

PR : Prevalence Ratio ; SES: Socioeconomic status.

<sup>a</sup> Prevalence ratio in the lowest versus the highest SES group.

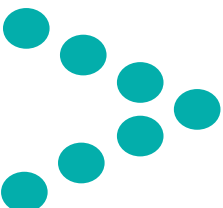
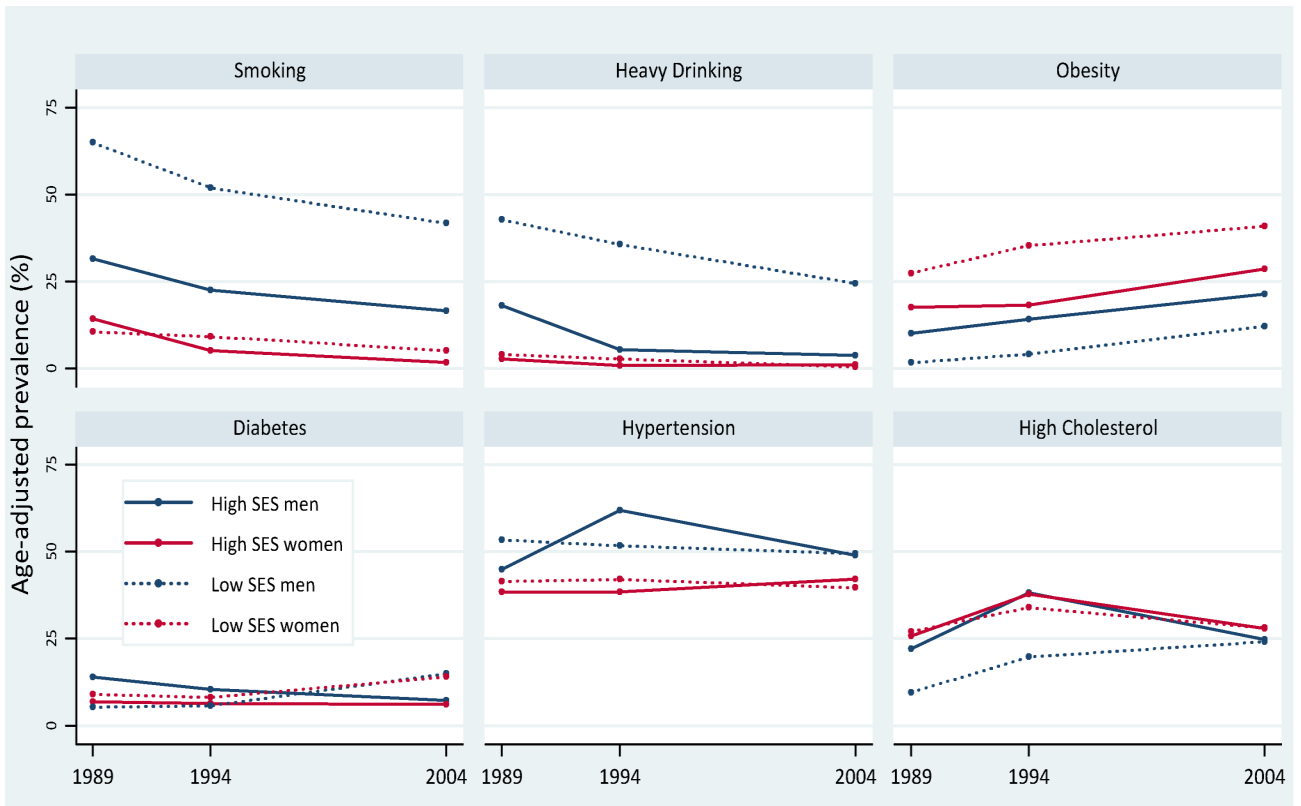
<sup>b</sup> p for interaction between SES and year of survey.



## Appendix D

Selected Variables	N	Prevalence <sup>2</sup>			Multivariate Logistic Regression <sup>3</sup>		
		%	95% CI	<i>P</i> ( $\chi^2$ )	OR	95% CI	<i>P</i>
Gender							
Men	504	38.5	34.5 -42.6	0	2.13	1.50-3.02	0
Women	563	27.7	24.1 -31.2		1	...	...
Age Group							
25-34	261	12.4	8.4 -16.4	0	1	...	...
35-44	267	29.3	23.9-34.7		2.61	1.62 -4.21	0
45-54	274	38.6	32.9 -44.4		3.83	2.41-6.10	0
55-64	265	50.4	44.4-56.3		6.33	3.98 -10.1	0
Ethnic group							
Black	716	36.2	32.9 -39.5	0.005	1	...	...
Mixed	214	24	18.4-29.7		0.48	0.32 -0.71	0
White	90	31.1	19.5 -42.7		0.88	0.52-1.49	NS
Indian/Asiatic	47	26.2	14.6-37.8		0.75	0.36 -1.55	NS
Body mass index, kg/m <sup>24</sup>							
Normal	557	22.1	18.7 -25.5	0	1		
Overweight	245	40.3	34.3 -46.2		2.93	2.02-4.25	0
Obese	259	45.9	40.1-51.8		3.63	2.55 -5.16	0
Alcohol consumption, mL/d							
Nondrinkers (0 or occasional)	777	30.9	27.6 -34.2	NS	1	...	...
Moderate drinkers (1-100)	189	34.5	25.1 -43.8		1.42	0.94-2.13	NS
Heavy drinkers ( $\geq 100$ )	101	33.7	28.9-38.4		1.46	0.88 -2.43	NS
Reported level of exercise, score							
Low	440	36.4	32.2-40.7	0.028	1	...	...
Intermediate	420	28	23.9-32.1		0.62	0.45 -0.86	0.004
High	203	35.1	28.6 -41.6		0.83	0.56-1.24	NS
Smoking (cigarettes/d)							
Nonsmokers (0)	829	34.4	31.3 -37.6	NS	...	...	...
Smokers ( $\geq 1$ )	238	29.7	21.9 -37.4		...	...	...
Serum total cholesterol, mmol/L							
Normal (<5.2)	440	29	24.4-33.6	0.001	...	...	...
Borderline (5.2-6.5)	357	31.1	26.5 -35.8		...	...	...
High ( $\geq 6.5$ )	246	43.3	37.2 -49.4		...	...	...

## Appendix E

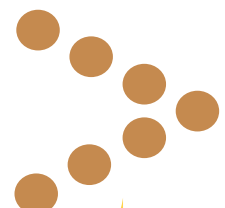


## Appendix F

**TABLE 2.** Prevalence of High Blood Pressure (BP) Among All Participants and Rates of Awareness, Treatment, and Control Among Participants With High BP

Age Group (yrs)	No. in 1989, 2004	Among Participants With High BP							
		High BP (%)		Aware (%)		Treated (%)		Controlled (%)	
		1989	2004	1989	2004	1989	2004	1989	2004
<b>Men</b>									
25–34	105, 126	26	23	33	31	4	24	0	10
35–44	127, 134	46	39	33	48	21	38	2	13
45–54	145, 158	55	56	38	64	14	58	1	12
55–64	136, 150	68	73	40	65	18	63	3	11
<b>Women</b>									
25–34	123, 149	8	10	40	60	20	60	0	40
35–44	143, 176	34	30	43	66	22	60	2	34
45–54	145, 181	48	52	54	77	38	72	9	24
55–64	157, 181	66	70	52	84	34	83	5	31
<b>Standardized (age 25–64 yrs)</b>									
Men	513, 568	45	44	36	55	15	49	2	12
Women	568, 687	34	36	49	75	31	72	5	30
Both sexes	1081, 1255	40	40	42	64	22	59	3	20
<b>Standardized (age 35–64 yrs)</b>									
Men		54	53	37	60	18	54	2	12
Women		47	47	50	77	32	73	5	29
Both sexes		51	50	43	68	24	63	4	20

High BP is defined as systolic/diastolic BP  $\geq$ 140/90 mm Hg or current antihypertensive treatment.



## Appendix G

### Effect of trade policy on social determinants of health

