**REPUBLIC OF MAURITIUS**


# MINISTRY OF HEALTH & QUALITY OF LIFE


# MAURITIUS
# NON-COMMUNICABLE DISEASES
# SURVEY 2004


**July 2006**

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# 1. EXECUTIVE SUMMARY

Mauritius has undergone an epidemiological transition from communicable to non-communicable diseases over the past few decades. A first Survey on the prevalence of NCD and their risk factors were carried out in Mauritius in 1987. Since then regular surveys at 5-6 years' interval have been carried out in 1992, 1998, and 2004. These surveys have documented the prevalence of NCD's mainly type 2 diabetes, and hypertension and their risk factors and the trends in these prevalences over the years.

The 2004 Survey was carried out on adults aged 20-74 years living in 14 randomly selected clusters that constituted a representative sample of the Mauritian population.

The main findings of the NCD Survey 2004 are:

- The age-standardised prevalence of diabetes in the Mauritian population aged 20-74 years was 15.0% (15.0% in males, 15.1% in females). However the prevalence among adults aged 30 years and over was 19.3 % i.e. one in every five adult in this age group had type 2 diabetes. The diabetes prevalence among adults aged 30 years and over which had progressively increased during the period 1987 to 1998 from 14.3% to 19.5% appears to have stabilized at around 19 % after 1998.

- The control of diabetes in those who were already diagnosed was poor: 60% of them had a fasting Plasma Glucose (FPG) $\geq$ 8.5 mmol/L.

- The ascertainment rate of diabetes (i.e. those in whom the disease had been diagnosed – the known cases) was 53.4% i.e. one in two diabetics did not know that he/she had the disease.

- The age standardised prevalence of Impaired Glucose Tolerance (IGT) was 10.2% (7.2% in males, 12.3% in females). Impaired Glucose Tolerance (IGT) which is a risk factor for future diabetes and cardiovascular disease continued to fall progressively from 19.3% in 1987 to 12.1% in 2004. In Mauritians aged 30 years and over, one in every eight has impaired glucose tolerance.

- The age-standardised prevalence of hypertension in adults aged 20-74 years was 23.1% (24.2% in males, 22.8% in females). In adults aged 30 years and over the prevalence has remained at around 30% during the period 1987-2004.

- The level of poor control among individuals already diagnosed with hypertension (blood pressure $\geq$ 160/95 mmHg) was 38.9%.

- The ascertainment rate of hypertension (i.e. those in whom the disease had been diagnosed – the known cases) was 54.5%.

- 10% of the Mauritian population aged 20-74 years was obese (BMI > 30) and another 25% was overweight (25 < BMI ≤ 30). The prevalence of obesity and overweight in both sexes taken together showed an increase from 31% in 1987 to 41% in 1998 and a subsequent decrease to 36% in 2004.

- 35.9% of males and 5.1% of females were current smokers. The prevalence of smoking among males has continued to decrease from 57.9% in 1987 to 35.9% in 2004.

- The prevalence of abusive alcohol intake among males increased from 16% in 1998 to 19% in 2004 after having decreased from 18% in 1987 to 14% in 1992. Among females abusive alcohol intake increased from 0.5% in 1998 to 1.9% in 2004 after having decreased from 2.1% in 1987 to 1.6% in 1992.

- The prevalence of hypercholesterolemia (cholesterol $\geqslant$ 5.2 mmol/L) was 45% in males and 37% in females. The prevalence of high cholesterol level has shown a steady decrease during the period 1987 to 2004 (i.e. from 56% to 45% in males and from 53% to 37% in females).

- The prevalence of high triglyceride level has not changed significantly during the period 1987 to 2004 (28% in males and 14% in females in 1987 compared to 31% in males and 13% in females in 2004).

- 24.5% of males and 9.5% of females were found to be practising adequate leisure physical activity. The practice of adequate leisure physical activities in adults aged 35-54 years continued to increase steadily during the period 1987-2004 from 11.8% to 24.5% in males and from 1.4% to 9.5% in females

The findings of the 2004 NCD Survey in Mauritius show that Non-Communicable Diseases remain a major Public Health problem on the island. A number of improvements have been documented over the years, namely a significant fall in smoking prevalence among males, a drop in the prevalence of IGT and an increase in the prevalence of adequate physical activity. However, overall, the prevalence of Type 2 diabetes remains at around 19 %, hypertension prevalence remains at around 30 % and a number of risk factors remain highly prevalent.

## 2.    INTRODUCTION

### 2.1    Background of the Survey

The multi-ethnic island nation of the Republic of Mauritius in the Indian Ocean has undergone an epidemiological transition over the past five decades as a result of rapid industrialisation and general improvements in living standards.  During this period there has been a shift in the diseases pattern from mainly communicable diseases to non communicable diseases.  In 1982, following the visit to Mauritius of a WHO Consultant at the request of the Ministry of Health, a National NCD study was recommended to document the prevalence of diabetes, hypertension and their risk factors in the population.  The first survey was carried in 1987 and provides baseline values that have been useful in following trends in prevalence of factors under study.

In 1992 and 1998, further surveys were carried out as part of the formal evaluation of progress and to monitor trends in NCD disease and risk factor distribution in the population.  The 11-year incidence data provided more reliable information on potential risk factors for disease and mortality than were currently available for Mauritius.

The report showed that in the 11-year period 1987-1998 there were reductions in the prevalence of cigarette smoking, and frequent alcohol consumption, and a favourable increase in leisure physical activity levels in Mauritian adults.  In contrast, the prevalence of diabetes, overweight and obesity increased over the same period.

From 1987 to 2004, the NCD Unit of the Ministry of Health coordinated the implementation of a wide-ranging programme aimed at prevention and control of diseases and risk factors including Type 2 diabetes, hypertension, stroke, coronary heart disease, dyslipidaemia, obesity, cigarette smoking, alcohol abuse and lack of physical activity.

The 2004 survey was planned as part of the formal 5-6 yearly evaluation of progress in achieving programme aims by monitoring trends in disease and risk factor distribution in the population.  The 17-year prevalence data from the 2004 and previous surveys gives more reliable information on NCDs,  their risk factors and their trends thereof.

The present study of NCD in Mauritius is a collaborative project of the Ministry of Health and Quality of Life, and WHO AFRO.

## 2.2 Objectives

### 2.2.1 *General*

The 2004 NCD Survey which involved adults aged 20-74 years has been carried out with the overall goal of documenting the prevalence of NCDs and their risk factors as well as monitoring progress and impact of the intervention programmes during the period 1987-2004.

### 2.2.2 *Specific*

The specific objectives of the survey were:

(a)     to determine the prevalence of NCDs (viz.: Type 2 diabetes mellitus and hypertension).

(b)     to determine the prevalence of associated risk factors (viz.: obesity, dyslipidaemia, impaired glucose metabolism, smoking, excessive alcohol consumption, inadequate physical activity).

(c)     to study trends in the prevalence of NCDs and their risk factors.

(d)     to study the level of control in diabetic and hypertensive subjects and the trends thereof.

### 2.2.3 *Technical Support*

The previous surveys (1987, 1992 and 1998) had the support of a number of staff of three WHO Collaborative Centres.  The NCD survey 2004 has been carried out by a Mauritian team with some technical guidance from WHO-AFRO.

## 2.3　Methodology

### 2.3.1　*Study Type and Sample Size*

This survey was a national cross-sectional study involving 4,200 Mauritian adults aged 20-74 years.

A random multi-stage cluster sampling procedure was applied to identify 14 clusters out of the 379 Primary Enumeration Areas (PEA) defined by the Central Statistics Office and used in the 2000 population census. Seven clusters were chosen randomly from the 14 clusters participating in the 1998 survey and the other seven were selected out of the other 365 PEA's.

Each cluster was divided into a number of Secondary Enumeration Areas (SEA) and one SEA was selected randomly. From each SEA that was selected around 300 individuals enumerated from 150-200 households were invited to participate in the survey.

The survey field work was carried out during September and October 2004. A total of 4,500 adults aged 20-74 years were invited and the response rate was 91%.

### 2.3.2　*Data Collection*

A WHO approved protocol similar to those of the 1987, 1992 and 1998 surveys was adopted and in many instances the same local staff were involved. Two survey teams worked simultaneously at different survey locations.

Each day, and at both survey sites, approximately 100-120 participants were invited to attend after an overnight fast. Following registration, a fasting blood sample was collected and analysed. All participants except diabetics on treatment and those found to be diabetic on fasting blood analysis underwent a glucose tolerance test as per WHO guidelines.

Measurement of the height and weight, waist and hip circumference and blood pressure were then carried out on all participants. They were then interviewed to obtain information on personal and family medical history, lifestyle habits and socio-economic indicators through a questionnaire which was filled in by trained health personnel.

Another questionnaire specifically assessing physical activity levels was filled in for non-diabetic participants aged 35-54 years.

As regards laboratory investigations, fasting and 2-hour blood glucose were measured immediately at the survey site. Other blood samples were sent to the Central Health Laboratory, Victoria Hospital where a number of additional tests were carried out.

### 2.3.3  *Data Capture, Statistical Analysis and Quality Control*

Various steps were taken to ensure the quality of data throughout the whole operational procedures.  Two officers at each survey site verified the forms for completeness before the respondents were allowed to leave the sites.  These forms were then sent to the Data Manager on a daily basis where a rigorous control was done.

Officers of the Health Statistics Unit re-edited all the forms for consistency.  The data entry was done by staff of the Medical Records Office under the close supervision of the Data Manager.  The Dbase III plus package was used.

Before analysis, the data was cleared under the close supervision of a Statistician delegated by WHO/AFRO.  A number of questionnaires were retrieved for verification and control.  The data was checked and amended accordingly.

The data was processed and analysed using the EPI-Info statistical package.  The findings were assessed for reliability.  For the purpose of this preliminary report, simple proportions have been calculated.  A few cross-tabulations have also been included.  Certain prevalence for the 2004 survey have been standardized using the direct method based on the 2000 census population.  However, the ensure comparability across the 4 NCD Surveys, the 1990 census population was used as standard.  Crude prevalence have also been given.  The interpretation of the different results should therefore be done with caution.

### 2.3.4  *External Quality Assessment (EQA)*

External quality assessment of all laboratory investigations were carried out in a UK laboratory (Addenbrooke's Hospital, Cambridge) on one out of every ten blood specimens collected.  The external quality control values obtained were not significantly different from the values obtained in Mauritius.  No adjustment of these results was necessary

# 3. RESULTS OF THE SURVEY

## 3.1 Diabetes

### 3.1.1 *Prevalence of Diabetes*

The preliminary results of the 2004 NCD Survey indicate that the age-standardised prevalence of diabetes in the Mauritian population aged 20-74 years was 15.0% (15.0% among male, 15.1% among female).

The 15.0% prevalence of diabetes has been obtained by standardizing the prevalence by 5-year age-groups and sex to the Mauritian population as at the Census Year 2000.

### 3.1.2 *Trend in the Prevalence of Diabetes 1987-2004*

In order to compare and show the trend in the prevalence of diabetes in the 4 NCD Surveys, the 2004 NCD Survey results for adults aged 30 years and above have been standardized on the National population as at Census Year 1990. The prevalence of diabetes in that age-group increased from 14.3% in 1987 to 19.5% in 1998 (Table 1). The prevalence has decreased slightly to 19.3% in 2004. It appears that over the past 5 – 10 years the prevalence of diabetes has stabilised around 19 %.

**Table 1 - Prevalence of diabetes from 1987 to 2004
in population aged 30 and above**

| NCD survey years | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| Male | 14.2 | 16.3 | 18.4 | 18.9 |
| Female | 14.5 | 17.4 | 20.6 | 19.7 |
| Total | 14.3 | 16.9 | 19.5 | 19.3 |
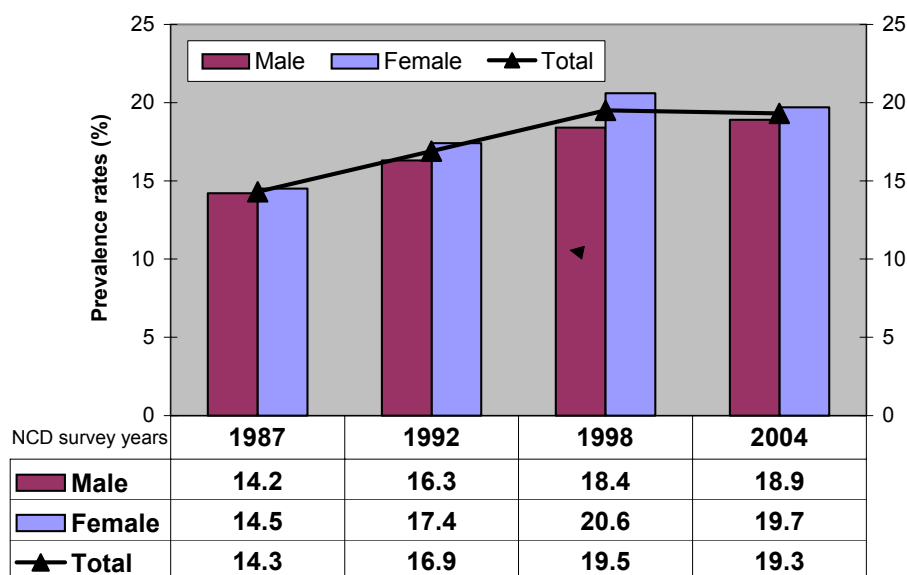
### 3.1.3  Age-Specific prevalence of diabetes – 2004

The crude prevalence of diabetes in 2004 (Table 2) by age-group shows that 2.4% of adults aged 20-29 years are diabetic.  As expected, the prevalence increases with age; 8.0% among those aged 30-39 years and 17.6% among those aged 40-49 years.

**Table 2 - Age-specific prevalence rates of diabetes - 2004**



| 10-yr age-groups | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70+ |
|---|---|---|---|---|---|---|
| Male | 2.8 | 6.6 | 20.6 | 34.2 | 36.2 | 36.6 |
| Female | 2.2 | 8.9 | 15.4 | 31.5 | 38.7 | 42.9 |
| Total | 2.4 | 8 | 17.6 | 32.7 | 37.6 | 39.7 |
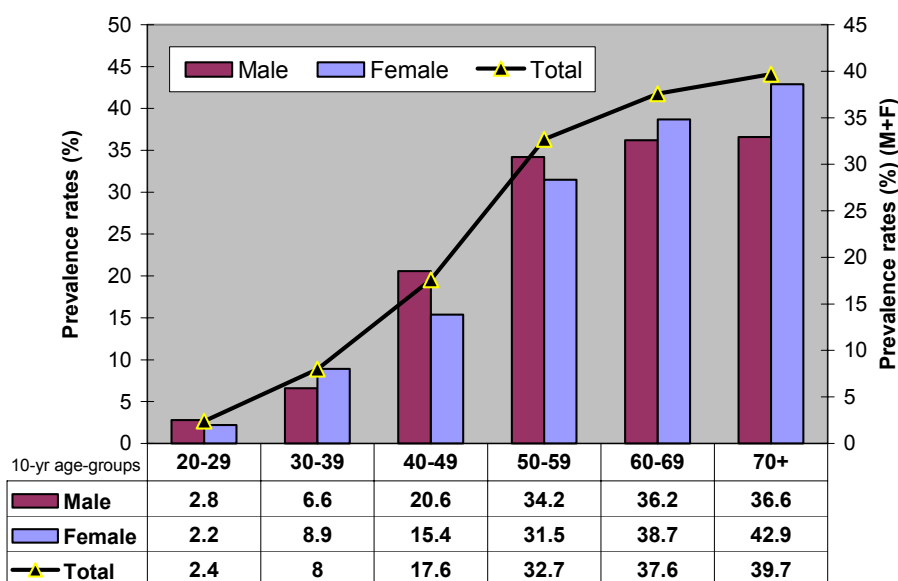
### 3.1.4  Prevalence of diabetes by ethnic group

The crude prevalence by ethnic groups (Table 3) indicates that the population of Asian origin was more prone to diabetes.  The highest crude prevalence in 2004 was among Muslims with 20.5% as compared to 15.8% among the "creoles", which was the lowest.  It should be noted that crude diabetes prevalence was over 15% in all the ethnic groups that constitute the Mauritian population.

**Table 3 - Crude Prevalence (20 – 74 years) by ethnic group and sex - 2004**

|  | Hindu | Muslim | Creole | Chinese | TOTAL |
|---|---|---|---|---|---|
| Men | 21.8 | 20.1 | 16.2 | 18.3 | **20.2** |
| Women | 17.2 | 20.8 | 15.6 | 16.2 | **17.7** |
| **Both Sexes** | **19.1** | **20.5** | **15.8** | **17.2** | **18.7** |

### 3.1.5  Treatment and Control for Diabetes

In 2004, 88.6% of known diabetic subjects reported that they were on regular treatment and follow-up. (Table 4). Of all known diabetes subjects, 17.3% had a good control (FPG ≤ 7.0 mmol/L), 22.9% a fair control (7.0 mmol/L < FPG < 8.5 mmol/L) and 59.9% a poor control (FPG ≥ 8.5 mmol/L).

**Table 4 - Effectiveness of control of fasting blood glucose (FBG)
in all subjects reporting a diagnosis of diabetes (2004).**

| Current treatment for diabetes | % | LEVEL OF CONTROL * | | |
| --- | --- | --- | --- | --- |
| | | FPG < 7.0 Good | 7.0 ≤ FPG ≤ 8.5 Fair | FPG > 8.5 Poor |
| None | 6.3 | 0.0% | 26.9% | 73.1% |
| Diet only | 5.1 | 0.0% | 47.6% | 52.4% |
| Herbal | 0.0 | - | - | - |
| Oral drug (only) | 73.2 | 19.9% | 22.3% | 57.8% |
| Insulin (only) | 8.5 | 17.1% | 20.0% | 62.9% |
| Oral & Insulin | 6.8 | 17.9% | 10.7% | 71.4% |
| TOTAL | 100.0 | 17.3% | 22.9% | 59.9% |

*According to new WHO cut-off points*

It should be pointed out that the above levels of control are defined according to the new WHO cut-off points.  However, taking poor control as "Fasting Plasma Glucose ≥ 11.1 mmol/L", the percentage of poor control among all known diabetic subjects was 41.0% in 1998 and 32.5% in 2004.

### 3.1.6  *Ascertainment of Diabetes*

In 2004, the proportion of respondents who already knew that they have diabetes was 53.4% (52.1% among males, 54.4% among females).  These figures were based only on "new" participants.  (Table 5)

**Table 5 - Proportion DM known in NCD surveys in Mauritius**

| Survey years | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| Male | 38.7 | 47.7 | 61.7 | 52.1 |
| Female | 45.5 | 58.4 | 49.5 | 54.4 |
| Total | 42.4 | 53.7 | 51.3 | 53.4 |
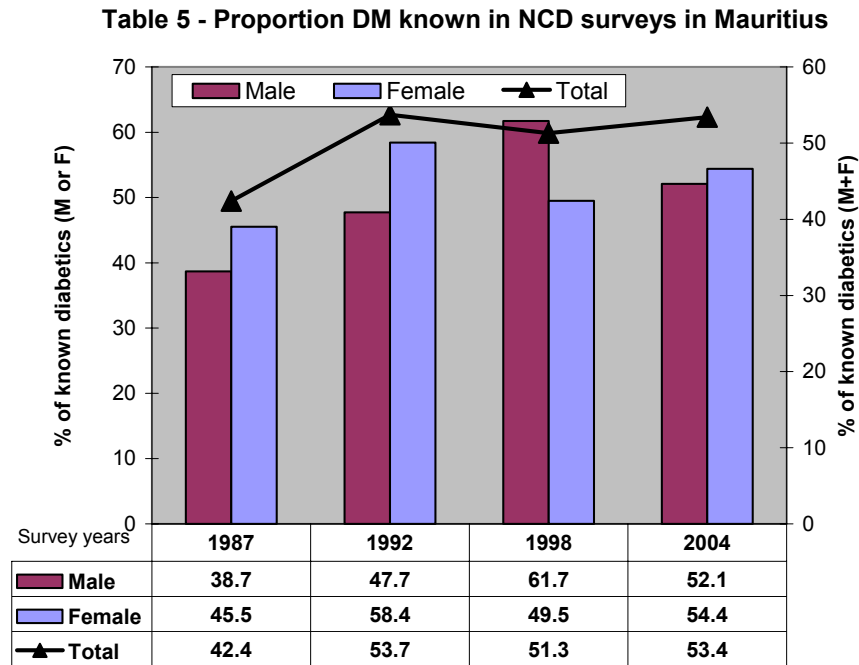
The ascertainment rates of diabetes by sex during the period 1987 to 2004 show an increase of around 10 % over the 17 year period.  However, in 2004, 46.6% of individuals surveyed and found to be diabetic did not know that they had the disease.

## 3.2   Impaired Glucose Tolerance

### 3.2.1   Prevalence of Impaired Glucose Tolerance

The prevalence of Impaired Glucose Tolerance (IGT), a risk factor for both future Type 2 diabetes and cardiovascular diseases, was determined in all non-diabetic participants aged 20-74 years.  The criteria used for classifying individuals as having IGT were based on the WHO criteria modified for epidemiological purposes.

The age-standardised prevalence of IGT in the population aged 20-74 years was found to be 7.2% in males, 12.3% in females and 10.2% for both sexes.

During the previous NCD Surveys (i.e. 1987, 1992 and 1998) IGT was determined in participants aged 30 years and over.  Using this age group, the trend in the prevalence of IGT in the past 17 years is shown in Table 8.

**Table 6 - IGT Prevalence (%) among participants aged 30 years and over**



| NCD survey years | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| Male | 15.6 | 14.9 | 11.8 | 8.7 |
| Female | 22.5 | 19.3 | 20.2 | 14.6 |
| Total | 19.3 | 17.3 | 16.6 | 12.1 |
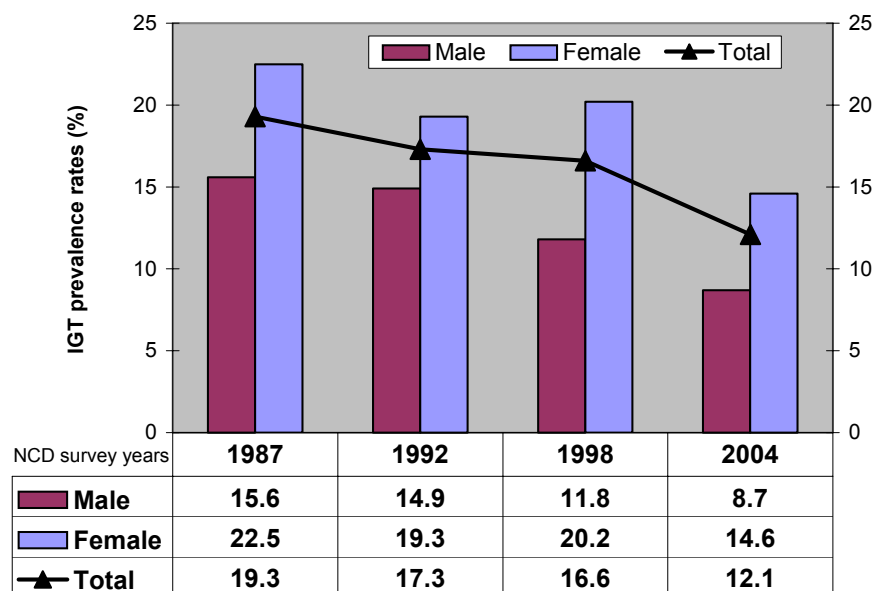
It should be noted that IGT is more prevalent among women and that there has been a progressive decrease in IGT prevalence in both men and women during the period 1987-2004.

### 3.2.2   Age-specific prevalence of IGT – 2004

The prevalence of IGT by age is shown in Table 7.  It is noted that there was an increase in the prevalence of IGT with age with prevalence in females significantly higher than in males at all ages until around 70 years after which the prevalence in males becomes significantly higher than in females.

**Table 7 - Age-specific prevalence rates for IGT - 2004**

| 10-yr age-groups | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70+ |
|---|---|---|---|---|---|---|
| Male | 2.4 | 5.6 | 10.1 | 10 | 11.9 | 23.9 |
| Female | 5.9 | 11.8 | 15.9 | 15.7 | 19.7 | 12.9 |
| Total | 4.7 | 9.3 | 13.3 | 13.2 | 16.2 | 18.4 |
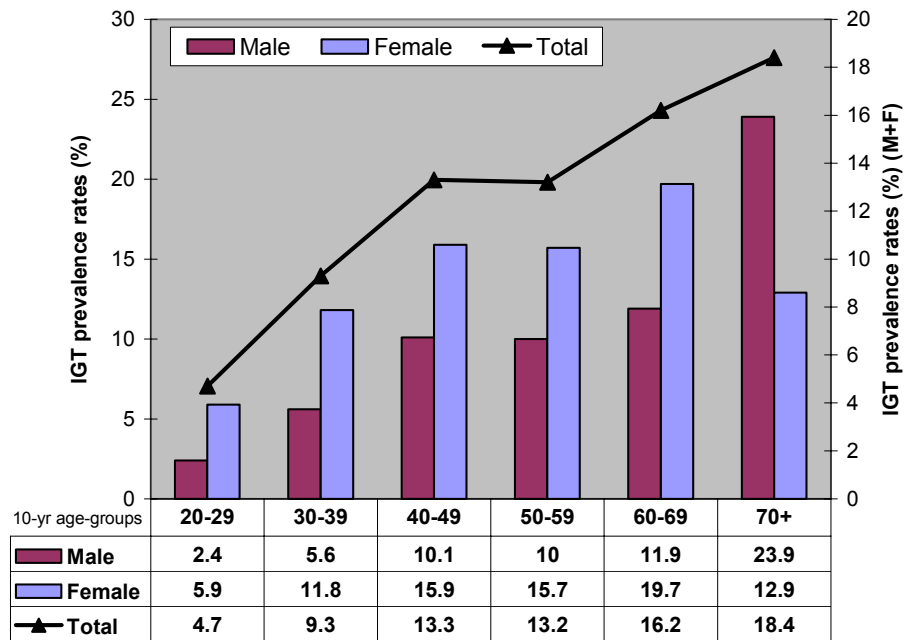
### 3.2.3  *Prevalence of IGT by ethnic group and sex - 2004*

The prevalence of IGT is more or less the same in all ethnic groups except among the "Chinese" who have a significantly higher rate (Table 8).  Women in general and in all ethnic group had a significantly higher prevalence of IGT.

**Table 8 - Crude prevalence (%) of IGT by ethnic group and sex – 2004**

|  | Hindu | Muslim | Creole | Chinese | TOTAL |
|---|---|---|---|---|---|
| **Men** | 8.2 | 8.3 | 9.1 | 15.1 | **8.7** |
| **Women** | 13.1 | 12.3 | 13.5 | 20.2 | **13.3** |
| **Both Sexes** | **11.0** | **10.6** | **11.9** | **17.7** | **11.4** |

### 3.2.4  *Glycaemic states  and associated conditions*

Diabetes and IGT are strongly associated with a number of chronic diseases and their risk factors.   Table 9 shows that hypertension, overweight, obesity and hyperlipidaemia were found to be significantly more prevalent in diabetes and IGT with rates among diabetics higher than rates among those with IGT.  In the 2004 survey it was found that 52% of diabetic subjects were hypertensive compared to only 20.3% of those with normal glycaemia   From the same table, it can also be concluded that BMI values are closely associated with the glycaemic values; 55.4% of diabetic subjects were overweight or obese as compared to 33.1% among people with normal glycaemic level.  The prevalence of hypertension among people with IGT is twice the prevalence in people with normal glycaemia

**Table 9 - Crude Prevalence of diabetes, IGT and normo-glycaemic by some associated conditions (2004).**

| People with: | DM | IGT | Normal Glycaemic level |
|---|---|---|---|
| % of hypertensive ( $\geq$ 140/90) | 51.8 | 40.5 | 20.3 |
| % of overweight (25 < BMI $\leq$ 30) | 37.0 | 32.8 | 25.0 |
| % of obesity (BMI > 30) | 18.4 | 17.7 | 8.1 |
| % of cholesterolemia ($\geq$ 5.2) | 52.8 | 44.7 | 36.0 |
| % of triglycerides $\geq$ 2.0 | 36.5 | 24.0 | 15.5 |
| % HDL – Cholesterol < 1.0 | 53.5 | 43.4 | 43.5 |

## 3.3　Hypertension

### 3.3.1　Prevalence of Hypertension

Blood pressure was measured in all participants and all those, not previously diagnosed as with hypertension, were classified as having hypertension when their average blood pressure was > 140/90 mmHg.  The prevalence of hypertension in 2004 in participants aged 20-74 years (standardized on the Census year 2000 population) was 24.2% in males, 22.8% in females and 23.1% in both sexes.  Among adults aged 30 years and over the age prevalence of hypertension during the period 1987-2004 has stayed within the range 26-30% (Table 10).  The prevalence in this age group appears to have stabilized at around 30% and there is no difference in the prevalence among males and females.

**Table 10 - Age standardised prevalence (%) of hypertension in population aged 30 years and over (1987-2004)**



| NCD survey years | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| Male | 31.7 | 26.5 | 30 | 29.7 |
| Female | 28.9 | 26.1 | 29.5 | 29.9 |
| Total | 30.2 | 26.2 | 29.6 | 29.8 |
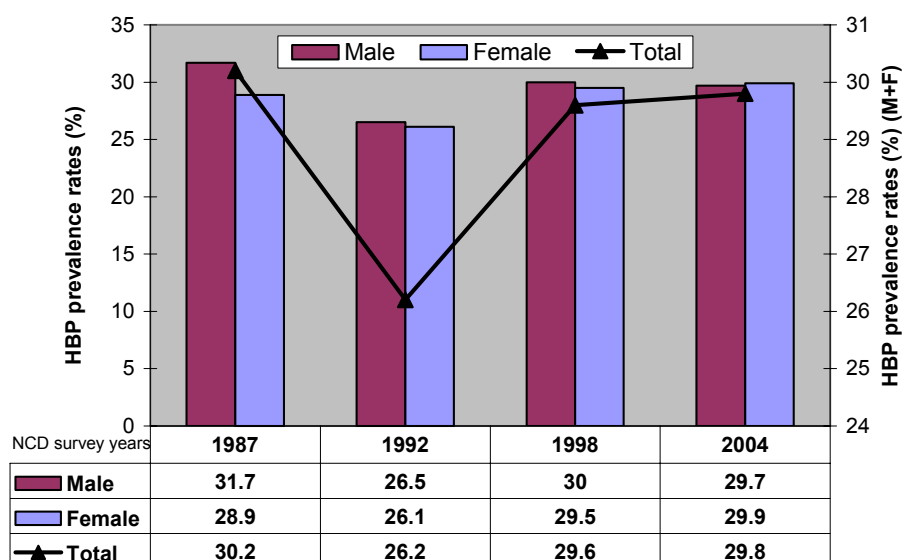
### 3.3.2　Age-specific prevalence of hypertension

The crude prevalence of hypertension in 2004 (Table 11) by age-group shows that only 4.5% of adults aged 20-29 years are hypertensive.  The rates increase with age, are higher among males than females below the age of 50 years.  After the age of 50 years hypertension becomes more prevalent in females.

**Table 11 - Age-specific prevalence rates
of hypertension - 2004**



| 10-yr age-groups | 20-29 | 30-39 | 40-49 | 50-59 | 60-69 | 70+ |
|---|---|---|---|---|---|---|
| Male | 7.2 | 15.9 | 33 | 41 | 50.2 | 67.6 |
| Female | 3.1 | 13.1 | 22 | 45.9 | 65.1 | 71.4 |
| Total | 4.5 | 14.2 | 26.8 | 43.8 | 58.4 | 69.5 |
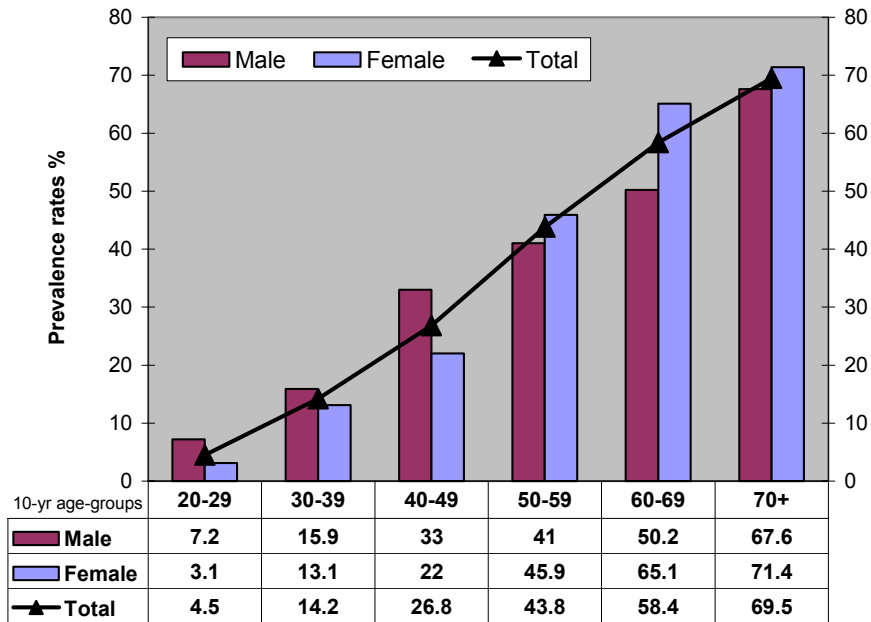
* **among** new "participants" only.


### 3.3.3  *Prevalence of hypertension by sex and ethnic group*

The crude prevalence of hypertension in 2004 is significantly higher among "Creoles" and "Chinese" as compared to levels found among "Hindus" and "Muslims" (Table 12).

*Table 12 - Crude Prevalence (%) of hypertension by ethnic group and sex in participants aged 20-74 years (2004)*

|  | Hindu | Muslim | Creole | Chinese | TOTAL |
|---|---|---|---|---|---|
| **Men** | 30.7 | 22.2 | 37.2 | 48.4 | **30.6** |
| **Women** | 24.2 | 27.7 | 31.9 | 28.6 | **26.9** |
| **Both Sexes** | **27.0** | **25.3** | **33.8** | **38.1** | **28.5** |


### 3.3.4  *Control for hypertension*

The participants who were known to be hypertensive were assessed for the effectiveness of blood pressure control in them.  It should be noted that 39% of hypertensive participants were poorly controlled (Table 13).  The level of poor control was found to be higher in males (42.3%) than in females (37.1%).

*Table 13 - Effectiveness of control of blood pressure by age group and sex, 2004*

| Age-group | Good[a] % | Fair[b] % | Poor[c] % |
|-----------|-----------|-----------|-----------|
| 20-39 | 34.0 | 27.7 | 38.3 |
| 40-59 | 34.3 | 25.3 | 40.4 |
| 60-74 | 30.0 | 32.6 | 37.4 |
| **TOTAL** | **32.5** | **28.6** | **38.9** |

[a] Good control = systolic <140 and diastolic <90 mmHg
[b] Fair control = values between good and poor
[c] Poor control = systolic ≥ 160 or diastolic ≥ 95 mmHg

### 3.3.5  *Ascertainment of hypertension*

Many participants who were found to be hypertensive were not aware that they had hypertension.  The rate of detection of hypertension (ascertainment rate) in 2004 was 44.8% in males, 62.0% in females and 54.5% in both sexes.

Table 14 shows the ascertainment rate of hypertension in men and women during the period 1987-2004.  There has been an increase in ascertainment rate over the years but still in 2004 about 45% of individuals surveyed and found to be hypertensive did not know that they were hypertensive.

**Table 14 - Proportion of HBP known in NCD surveys in Mauritius  ***



| Survey years | 1987 | 1992 | 1998 | 2004 |
|-----------|-----------|-----------|-----------|-----------|
| **Male** | 31.8 | 37.2 | 30.2 | 44.8 |
| **Female** | 45.3 | 46.1 | 52.7 | 62 |
| **Total** | 38.5 | 42.3 | 41.8 | 54.5 |
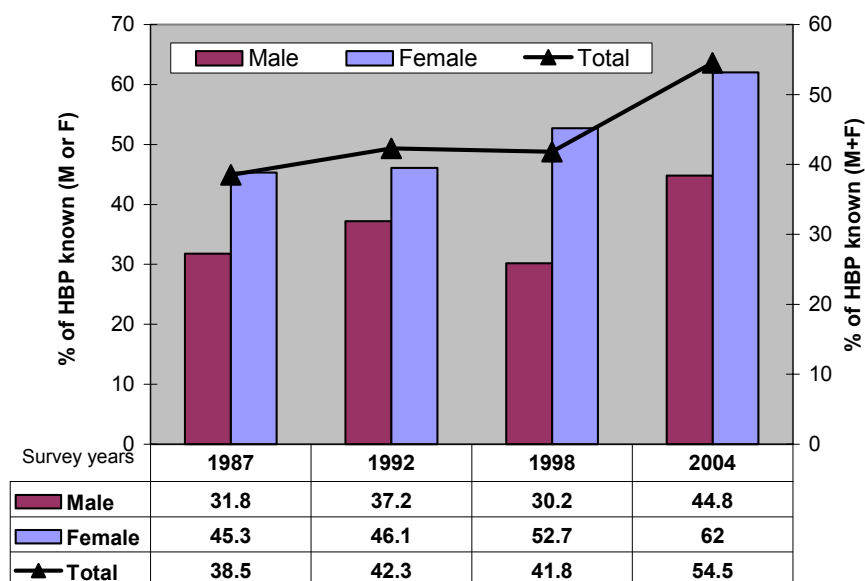
## 3.4 Obesity and Overweight

### 3.4.1 Prevalence of Obesity and Overweight

In 2004, the age-standardised prevalence of obesity in adults aged 20-74 years was 5.6% among males and 13.7% among females, giving an overall prevalence of 10.3%. The difference in the prevalence of overweight among males and females was less marked.  The prevalence of overweight was 25.1% among males and 25.7% among females giving an overall prevalence of 25.4%.   Taken together, 35.7% of the Mauritian population aged 20-74 years are either obese or overweight.

In 2004, the crude prevalence rates of obesity and overweight by ethnic group are shown at Table 15.

**Table 15 – Crude prevalence of obesity and overweight by ethnic group
in adults aged 20-74 years (2004)**

| Prevalence % | Hindu | Muslim | Creole | Chinese | Total |
|---|---|---|---|---|---|
| **Men** | | | | | |
| **Obesity** | 5.6 | 5.6 | 6.8 | 8.7 | **5.9** |
| **Overweight** | 27.6 | 27.7 | 28.7 | 31.5 | **28.0** |
| **Women** | | | | | |
| **Obesity** | 12.9 | 16.3 | 19.9 | 4.1 | **14.9** |
| **Overweight** | 28.3 | 26.2 | 32.5 | 17.5 | **28.3** |
| **Total** | | | | | |
| **Obesity** | **9.8** | **11.6** | **15.0** | **6.3** | **11.1** |
| **Overweight** | **28.0** | **26.8** | **31.1** | **24.3** | **28.2** |

*   *"Obesity" is defined as a body mass index greater than 30 kg/m$^2$ and "overweight" as a body mass index greater than 25 kg/m$^2$ but less or equal to 30 kg/m$^2$.*

The crude prevalence of obesity was 9.8 % among the "Hindus"  and 11.6% among the "Muslims".  However, the prevalence of obesity was higher among the "Creoles" (15.0%) and the "Chinese" (24.3%).

### 3.4.2 Prevalence of Obesity and Overweight from 1987 to 2004

In order to compare the prevalence of obesity and overweight over the 4 NCD Surveys, the 1990 Census Population has been used to standardize the rates and the results are given in Table 16 and Table 17 respectively.

**Table 16 - Obesity prevalence in consecutive NCD surveys in Mauritius**



| Survey years | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| Male | 3.1 | 5.2 | 6.4 | 5.6 |
| Female | 9.2 | 14.5 | 15.4 | 13.7 |
| Total | 6.3 | 10.2 | 11.5 | 10.3 |
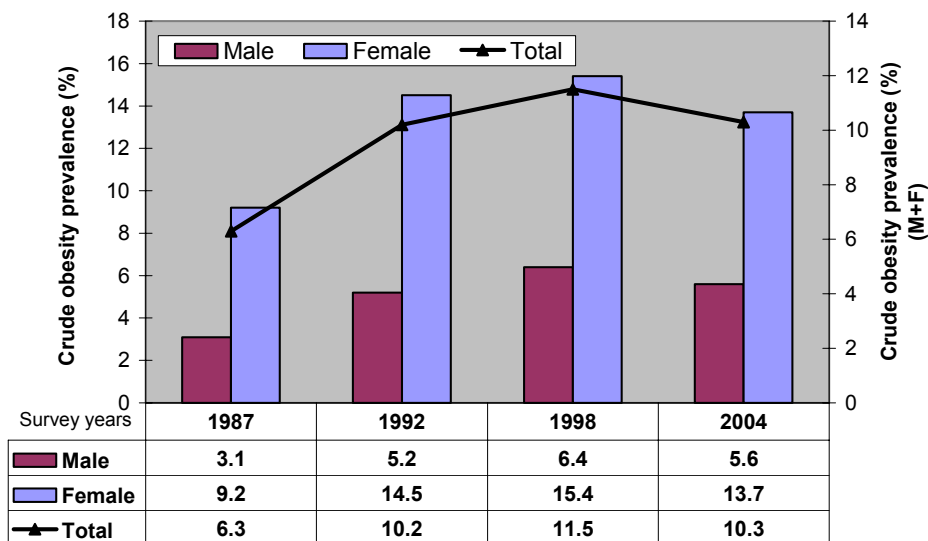
**Table 17 - Overweight prevalence in consecutive NCD surveys in Mauritius**



| Survey years | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| Male | 21.7 | 28.2 | 29.7 | 25.1 |
| Female | 26.5 | 31.2 | 28.8 | 25.7 |
| Total | 24.2 | 29.8 | 29.1 | 25.4 |
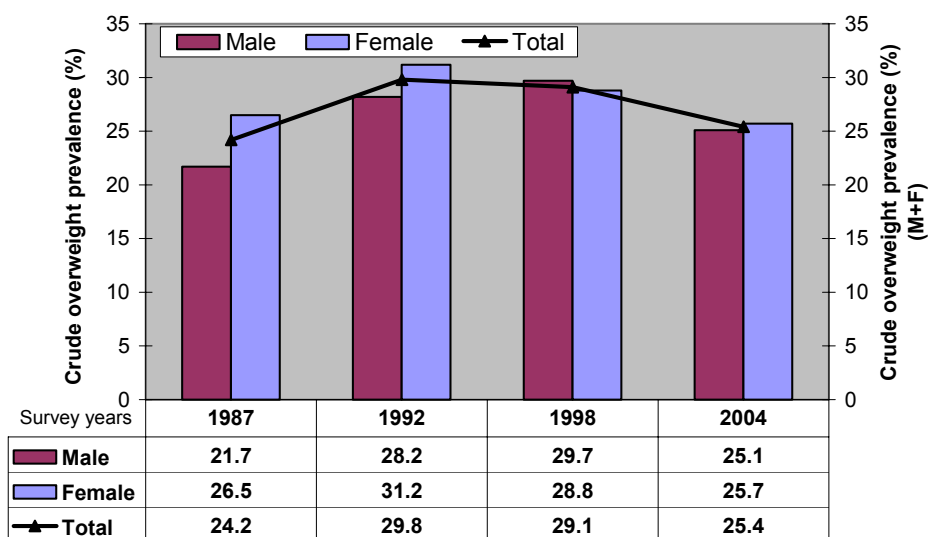
The trends of both obesity and overweight over the 17-year period do not follow the same pattern for males and females. Taking obesity and overweight altogether, the age-standardised prevalence for both males and females were 30.5% in 1987, 40.0% in 1992, 40.6% in 1998 and 35.7% in 2004.

## 3.5   Tobacco Consumption

Overall, 35.9% of males and 5.1% of females (aged 20-74 years) were current smokers in 2004 (Table 18).  The results also indicate that the percentages of smokers among males are higher in the younger age-groups (Table 19).

**Table 18 - Crude  prevalence of tobacco consumption 1987 - 2004**

| Survey years | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| Male | 57.9 | 47.3 | 42 | 35.9 |
| Female | 7 | 4.8 | 3.3 | 5.1 |
| Total | 30.7 | 24.3 | 20.2 | 18 |
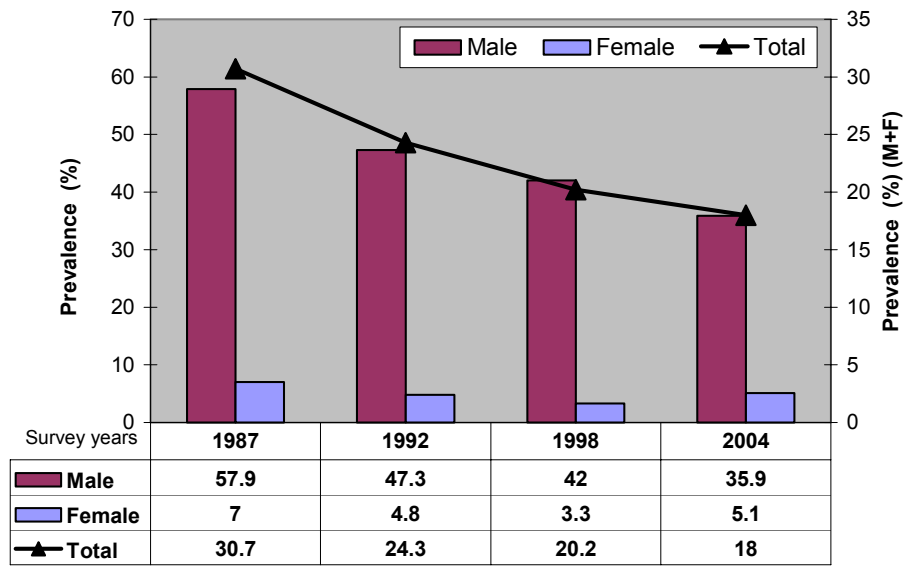
The prevalence of smokers among males indicate a downward trend across the 17-year period.  Among females, the prevalence remains low (Table 19).

**Table 19 - Age-specific smoking rates among males and females (2004)**

| | Current Smokers (%) | |
|---|---|---|
| **Age** | **Male** | **Female** |
| **20-29** | 43.4 | 6.0 |
| **30-39** | 39.3 | 4.2 |
| **40-49** | 38.4 | 6.4 |
| **50-59** | 32.5 | 3.3 |
| **60-74** | 24.9 | 5.4 |
| **20-74** | **35.9** | **5.1** |

## 3.6    Alcohol Consumption

The Survey results indicate that 58% of males and 28% of females consume alcohol with 15.0% of male drinkers taking alcohol everyday (Table 20).

**Table 20 - Distribution of alcohol consumption by frequency and sex among drinkers.**

|  | Male (%) | Female (%) |
|---|---|---|
| **Daily** | 15.0 | 4.1 |
| **4-6 times per week** | 4.3 | 1.2 |
| **2-3 times per week** | 18.2 | 4.4 |
| **Once a week or less** | 19.4 | 8.9 |
| **Occasionally** | 43.1 | 81.4 |
| **TOTAL** | **100.0** | **100.0** |

The findings also show that 22.5% of males aged 20-74 years were drinking alcohol more than once a week in 2004.  The corresponding figure among females was 5.6%.

In 2004, the distribution of alcohol consumption by ethnic group among males are as shown in Table 21.

**Table 21 – Alcohol consumption by ethnic group in men (2004)**

|  | Non drinkers % | Casual/Moderate drinkers % | Heavy drinkers % |
|---|---|---|---|
| **Hindu** | 24.7 | 52.4 | 22.9 |
| **Muslim** | 94.5 | 3.5 | 1.9 |
| **Creole** | 19.7 | 46.0 | 34.3 |
| **Chinese** | 37.1 | 49.5 | 13.5 |
| **Total** | **42.0** | **38.9** | **19.1** |

*Heavy drinkers are those who drink on 2 or more days a week and have at least 3 drinks per day. It also includes those who drink once a week or less but have more than 5 drinks on these days*.

The figures indicate that the crude prevalence of heavy males drinkers was 34.3% among "Creole" and 22.9% among "Hindu" in 2004.  The corresponding prevalence among "Chinese" and "Muslim" were 13.5% and 1.9% respectively.

Taking into consideration only heavy drinkers, i.e. people with abusive alcohol consumption, the results given in Table 22 indicate that crude prevalence among males had shown a downward trend between 1987 and 1992. However, the prevalence has increased by 20% between 1998 and 2004.

**Table 22 - Prevalence of abusive alcohol consumption 1987 - 2004**

| Survey years | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| Male | 18.2 | 14.4 | 15.9 | 19.1 |
| Female | 2.1 | 1.6 | 0.5 | 1.9 |
| Total | 9.6 | 7.5 | 7.2 | 9.1 |
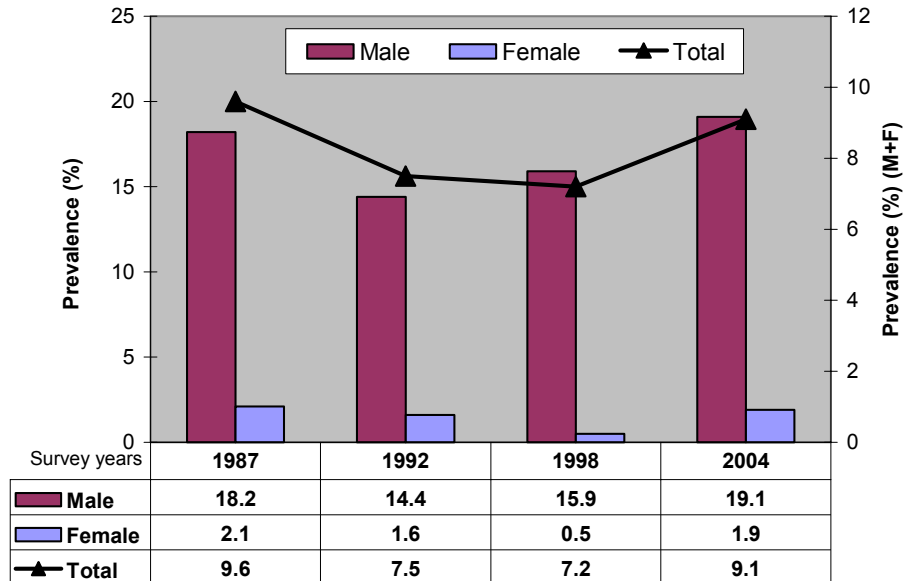
*NB:* *comparability of 2004 figures with previous surveys may be slightly affected because of definition*

## 3.7   Serum Lipids

These figures show that dyslipidaemia, a risk factor for cardio-vascular diseases and diabetes complications, is more common among males than among females (Table 23).

**Table 23 - Crude prevalence rates among adults aged 20-74 years of elevated total cholesterol, HDL-cholesterol and fasting triglyceride levels in 2004.**

|  | Male (%) | Female (%) |
|---|---|---|
| Cholesterol ≥ 6.5 | 10.3 | 8.2 |
| 6.5 > Cholesterol ≥ 5.2 | 34.6 | 28.5 |
| HDL-Cholesterol < 1.0 | 60.9 | 34.1 |
| Triglycerides ≥ 2 | 30.9 | 12.8 |

The results of the serum lipid tests done in 2004 among adults 20-74 years, by ethnic group and sex, are shown in Table 24.

**Table 24 – Serum lipid levels among adults aged 20-74 years by ethnic group and sex (2004)**

|  | Hindu % | Muslim % | Creole % | Chinese % |
|---|---|---|---|---|
| **Men** |  |  |  |  |
| Cholesterol ≥ 6.5 | 12.9 | 7.7 | 8.1 | 4.3 |
| 6.5 > Cholesterol ≥ 5.2 | 34.1 | 34.8 | 33.8 | 41.9 |
| HDL-cholesterol < 1.0 | 57.3 | 74.8 | 51.0 | 56.2 |
| Triglycerides ≥ 2 | 34.1 | 27.6 | 27.4 | 28.3 |
|  |  |  |  |  |
| **Women** |  |  |  |  |
| Cholesterol ≥ 6.5 | 7.9 | 7.8 | 9.5 | 7.1 |
| 6.5 > Cholesterol ≥ 5.2 | 27.8 | 30.2 | 27.5 | 32.3 |
| HDL-cholesterol < 1.0 | 33.9 | 41.3 | 27.6 | 24.5 |
| Triglycerides ≥ 2 | 13.9 | 14.0 | 9.5 | 10.1 |

The prevalence of elevated total cholesterol (≥ 5.2 mmol/L) is highest among the "Hindu" males and it is lowest among the females of the same ethnic group.

Concerning low HDL-cholesterol, the prevalence in both "Muslim" males and females is the highest.

As far as triglyceride levels are concerned, the prevalence in the "Hindu" males is the highest.  Among females, the levels are significantly higher among "Hindus" and "Muslims"

The evolution of dyslipidaemia levels during the period 1987 to 2004 is shown in Table 25. The improvement documented in 1992 did not continue till 1998. The situation worsened in 1998 to levels higher than those found in 1987. However, during the period 1998 to 2004, some improvements in most of the parameters under study were noted.

**Table 25 - Crude prevalence (%) of dyslipidaemia from 1987 to 2004.**

|  | 1987 | 1992 | 1998 | 2004 |
|---|---|---|---|---|
| **Male**<br>**Cholesterol ≥ 6.5** | 24.9 | 6.2 | 13.0 | 10.3 |
| **6.5 > Cholesterol ≥ 5.2** | 31.5 | 27.6 | 36.7 | 34.6 |
| **HDL-cholesterol < 1.0** | 22.7 | 18.4 | 57.0 | 60.9 |
| **Triglycerides ≥ 2** | 28.2 | 25.1 | 41.1 | 30.9 |
|  |  |  |  |  |
| **Female**<br>**Cholesterol ≥ 6.5** | 23.0 | 5.9 | 9.7 | 8.2 |
| **6.5 > Cholesterol ≥ 5.2** | 29.9 | 25.8 | 27.9 | 28.5 |
| **HDL-cholesterol < 1.0** | 13.9 | 9.2 | 47.3 | 34.1 |
| **Triglycerides ≥ 2** | 13.7 | 11.2 | 22.3 | 12.8 |

## 3.8    Leisure Physical Activity

In 2004, the prevalence of adequate (moderate or heavy) physical activity in the age group 35-54 years is 24.5% among males and 9.5% among females.  (Table 26)

**Table 26 - Prevalence (%) of leisure physical activity (moderate and heavy) in age group 35 – 54 years.**

|  | 1987* | 1992* | 1998* | 2004 |
|---|---|---|---|---|
| **Male** | 11.8 | 17.3 | 21.2 | 24.5 |
| **Female** | 1.4 | 2.3 | 7.2 | 9.5 |

*  adjusted for age

There has been an increasing trend in the prevalence of adequate leisure physical activity during the 17-year period both among males and females (Table 26). However, among males, only one in every 4 aged 35-54 years is engaged in such activity, and in females, the ratio is 1 in 10.  It emerges that physical activity level is still low, especially among the females.

# 4.    DISCUSSION

The findings of the 2004 Mauritius NCD Survey data suggest that there has been a number of noticeable changes in the evolution of diabetes, hypertension as well as their risk factors in the population during the past 17 years.

## 4.1    Diabetes Mellitus

The prevalence rate of Type 2 diabetes in adults aged 20-74 years in 2004 was found to be 15.0%.  In the age group 30 years and over the prevalence had reached 19.5% in 1998 from 14.3% in 1987.   In the 2004 survey, the prevalence in those aged 30 years and over was found to be 19.3%, showing a stabilisation in Diabetes  prevalence.

Case ascertainment of diabetes in the population remains at 53.4% showing that one in every two persons with diabetes still does not know that he/she has the disease.

The rate of poor control in those with the disease remains high with 60% of all diabetics surveyed being poorly controlled (FPG $\geq$ 8.5 mmol/L).   In 1998, the prevalence of poorly controlled diabetes (FPG $\geq$ 1.1 mmol/L) was 41% and this figure has fallen to 32.5% in 2004.  The level of poor controls remains very high.

### 4.2    Impaired Glucose Tolerance (IGT)

The prevalence of Impaired Glucose Tolerance (IGT) has decreased by over 40% during the period 1987 to 2004 and was found to be 12.0% in 2004.  If this trend continues or if this level is maintained a further reduction in the prevalence of Type 2 diabetes may be expected in future.  The fall in IGT prevalence may have resulted from a greater awareness of the need for the prevention of diabetes in the population through the adoption of a healthy lifestyle and falls in the prevalence of overweight and obesity, hyperlipidaemia and increase in physical inactivity.

## 4.3    Hypertension

The prevalence of hypertension continues to remain around 30%, ascertainment rate remains at 55% and the level of poor control of blood pressure (blood pressure $\geq$ 165/95 mmHg) in those with the disease is 39%.  A number of conditions may have contributed to this situation, namely stressful lifestyle, poor compliance with pharmacological and non-pharmacological treatment and the reluctance of people at risk to get screened and treated early.

## 4.4    Overweight and Obesity

A decrease of around 10% in overweight and obesity has been observed during the period 1998 to 2004. This may have resulted from a greater awareness in the population of the health risks associated with obesity and the need to maintain normal body weight. The prevalence of overweight and obesity in 2004 was 35.7 % with the condition being more prevalent among women than among males.

## 4.5    Hypercholesterolaemia

During the period 1987 to 2004 there has been an overall 20% reduction in the prevalence of hypercholesterolaemia (i.e. cholesterol $\geq 5.2$ mmol/L) in males and a 31% reduction among females. This may have resulted from greater awareness of the health risks associated with hypercholesterolaemia following health education and the availability of cholesterol lowering drugs.

## 4.6    Leisure Physical Activity

Leisure Physical Activity has continued to increase steadily in both males and females during the period 1987 to 2004. The prevalence of adequate moderate or heavy leisure physical activity has increased from 11.8% in 1987 in males to 24.5% in 2004 among males and from 1.4% in 1987 to 9.5% in 2004 among females. These figures are still low, especially in females and they are likely to increase as more and more adults adopt a healthier lifestyle where regular physical activity is an important component.

## 4.7    Tobacco Consumption

Tobacco consumption continues to decrease steadily with current smoking among males decreasing from 58% in 1987 to 36% in 2004. In females there was a steady decrease from 1987 to 1998 (i.e. from 7% to 3.3%) but during the period 1998 to 2004 there is an increase to 5.1%. Smoking remains more common in younger males. This steady fall may have resulted from greater awareness of the ill effects of tobacco on health, anti-smoking measures (fiscal and legislative) taken by the government and anti-tobacco campaigns by non-governmental and other organisations.

## 4.8    Alcohol Consumption

The prevalence of abusive alcohol intake in males was 18.2% in 1987; this level dropped to 14.4% in 1992 and since then it has been increasing and reached 19.1% in 2004. Among women there is a similar pattern and the level reached around 2% in 2004 from 0.5% in 1998. Abusive alcohol intake remains a major health problem despite health education and a number of measures (legislative, fiscal and others) taken to discourage people from drinking excessively.