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2011

### Understanding health profile of the middle-aged residents in Tsuen Wan

Tsuen Wan Safe and Health Community

Tsuen Wan Adventist Hospital

Asia-Pacific Institute of Ageing Studies, Lingnan University

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Tsuen Wan Safe and Health Community  
Tsuen Wan Adventist Hospital  
Asia-Pacific Institute of Ageing Studies, Lingnan University

# Understanding Health Profile of the Middle-aged Residents in Tsuen Wan

## Report

Year 2010/2011

## Table of Content

Table of Content .....	I
Acknowledgement.....	II
Table and Index .....	III
Consultant Team.....	V
Introduction .....	1
Chapter 1: Background.....	2
1.1 <i>Mandate of NCDs control</i> .....	2
1.2 <i>The prevalence of NCD in Hong Kong</i> .....	2
1.3 <i>Tsuen Wan as a safe and healthy community</i> .....	3
1.4 <i>Research Objectives</i> .....	3
Chapter 2: Guiding Literature .....	4
2.1. <i>Life course approach provide the best way to understand NCD</i> .....	4
2.2. <i>Building the first health profile for the potentially high risk</i> .....	5
Chapter 3: Methodology.....	7
3.1.    Sample.....	7
3.2.    Instrument Development.....	9
3.3.    Data Collection .....	9
Chapter 4: Data Analysis.....	10
4.1    Characteristics of Survey Population .....	10
4.2    Behavioral Risk Factors .....	12
4.3    Health Condition and Measurements .....	18
4.4    Combined Risk Factors.....	22
Chapter 5: Discussion and Way forward.....	24
5.1    Health risks different in sex .....	24
5.2    Environmental factors alter personal behaviors.....	24

## **Acknowledgement**

The Consultant Team would like to express our sincere thanks to all the stakeholders from Tsuen Wan's non-governmental organizations and community members, who participated in this *Health Profile Study of the Middle-aged Residents in Tsuen Wan*. We are most grateful to the residents for their participation in the interviews and at the same time, we share heartfelt gratitude to a team of volunteers for their generosity and endeavors. Finally, we are indebted to the support, guidance and advice from all the members of Tsuen Wan Safe and Health Community and Tsuen Wan Adventist Hospital all through the Study.

The Consultant Team  
Asia Pacific Institute of Ageing Studies  
Lingnan University

July 2011

## Table and Index

### List of Tables

Table 1	Proposed design of cluster sampling
Table 2	Distribution of collected samples
Table 3	Emerged sample distribution for data-analysis
Table 4	Demographic Indicators
Table 5	Eating patterns
Table 6	Comparison between TW & DH survey on dining out
Table 7	Smoking
Table 8	Comparison between TW & DH survey on smoking
Table 9	Alcohol consumption
Table 10	Comparison between TW & DH survey on alcohol consumption
Table 11	Physical activity
Table 12	Comparison between TW & DH survey on moderate exercise
Table 13	The prevalence of NCD in Tsuen Wan
Table 14	Overweight and obesity
Table 15	Blood pressure and hypertension
Table 16	Blood glucose and diabetes
Table 17	Cholesterol
Table 18	Combined risk factors

### List of Figures

Figure 1	A Life course perspective for maintenance of the highest possible level of functional capacity
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## Appendixes

Appendix 1            Schedule of data collection

## Abbreviations Index

APIAS	Asia-Pacific Institute of Ageing Studies
NCD	Non-communicable disease
TWAH	Tsuen Wan Adventist Hospital
TWSHCSC	Tsuen Wan Safe and Health Community Steering Committee
WHO	World Health Organization
DH	Department of Health, HKSAR
STEPS	Stepwise approach
BHBHK	Better Health for Better Hong Kong Campaign
BRFSS	Behavioral Risk Factor Surveillance System

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## **Introduction**

Modernization marked the progress of society and posed various changes to human life as well as the epidemiological transition. Improvements in public health care, living conditions, income and the control of infectious diseases were important factors in the first half of the twentieth century that led to the increases in life expectancy, while in the second half it was improvements in social conditions, health technologies such as antibiotics, and widespread immunization. The existences of advanced medical services effectively get rid of the prevalence of infectious disease that caused immediate human threats such as Measles and Smallpox.

Given that technological advancement helps to increase life-expectancy, people are now likely to die of diseases associated with living longer, such as stroke or heart disease, rather than the traditional infectious diseases of bacteria or genes. As a consequence, it comes to an era of chronic disease which progressively causes irreversible damages to health as well as posing long term burdens on healthcare and medical sector worldwide.

Considerable studies indicated that chronic disease developed through lifestyle risks and its severity is highly depended on how many cumulative risk factors that an individual exposed to. In regards to its own specific epidemiological nature, there are various terminologies such as 'Lifestyle disease', 'Illness of the wealth' occurs to identify all these distinctive characteristics and the term of Non-communicable disease (NCD) has been accepted as the official classification in Hong Kong.

This study explores 1) The guiding framework of health promotion strategies. 2) The general health condition among the middle-aged residents in Tsuen Wan. 3) The prevalence of the major risk factors of unhealthy diet, smoking, alcohol consumption and sedentary lifestyle. 4) Possible recommendations on health promotion to the district.



## Chapter 1: Background

### *1.1 Mandate of NCDs control*

The World Health Organization (2002) reported that Non-communicable disease (NCD) including cardiovascular diseases, cancers, chronic respiratory diseases and diabetes were the most predominated disease in the world, which accounted for 35 million global deaths in 2005 and projected to have remarkable increase. Acting as the legitimate authority on health monitoring, series of recommended actions that against NCD risk had been announced by the WHO (2008) in ‘2008-2013 Action Plan for the Global Strategy for the Prevention and Control of non-communicable diseases’.

Considering the cause of NCD is derived from lifelong risk factors typically developed through unhealthy behavioral practices, the suggested NCD framework highly emphasized on the promotion of healthy living practice in order to reduce potential risks. Since that NCD risk factors and its severity would accumulate in the life-course, therefore, the framework addressed that effective NCD control lies in early prevention as intervention may come too late once behavioral risks (ie. unhealthy diet, smoking, alcohol misuse and physical inactivity) have transformed into biomedical conditions (ie. obesity, high blood glucose and cholesterol). The framework suggested that health promotion strategies, with a strong focus on disease prevention, are needed to empower people to act both individually and collectively to prevent risky behaviors.

The WHO considered that the first action of NCD control was to collect health data in different counties and hence examine the prevalence of risk in specific areas. Under this circumstance, the STEPwise (STEPs) surveillance had been set up as the standard protocol which allows countries to collect health data as well as lifestyle practices of the people. In fact, many countries such as Cambodia (2010) and Maldives (2004) had been underwent the survey.

### *1.2 The prevalence of NCD in Hong Kong*

It had been evidently proved that NCDs and their risk factors initially occur among those with high socio-economic status and those living in urban areas. (WHO, 2010) As one of the world busiest city, many people in Hong Kong were surrounded by rushing environment with limited healthy choices around. In regards to the latest health statistic (2010), the percentage of registered deaths in Hong Kong were accounted for 31.2% (cancer), 15.6% (heart disease) and 8.4% (cardiovascular diseases), in which, cancer and heart disease remains as the top two killers over the past ten years.

### *1.3 Tsuen Wan as a safe and healthy community*

Tsuen Wan was one of the 18 administrative districts situated in the New Territory. The district was covered by approximately 6000 hectares and the latest population reported by the Population and Household Statistic (2009) was accounted for 291 800. It is important to secure a healthy living environment for a densely area, the Tsuen Wan District Council working closely with local stakeholders and community partners to secure district's living standard. In 2002, a professional team including the TW District Council, the Yuen Yuen Institute and devoted local stakeholders set up Tsuen Wan Safe and Healthy Community Steering Committee (TWSHCSC) in responsible for local health and safety issues. The committee has been designated by the WHO as a member of "Alliance for Healthy Cities" in 2007 and the district, also recognized as the 101th safe community in 2006.

Carrying the doctrine of healthy city, the TWSHCSC collaborated with Tsuen Wan Adventist (TWAH) to implement 'Health Union 2010' project in June 2010. The program aims to promote health and arouse public awareness on NCD through series of health education seminars as well as providing individual health check-up. For better understanding on the health condition of the district, the Asia-Pacific Institute of Ageing Studies of Lingnan University had been invited to undergo a health profile study along with this one year project.

### *1.4 Research Objectives*

- to conduct health check programs for the collection of individual health data related to non-communicable diseases as well as behavioral-biomedical risk factors and environmental determinants (only restrict to socio-economic status);
- to make use of the collected data for constructing a basic health profile of the middle-aged group as foundation for intervention assessment;
- to evaluate the correlation between NCDs and associated risk factors of middle-aged residents in Tsuen Wan District; and
- to suggest possible interventions.

## Chapter 2: Guiding Literature

The previous section present the background of NCD and the recommended framework of NCD control. The guiding literatures review the underlying reasons on why and how life-course perspective becomes the rationale for the study of NCD. Meanwhile, previous studies on NCD effectively explore the risks among people in different age and identify the gap in between; also it helps to provide supporting reasons to the needs of building health profile for the middle-aged.

### 2.1. *Life course approach provide the best way to understand NCD*

Using life-course approach to study health is not a new perspective in human history. Many scholars (Fries, 1982; Kuh and Ben-Shlomo, 1997) pointed out that it was more effective to deal with the underlying cause of disease development before its onset. The first notion to study the relationship between human's morbidity as well as mortality in age could be traced back to the James Fries over twenty years ago.

Referred to Fries, the Incremental Model of Chronic Disease (1981) identified the linear increase in morbidity as well as mortality rate. Meanwhile, he also addressed the compression of morbidity (1982) to explain the possibility of risk factors accelerates the first onset of chronic disease, in consequence, human has longer suffering period. The famous experiment Fries did was measure the differences of health changes between two smoking brother, with one smoked heavily than the other. Through the linear increase of morbidity/ mortality approach, the experiment presumed the two brothers suffered pneumonia at age 30 and Fries explained that the heavily-smoking bother has the higher possibility to suffer from intensive rehabilitations from heart attack, stroke and lung cancer since age 50 while his brother began to suffer at later age with relatively less effects. Fries claimed that, "*the burden of lifetime illness may be compressed into a shorter period before the time of death, if the age of onset of the first chronic infirmity can be postponed*", this sentence suggested that people should modify the risk factors at earlier stage in order to reduce the progressive severity of disease as well as to postpone multiple disease effects.

Several studies further taken Fries' concept and attempted to examine the development of risk factors even earlier than in adulthood and also suggested to study the critical periods of growth. The WHO (2000) defined critical period as "*when an insult during a specific period of development has lasting or lifelong effects on the structure or function of organs, tissues and body system*". According to Barker's idea on programming (1998), the critical period occurs long before the babe were born and he hypothetically assumed that adult chronic disease is biologically programmed in utero. The possible risks in utero such as mother's malnutrition might prone to babe's disproportionate fetal growth as well as lifetime disease development.

Other scholars Sholomo and Kuh analyzed how critical period in the life-course is crucial to NCD development and may act to cause chronic disease in four ways (WHO, 2002).

- *A critical period where an insult during specific period of growth causing lifelong effects to physical functioning;*
- *A critical period with later effect modifiers where the later factors may modify such as risk earlier incurred*
- *Accumulation of risk with separate and uncorrelated results where independent risk factors at each stage of life combine to raise disease risk*
- *Accumulation of risk with correlated results where one adverse experience will tend to another adverse experience in a cumulative way and create chains of risk*

The critical period of growths widely accepted as the foundation to understand NCD development which supporting the gradual accumulation of risk at each life stage combine to raise disease risk. Sholomo and Kuh (1997) supported the critical period models with different angle to Baker, they believed that any psychological or social experiences that human encountered in the life-course might also become the potential risks. In consequence, lifetime factors such as education, lifestyle and occupation which have no relation to genes or biological development should also account as the risk factors.

## *2.2. Building the first health profile for the potentially high risk*

The NCD framework suggests health promotion strategy to prevent chronic disease. Under this circumstance, the Hong Kong Department had commissioned several studies on specific health issues and conducted regular surveillance upon behavioral risk factors among various age groups to examine the lifestyle-risks at different age.

Studies from The Chinese University of Hong Kong (Ko, 2008; Sung 2007) found that obesity was remarkable among children due to the widely adoption of ‘western eating style’. Similarly, The Assessment of Dietary Pattern in Primary Schools (2008) reported that only 9.8% to 25.6% of the sampled Primary 4-5 students did not have any unhealthy foods<sup>1</sup> in the week prior to the survey. Meanwhile, only half of the targets consumed sufficient fruits and vegetables on a regularly basis which indicated that unhealthy diet are expectedly common among the youth.

Obesity is not only the case among youths. The Population Health Survey 2003/2004 identified 22.3% of men and 20% of women were obese. In addition, unhealthy lifestyle among adults was evidently showed in the Better Health for Better Hong Kong (BHBHK) Campaign. Off the 5882 working adults, 78% of them adopted sedentary lives and 50.3% reported by unhealthy diet.

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<sup>1</sup> Fried/deep-fried food, food high in sugar/salt/fat, and/or drinks with add sugar

The Health Statistic 2009 indicated older person who aged 65+ were the majority of all causes of death and around 43% of them were died from either cancer or heart disease. The Population Health Survey 2003/2004 discovered that 82.1% of people who aged 65-74 engaged in moderate exercise more than four days a week which was the highest proportion among all ages.

These findings evidently showed that a branch of people, whatever the age, were under certain kind of behavioral risks which cohere with the life-course perspective that we have been discussed in section 2.1. Apart from understanding lifelong risk factors associated to NCD development, the WHO also provided evidence to show how lifetime risks alter individual's functional capacity (Figure 2).

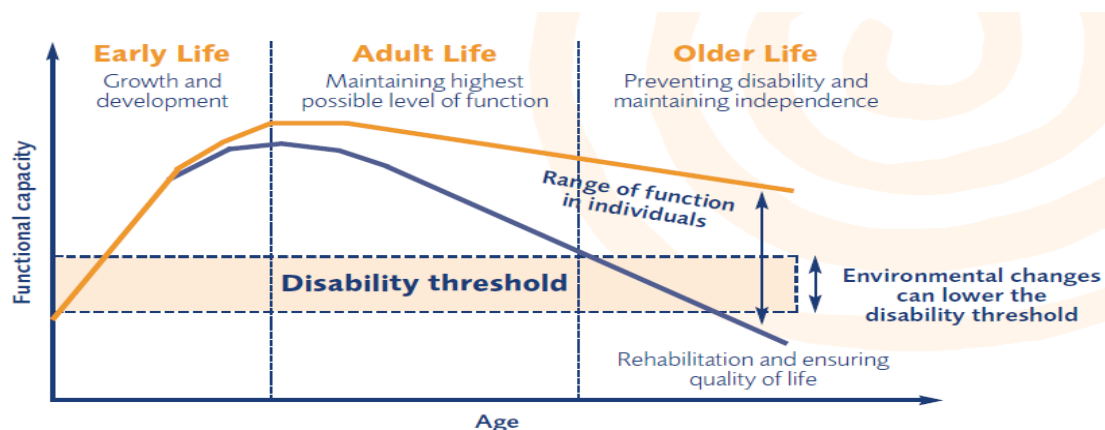


Figure 1: A Life course perspective for maintenance of the highest possible level of functional capacity (WHO, 2000)

The figure above indicated the changes of functional capacity in age. The WHO addressed that the rate of functional capacity decline is largely determined by behavior factors, the severity of cumulative risk begins to maximize at mid-adult life and finally lead to irreversible effects at later age.

The literatures examine how lifetime risk act to the development of disease and provides evidences to indicate the prevalence of risk factors varies in age. As functional capacity decline as age increase which at the same time point out that individual's resistance decline in age too. Therefore, the rate of morbidity in mid-adult life is potentially high and in fact, the middle-aged will be the final check point of NCD before it turns to irreversible. However, there are no existence research has been done among the middle-aged so far and this study will fill the gap and provide the first basis of health condition among the potentially high risk group.

## Chapter 3: Methodology

### 3.1. Sample

The guiding literatures pointed out that the lifetime developments are crucial to understand the accumulation of risks as well as NCD development. To examine the prevalence of risk factors varies in age, this study expected to collect 600 samples from people who age 41-65 years with 5-year intervals as the age-range.

Since that every physical and social factors could be act to disease development, socio-economic factors had been taken into investigation. Cluster sampling method had been used to ensure a fair size of sample were further drawn according to individual's socio-economic status starting from gender, age group, employment status and education level (Table 1). In addition, four follow-up focus groups were designed to cross check with the quantitative data and to generate opinions for facilitating the design of healthy lifestyle promotion programs.

	Working group				Non- Working group			
	High Education		Low Education		High Education		Low Education	
	Men	Women	Men	Women	Men	Women	Men	Women
41-45	15	15	15	15	15	15	15	15
46-50	15	15	15	15	15	15	15	15
51-55	15	15	15	15	15	15	15	15
56-60	15	15	15	15	15	15	15	15
61-65	15	15	15	15	15	15	15	15
Cluster-total	75	75	75	75	75	75	75	75
Sub-total	300				300			
<b>Total</b>	<b><u>600</u></b>							

\*Working group: Either working as full/part time job or unemployed in the previous 6 months

\* Non-working group: Housewives who not working in the previous 6 months and/or those retired.

\* High Education Level: Secondary Five and/or above

\* Low Education Level: Secondary Four and/or below

#### 3.1.1 Limitation and Justification

The eight months data collection period successfully collected information from 430 samples with mild degree of under-sample existed. Table 2 indicated the overall distribution of collected samples and the response rate of men was comparatively lower than women, typically among the non-working young men.

Table 2: Distribution of collected sample								
	Working group				Non- Working group			
	High Education		Low Education		High Education		Low Education	
	Men	Women	Men	Women	Men	Women	Men	Women
41-45	6	<u>14</u>	4	11	0	10	1	6
46-50	6	<u>19</u>	10	12	0	13	0	<u>14</u>
51-55	<u>16</u>	12	10	<u>14</u>	2	11	3	<u>28</u>
56-60	4	5	<u>16</u>	<u>20</u>	6	<u>15</u>	4	<u>33</u>
61-65	7	1	6	5	8	<u>15</u>	<u>15</u>	<u>48</u>
Cluster-total	39	51	46	62	16	64	23	129
Sub-total	198				232			
<b>Total</b>	<b><u>430</u></b>							

The problem of under-sample particularly among the youngest group might lead to ineffective analysis. Under this circumstance, the study emerged the original cluster into two groups of 10-years interval and one group of 5-years interval to ensure that samples were valid to generate analysis with 95% confidence level. Hence, the samples had been clustered into the younger middle-aged, the middle-aged and the old age according to the age range (Table 3).

Table 3: Emerged sample distribution for data-analysis		
	Men	Women
41-50	27	99
51-60	61	138
61-65	36	69
Sub-total	124	306
<b>Total</b>	<b><u>430</u></b>	

The greatest problem the team encountered was underestimated the possibility of finding sample according to the criteria. In fact, the gaps of sampling did not effectively provide a representative sample which reflecting the general health status among the middle-aged resident in Tsuen Wan. Therefore, this study aim to provide the basis and evidence to show the health condition among the middle-aged targets. We taken this study as the first step to screen out the potential health risks and the groups at risk in the district. It was the first study in Tsuen Wan upon NCD risks, the result would be worth to the future planning on NCD control as well as health promotions. A large samples which cover all ages in the district is inevitably recommend for a representative sampling and would be suggest as the follow-up study.

## **3.2. Instrument Development**

The health profile questionnaire was designed base on the WHO's STEP approach for NCD surveillance. The core information which contain basic socio-economic and behavioral risk data are collected in step 1, followed by simple physical measurement on individual's height, weight, waist and blood pressure, and the last step is taking biomedical measurement on blood glucose and cholesterol. Apart from the core information on diet, smoking alcohol, physical activity and health-data, some questions that specifically applied to Hong Kong also included such as the Healthy Eating Principles.

## **3.3. Data Collection**

### 3.3.1 Interview Training

The interview team consisted of 8-10 elders who were well-trained by basic interview techniques and assisted in interviews for previous APIAS researches. All interviewers had given 3 hours general training in May, at which the questions, guidelines, show-cards and interviewer instructions were gone through. Short briefings to the team were given by the chief researcher before each data-collection section for any reminder and clarification.

### 3.3.2 Procedure

The data were collected by on-site face-to-face interviews at the health check section. A detail schedule of the 15 health check sections was listed in appendix 1. The organizing committee of Health Union 2010 invited Tsuen Wan residents to register as member and throughout the year, a series of health activities including 3 Health Talks, an individual health check and half-day health camp were provided to each member.

The health check sections were conducted by staffs from TWAH and TWSHCSC. Participants who were eligible for the survey would be invited for a 20mins interview after registration and proceed to individual's health check.

### 3.3.3 Quality Assurance

Each interviewer assisted in having instant verification on the completed questionnaire and the chief researcher overhauled all questionnaire onsite. The interview procedures as well as the collection of health check data were reviewed by the chief researcher, who identified the troubles and difficulties encountered.



## Chapter 4: Data Analysis

### 4.1 Characteristics of Survey Population

In total, there were 430 out of 600 Tsuen Wan residents ranging from age 41-65 years old participated in the survey and the response rate reached 71.7%. The demographic and socio-economic backgrounds of the targeted samples were listed in Table 4.

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
<b><u>Marital Status</u></b>												
Single	3.7%	5.1%	4.8%	1.6%	2.0%	2.0%	2.8%	0.0%	1.0%	2.4%	2.6%	0.6%
Married	96.3%	87.9%	89.7%	95.1%	87.7%	89.9%	97.2%	78.3%	84.8%	96.0%	85.6%	88.6%
Separated	0.0%	0.0%	0.0%	3.3%	0.7%	0.5%	0.0%	0.0%	0.0%	0.0%	0.3%	0.2%
Divorced	0.0%	6.1%	4.8%	0.0%	6.5%	5.5%	0.0%	8.7%	5.7%	1.6%	6.9%	5.3%
Widowed	0.0%	1.0%	0.0%	0.0%	2.9%	2.0%	0.0%	13.0%	8.6%	0.0%	4.6%	3.3%
<b><u>Education Level</u></b>												
Uneducated	0.0%	0.0%	0.0%	0.0%	1.4%	1.0%	0.0%	7.2%	4.8%	0.0%	2.3%	1.6%
Primary or below	22.2%	14.1%	15.9%	29.5%	31.2%	30.7%	25.0%	33.3%	30.5%	26.6%	26.1%	26.3%
F.1-F.4	33.3%	29.3%	30.0%	24.6%	36.2%	32.7%	33.3%	36.0%	35.2%	29.0%	34.0%	32.6%
F.5-F.7	25.9%	42.4%	38.9%	29.5%	26.1%	27.1%	19.4%	18.8%	19.0%	25.8%	29.7%	28.6%
Tertiary or above	18.5%	14.1%	15.1%	16.4%	5.1%	8.5%	22.2%	4.3%	10.5%	18.5%	7.8%	10.9%
<b><u>Employment Status</u></b>												
Full-time	96.3%	33.3%	46.8%	65.6%	20.3%	34.2%	27.8%	2.9%	11.4%	61.3%	20.6%	32.3%
Part-time	0.0%	20.2%	15.9%	8.0%	15.9%	13.6%	5.6%	5.8%	5.7%	5.6%	15.0%	12.3%
Unemployed	0.0%	3.0%	2.4%	1.6%	0.7%	1.0%	2.8%	0.0%	1.0%	1.6%	1.3%	1.4%
Retired	0.0%	1.0%	0.8%	21.3%	11.6%	14.6%	63.9%	31.9%	42.9%	29.0%	12.7%	17.4%
Housewife	0.0%	42.4%	33.3%	0.0%	50.7%	35.2%	0.0%	58.0%	38.1%	0.0%	49.7%	35.3%
Others	3.7%	0.0%	0.8%	0.0%	0.7%	1.5%	0.0%	1.4%	1.0%	2.4%	0.7%	1.2%
<b><u>Monthly Income</u></b>												
No Income	0.0%	41.4%	32.5%	14.8%	54.3%	42.2%	55.6%	85.5%	75.2%	23.4%	57.2%	47.4%
\$5999 or below	0.0%	21.2%	16.7%	9.8%	21.7%	18.1%	16.7%	5.8%	9.5%	9.7%	18.0%	15.6%
\$6000 - \$9999	25.9%	13.1%	15.9%	19.7%	12.3%	14.6%	5.6%	4.3%	4.8%	16.9%	10.8%	12.6%
\$10000 - \$19000	40.7%	14.1%	19.8%	29.5%	5.8%	13.1%	13.9%	4.3%	7.6%	27.4%	8.2%	13.7%
\$20000 - \$39999	18.5%	6.1%	8.7%	19.7%	4.3%	9.0%	5.6%	0.0%	1.9%	15.3%	3.9%	7.2%
\$40000 or above	14.8%	3.0%	5.6%	6.6%	0.7%	2.5%	2.8%	0.0%	1.0%	7.3%	1.3%	3.0%
<b><u>Source of Income</u></b>												
Salary	100.0%	53.5%	63.5%	80.3%	26.5%	42.7%	27.8%	8.7%	15.2%	69.4%	31.0%	42.1%
Family support	0.0%	41.4%	32.5%	11.5%	61.8%	45.7%	38.9%	71.0%	60.0%	16.9%	56.9%	45.3%
CSSA	0.0%	3.9%	2.4%	0.0%	0.7%	0.5%	2.8%	1.5%	1.9%	0.8%	1.6%	1.4%
Personal saving	0.0%	2.0%	1.5%	3.3%	4.4%	4.0%	19.4%	14.5%	16.2%	7.3%	5.9%	6.3%
Others	0.0%	0.0%	0.0%	4.9%	6.6%	6.0%	11.1%	4.3%	6.7%	5.6%	3.9%	4.4%
<b><u>Living Arrangement</u></b>												
Living alone	3.7%	3.0%	3.2%	3.3%	8.7%	7.0%	0.0%	13.0%	8.6%	2.4%	7.8%	6.3%
Living with spouse and/or children	96.3%	92.9%	93.7%	96.7%	90.6%	92.5%	97.2%	87.0%	90.5%	96.8%	90.5%	92.3%
Others	0.0%	4.0%	3.2%	0.0%	0.7%	0.5%	2.8%	0.0%	1.0%	0.8%	1.6%	1.4%

#### 4.1.1 Age and Gender

There were 71.5% of female and 28.8% of male respondents participated in the survey with overall mean age at 54.5. On average, the mean age of men and women were 55.6 and 54.1 respectively.

#### 4.1.2 Marital Status and Living Arrangement

Married population accounted for 88.6%. The survey reported that the majority of sample living with family, only 6.3% lived alone and most of them were women. Besides, 79.3% of the surveyed population has been living in Tsuen Wan for at least 10 years.

#### 4.1.3 Education Level

The low education group (on or below S.4) accounted for 60% of the surveyed population. Respondents with high education level were commonly found in the younger middle-age, whereas around 70% of the old-age samples dominated the low education group in which 4.8% claimed to be uneducated. In regards to sex, higher proportion of women was found in low education group with rare proportion in tertiary level; however, the proportion of men (18.5%) with tertiary education was almost a double in women (7.8%).

The study reported that sample with high education level were the younger middle-aged (age 41-50) which showing that the progressive development of society offers better education to the public, in resulting of more literate people from generation to generation.

#### 4.1.4 Employment Status and Personal Income

Half of the surveyed population belongs to non-working group in which 17.4% were retired and 35.3% were housewives. Male working respondents were reported by higher percentage across all ages, 61.5% of men and 20.6% of women engaging in full-time jobs, however, the proportion of part-time works were higher in women.

On financial condition, respondents with no monthly income accounted for 47.4% and almost half of them were women. On average, the average income of the overall population was around \$6,902. In fact, the average amounts were quite varied in sex that the mean income among men and women were around \$13,257 and \$4,326 respectively.

Wages and family support were the main source of income and each of them took up 40% of the overall population. In regards to sex, 69.4% of men's income was come from paid-job while 56.9% of women's income was from family support. This figure reinforce that higher proportion of the sampled men were the working group. In

addition, 6.3% of the respondent supported their living by personal saving and only 1.4% of the sample relies on government's provision.

## 4.2 Behavioral Risk Factors

Behavioral risk factors including unhealthy diets, smoking, alcohol consumption, physical inactivity and biomedical conditions were reported as the fundamental attributes in NCD development. This section presents the behavioral patterns of the surveyed population and some relevant data will be compared to the data from Behavioral Risk Factor Surveillance System (BRFSS)<sup>2</sup> to examine certain findings.

### 4.2.1 Eating Patterns

Table 5 indicates the general eating patterns of the respondents in terms of the frequency of dining out, fruits and vegetables consumption and the practices of health eating principles.

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
<b><u>Dining Out</u></b>												
Mean days on outdoor lunch	4.4	3	3.3	3.4	2.6	3.2	2.7	1.6	2	3.4	2.5	2.8
Mean days on outdoor dinner	2.4	0.8	2	1.9	1.5	1.6	0.9	0.8	0.8	1.7	1.4	1.5
Irregular meal times (both lunch and dinner)	3.7% (± 7.6)	5.1% (± 4.3)	4.8% (± 3.7)	14.8% (± 9.1)	7.2% (± 4.4)	9.5% (± 4.2)	8.3% (± 9.5)	2.9% (± 4.1)	4.8% (± 4.1)	10.5% (± 5.5)	5.6% (± 2.5)	7.0% (± 2.4)
Rarely consume household meals	14.8% (± 14.3)	8.1% (± 5.4)	9.5% (± 5.2)	13.1% (± 8.7)	5.8% (± 3.9)	8.0% (± 3.9)	0	1.4% (± 2.9)	1.0% (± 1.8)	9.7% (± 5.3)	5.6% (± 2.5)	6.7% (± 2.4)
Mean number of drinking water (per days)	6.1	5.9	6	5.8	3.1	6	6.5	6.4	6.4	6.1	6.1	6
<b><u>Fruits and Vegetables In-take</u></b>												
Mean days of fruits consumption (per week)	4.6	5.4	5.2	5.2	5.7	5.6	5.8	6.4	6.2	5.2	5.8	5.6
Mean days of vegetable consumption (per week)	5.7	6.5	6.3	6	6.6	6.4	6.4	6.8	6.6	6	6.6	6.5
Low Fruits in-take (less than 3 days a week)	33.3% (± 19.0)	23.2% (± 8.5)	25.4% (± 7.7)	26.2% (± 11.4)	17.4% (± 6.4)	20.1% (± 5.6)	13.9% (± 11.9)	8.7% (± 6.8)	10.5% (± 5.9)	24.2% (± 7.6)	17.3% (± 4.3)	19.3% (± 3.7)
Low Vegetables in-take (less than 3 days a week)	11.1% (± 12.7)	1.0% (± 2.0)	3.2% (± 3.1)	11.5% (± 8.2)	2.9% (± 2.8)	5.5% (± 3.2)	5.6% (± 7.8)	1.4% (± 2.9)	2.9% (± 3.2)	9.7% (± 5.3)	2.0% (± 1.5)	4.2% (± 1.9)
<b><u>Health Eating Principles</u></b>												
Adopting "2 Plus 3 A Day" regularly	55.6% (± 20)	74.2% (± 8.8)	70.2% (± 8.1)	50.8% (± 13.2)	72.4% (± 7.6)	65.8% (± 6.8)	34.3% (± 16.5)	79.7% (± 10.1)	63.6% (± 9.6)	47.1% (± 9.0)	74.6% (± 5.0)	66.6% (± 4.5)
Adopting "3:2:1 proportion" regularly	59.2% (± 19.8)	88.9% (± 6.2)	82.5% (± 6.8)	68.3% (± 12.1)	92.0% (± 4.6)	84.8% (± 5.0)	61.1% (± 16.7)	79.7% (± 9.7)	73.3% (± 8.6)	64.2% (± 8.6)	88.2% (± 3.6)	81.3% (± 3.7)
Adopting "3 Low 1 High" regularly	51.9% (± 20.1)	83.8% (± 7.4)	76.7% (± 7.7)	62.3% (± 12.5)	86.1% (± 5.9)	78.8% (± 5.7)	61.1% (± 16.7)	85.5% (± 8.5)	77.1% (± 8.2)	59.7% (± 8.7)	85.2% (± 4.1)	77.9% (± 3.9)
Unwilling to adopt healthy eating principles	14.8% (± 14.3)	4.1% (± 4.0)	6.4% (± 4.4)	8.2% (± 7.1)	5.8% (± 3.9)	6.5% (± 3.5)	5.6% (± 7.8)	4.3% (± 5.0)	4.8% (± 4.1)	8.9% (± 5.0)	4.9% (± 2.5)	6.1% (± 2.2)

<sup>2</sup> The Behavioral Risk Factor Surveillance System (BRFSS) set up by the Hong Kong Department of Health (DH) to collect health information among Hong Kong adults. Around 2000 adults (age 18-64) were randomly invited for the telephone interview each year.

## *Dining out*

Excess fat, salt and oversized portions usually exist in outdoor meals which definitely an attribute to chronic disease. The survey reported that respondents averagely spent 2.8 days and 1.5 days on outdoor lunch and dinner respectively in a typical week. The frequency of dining out tends to be common among men particularly on outdoor lunch. In regards to age, both sexes reported that the younger-middle age were the majority of outdoor meals. In total, the percentages of men who had irregular meal times were almost a double than in women. Men were also reported by rare household meal across all age except aged 61-65.

Table 6 presents the comparison between the DH and TW survey on the prevalence of dining out. The latest DH survey reported that outdoor lunch were commonly found in men actually as same as the sample result. However, a significant raise among the percentage on outdoor dinner (9.8%) show that this typical patterns were proportionally greater than the DH reported, and comparatively more prevalent among men in the sample area.

	N		Both Sexes		Men		Women	
	DH (TN=2013)	TW (TN=430)	DH	TW	DH	TW	DH	TW
	Outdoor Lunch times in a week $\geq 5$	933	146	46.4%	34.0%	63.2%	48.4%	32.1%
Outdoor Dinner times in a week $\geq 5$	189	42	9.4%	9.8%	12.3%	<u>16.9%</u>	6.9%	6.9%

## *Fruits and Vegetables Consumption*

Fresh fruit and vegetable which contain vitamins and dietary fibers are essential nutrients to protect our health. On average, the weekly consumption of fruits and vegetables were 5.61 days and 6.45 days respectively. In regards to sex, women were comparatively higher than men in both fruits and vegetables in-take. Both sexes reported that the consumption of fruits and vegetables increase as well as age increase.

Many dietary guidelines include advice on the consumption of at least five portions a day of fruit and vegetable are beneficial to health. There were 19.3% ( $\pm 3.7$ ) and 4.2%  $\pm (1.9)$  of the sample population accounted for low consumption on fruits and vegetables respectively. Low frequency of fruit and vegetable in-take were typically found in the younger middle-age (25.4%  $\pm 7.7$ ), and also the proportions of low in-take level were comparatively high in men than women.

## *Healthy Eating Principles*

With reference to the advice on fruits and vegetable in-take, the Department of Health launched series of healthy eating campaign in which the slogans of “2 Plus 3 A Day<sup>3</sup>”

<sup>3</sup> For the promotion of optimal health, a daily intake of at least 2 servings of fruits and 3 servings of vegetables as part of a balanced diet”, Department of Health, HKSAR

“3 Low 1 High<sup>4</sup>” and “3:2:1 proportion<sup>5</sup>” has been widely introduced to the public. The survey revealed that “2 Plus 3 A Day” were the least popular one among the samples with only 66.6% ( $\pm 4.5$ ).

The figure also indicated that the incentive towards these principles was comparatively low in men and there were 8.9% ( $\pm 5$ ) of them had no intension to adopt these principles even if he knows it was good for health. The reasons of low incentive were commonly due to personal favor and time constrain.

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<sup>4</sup> Choose food low in fat, sodium and sugars as well as high in dietary fibre”, Centre for Food Safety, HKSAR

<sup>5</sup> The Food Pyramid: arrange your meal according to 3 proportions of grains and cereals, 2 proportions of fruits and vegetables and 1 proportion of meats, oil and fat”, Center of Health Education Unit, HKSAR

## 4.2.2 Smoking

Cigarettes release many chemicals such as tar and nicotine could damage human body and evidences shows that smokers are at higher risk for cancers. Table 7 presents the smoking habits of the survey, the figures show that 7% ( $\pm 2.4$ ) were current smokers and 6.3% ( $\pm 2.3$ ) were daily smokers. In terms of smoking frequency, 5.1% ( $\pm 2.1$ ) of the overall respondents smoke at least 10 times a week and 6.0% ( $\pm 2.3$ ) accounted for smokers who obtained smoking habits for at least 10 years.

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
Current Smoker	22.2% ( $\pm 16.8$ )	2.0% ( $\pm 2.8$ )	6.3% ( $\pm 4.4$ )	24.6% ( $\pm 11.1$ )	2.9% ( $\pm 4.1$ )	9.5% ( $\pm 4.2$ )	8.3% ( $\pm 9.5$ )	0	2.9% ( $\pm 3.2$ )	19.4% ( $\pm 7.0$ )	2.0% ( $\pm 1.5$ )	7.0% ( $\pm 2.4$ )
Daily Smoker	18.5% ( $\pm 15.7$ )	1.0% ( $\pm 2.0$ )	4.8% ( $\pm 3.7$ )	23.0% ( $\pm 10.8$ )	2.9% ( $\pm 4.1$ )	9.0% ( $\pm 4.1$ )	8.3% ( $\pm 9.5$ )	0	2.9% ( $\pm 3.2$ )	17.7% ( $\pm 6.9$ )	1.6% ( $\pm 1.5$ )	6.3% ( $\pm 2.3$ )
Smoking $\geq 10$ times a week	11.1% ( $\pm 12.7$ )	0	2.4% ( $\pm 2.7$ )	23.0% ( $\pm 10.8$ )	1.4% ( $\pm 2.1$ )	8.0% ( $\pm 3.9$ )	8.3% ( $\pm 9.5$ )	0	2.9% ( $\pm 3.2$ )	16.1% ( $\pm 6.6$ )	0.7% ( $\pm 0.9$ )	5.1% ( $\pm 2.1$ )
Obtain regular smoking habits $\geq 10$ years	18.5% ( $\pm 15.7$ )	0	4.0% ( $\pm 3.4$ )	23.0% ( $\pm 10.8$ )	2.9% ( $\pm 2.8$ )	9.0% ( $\pm 4.1$ )	8.3% ( $\pm 9.5$ )	0	2.9% ( $\pm 3.2$ )	17.7% ( $\pm 6.9$ )	1.3% ( $\pm 1.3$ )	6.0% ( $\pm 2.3$ )
Frequently affected by passive smoking	7.4% ( $\pm 10.6$ )	17.2% ( $\pm 7.5$ )	15.1% ( $\pm 6.3$ )	8.3% ( $\pm 7.2$ )	18.8% ( $\pm 6.6$ )	15.7% ( $\pm 5.1$ )	5.6% ( $\pm 7.8$ )	10.1% ( $\pm 7.4$ )	8.6% ( $\pm 5.4$ )	7.3% ( $\pm 4.7$ )	16.3% ( $\pm 4.2$ )	13.8% ( $\pm 3.2$ )

Rare percentage on smoking was found in women but male's percentage on smoking were almost 10 times greater than women. The middle-aged sampled were reported by higher percentage in smoking, typically prevalent among 51-60 years but dropped at old-age. Tough that women smokers were uncommon, 16.3% ( $\pm 4.2$ ) of women claimed that they were frequently affected by passive smoking which indicated that women were also prone to certain risks of disease that caused by cigarettes.

Comparing to the latest DH survey on smoking, Table 3a shows that the percentage of daily smokers decreased as well as non-smoking numbers increased, which mean that smoking in Tsuen Wan was comparatively less prevalent than the DH reported.

	N		Both Sexes		Men		Women	
	DH (TN=2013)	TW (TN=430)	DH	TW	DH	TW	DH	TW
Daily smoker	260	27	12.9%	6.3%	21.2%	17.7%	6.0%	1.6%
Never smoke	1522	954	75.6%	91.1%	61.5%	75.6%	87.5%	97.4%

## 4.2.3 Alcohol Consumption

Obesity can be a consequence of excessive alcohol consumption which putting people in the risk of wide range of illness. Table 9 assesses the patterns and prevalence of alcohol consumption.

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
Always consume alcoholic drinks	3.7% (± 7.6)	1.0% (± 2.0)	1.6% (± 2.2)	14.8% (± 9.1)	1.4% (± 2.1)	5.5% (± 3.2)	16.7% (± 12.8)	0	5.7% (± 4.5)	12.9% (± 6.0)	1.0% (± 1.1)	4.4% (± 2.0)
Consumed ≥10 times on alcohol over the past 30 days	7.4% (± 10.6)	3.0% (± 3.5)	4.0% (± 3.4)	23.0% (± 10.8)	0.7% (± 1.5)	7.5% (± 3.7)	27.8% (± 15.3)	0	9.5% (± 5.7)	21.0% (± 7.2)	1.3% (± 1.3)	7.0% (± 2.4)
Obtain regular drinking habit	22.2% (± 16.8)	11.1% (± 6.3)	13.5% (± 6.0)	39.3% (± 12.7)	8.0% (± 4.5)	17.6% (± 5.3)	41.7% (± 16.9)	1.4% (± 2.9)	15.2% (± 7.0)	<u>36.3%</u> (± 8.6)	7.5% (± 3.0)	15.8% (± 3.5)
Obtain regular drinking habit for ≥10 years	11.1% (± 12.7)	4.0% (± 4.0)	5.6% (± 4.0)	26.2% (± 11.4)	2.2% (± 2.4)	9.5% (± 4.2)	36.1% (± 16.5)	1.4% (± 2.9)	13.3% (± 6.6)	<u>25.8%</u> (± 7.8)	2.6% (± 1.8)	9.3% (± 2.8)
Daily drinkers	3.7% (± 7.6)	0	0.8% (± 1.6)	13.1% (± 8.7)	0	4.0% (± 2.8)	16.7% (± 12.8)	0	5.7% (± 4.5)	<u>12.1%</u> (± 5.8)	0	3.5% (± 1.7)

The data revealed that excessive alcohol consumption was not typical in the sample area. Only 7% (±2.3) of the sample population reported of having ≥10 times of alcohol consumption in the past 30 days and only 4.4% (±2.0) claimed to consume alcoholic drinks frequently.

Alcohol consumption was more prevalent in men across all ages. Off the 15.8% (±3.4) reported regular drinkers, only 7.5% (±3.0) were women while 36.3% (±8.6) were male drinkers. No female respondent were daily drinkers but 12.1% (±5.8) of male respondents did, meanwhile, the percentage of men with regular drinking habits for at least 10 years were 10 times greater than the rate in women.

In regards to the types of alcoholic drinks, Beers (21.8%) and Red/White wine (23%) were the most popular alcoholic drinks among respondents. Drinks that contain high percentage of alcohol such as Tequila and Vodka were reported by around 3.5%.

Table 10 indicated the comparison of the DH and sampled survey on alcohol consumption. Comparatively, the figure of daily drinkers was proportionally increased by 0.8% of the DH reported. However, the prevalence of male daily drinkers (12.1%) was sharply increased by 3 folds. Besides, both surveys reported that the percentage of regular drinkers was in similar proportion, in which the percentage of such pattern among women kept constant but increased in men.

	N		Both Sexes		Men		Women	
	DH (TN=2013)	TW (TN=430)	DH	TW	DH	TW	DH	TW
Consume alcohol everyday	54	15	2.7%	<u>3.5%</u>	4.7%	<u>12.1%</u>	0.9%	0.0%
Obtain regular drinking habits	338	68	16.8%	15.8%	27.4%	<u>36.3%</u>	7.8%	7.5%

#### 4.2.4 Physical Activity

Regular physical activity helps to maintain an optimum body weight and healthy bones, muscles and joints, hence reduces the risk of developing chronic diseases. The survey assessed both work-related and leisure exercises that respondent has taken and the results were shown in Table 11.

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
<b>Work-Related Physical Activity</b>												
Rare mild exercise for at least 10 mins	33.3% (± 19.0)	12.1% (± 6.6)	16.7% (± 6.6)	26.2% (± 11.4)	16.7% (± 6.3)	19.6% (± 5.6)	22.2% (± 14.3)	14.5% (± 8.5)	17.1% (± 7.4)	26.6% (± 7.9)	14.7% (± 4.0)	18.1% (± 3.7)
Rare moderate exercise for at least 10 mins	33.3% (± 19.0)	25.3% (± 8.7)	27.0% (± 7.8)	27.9% (± 11.5)	22.5% (± 7.0)	24.1% (± 6.0)	38.9% (± 16.7)	20.3% (± 9.7)	26.7% (± 8.6)	32.3% (± 8.3)	22.9% (± 4.7)	25.6% (± 4.1)
No Stretching exercise at work	44.4% (± 20.1)	29.3% (± 9.1)	32.5% (± 8.3)	36.1% (± 12.4)	37.0% (± 8.3)	36.7% (± 6.8)	36.1% (± 16.5)	38.2% (± 11.9)	37.5% (± 9.5)	37.9% (± 8.7)	34.8% (± 5.4)	35.7% (± 4.5)
No walking/cycling for at least 10 mins a day	18.5% (± 15.7)	15.2% (± 7.1)	15.9% (± 6.4)	9.8% (± 7.7)	17.6% (± 6.5)	15.2% (± 5.1)	13.9% (± 11.9)	15.9% (± 8.9)	15.2% (± 7.0)	12.9% (± 6.0)	<u>16.4%</u> (± 4.2)	15.4% (± 3.5)
Average Sitting hour ≥ 7 hours a days	<u>14.8%</u> (± 14.3)	<u>13.1%</u> (± 6.8)	<u>13.5%</u> (± 6.0)	9.8% (± 7.7)	7.3% (± 4.4)	8.1% (± 3.8)	8.3% (± 9.5)	7.4% (± 6.3)	7.7% (± 5.2)	10.5% (± 5.5)	9.2% (± 3.3)	9.6% (± 2.8)
<b>Leisure Exercise</b>												
Low level of mild exercise (less than 3 times per week)	85.2% (± 14.3)	68.7% (± 9.3)	<u>72.2%</u> (± 7.9)	72.1% (± 11.6)	46.3% (± 8.5)	54.3% (± 7.0)	36.1% (± 16.5)	30.4% (± 11.2)	32.38% (± 9.1)	64.5% (± 8.6)	50.0% (± 5.7)	54.2% (± 4.7)
Low level of moderate exercise (less than 3 times per week)	51.9% (± 20.1)	36.7% (± 9.7)	<u>40.0%</u> (± 8.7)	45.9% (± 12.9)	28.3% (± 7.6)	33.7% (± 6.6)	25.0% (± 14.9)	10.4% (± 7.6)	15.5% (± 7.1)	41.1% (± 8.8)	27.1% (± 5.0)	31.1% (± 4.5)
Rare engaging vigorous activity	69.2% (± 19.0)	86.7% (± 6.9)	83.1% (± 6.7)	80.3% (± 10.3)	84.1% (± 6.1)	82.9% (± 5.3)	68.6% (± 16.2)	81.2% (± 9.4)	76.9% (± 8.2)	74.6% (± 7.8)	84.3% (± 4.1)	81.5% (± 3.7)
<b>Level of Physical Activity</b>												
Successfully reach the suggested exercise level	3.7% (± 7.6)	17.3% (± 7.7)	<u>14.4%</u> (± 6.2)	14.8% (± 9.1)	25.2% (± 7.4)	21.9% (± 5.8)	41.2% (± 17.4)	30.4% (± 11.2)	33.9% (± 9.3)	19.7% (± 7.1)	23.8% (± 4.9)	22.6% (± 4.0)
Low Physical Activity	29.6% (± 18.4)	21.2% (± 8.2)	<u>23.0%</u> (± 7.5)	27.9% (± 11.5)	15.3% (± 6.1)	19.2% (± 5.5)	22.2% (± 14.3)	11.6% (± 7.7)	15.2% (± 6.9)	26.6% (± 7.9)	16.4% (± 4.2)	19.3% (± 3.8)
Unwilling to practice 30mins moderate exercise a day	18.5% (± 15.7)	22.4% (± 8.5)	<u>21.6%</u> (± 7.3)	19.7% (± 10.2)	17.4% (± 6.4)	18.1% (± 5.4)	8.3% (± 9.5)	11.6% (± 7.7)	10.5% (± 5.9)	16.1% (± 6.6)	17.7% (± 4.3)	17.2% (± 3.6)

For work-related exercise, around 80% and 70% of respondents engaged in at least 10mins mild and moderate activity a day. Only 18.1% (±3.1) and 25.6% (±4.1) of respondents rarely had exercise and this situation was typically in men. Meanwhile, respondents tend to have stretching exercises at work except the younger male samples. On average, there were 9.6% of the respondents sit for more than 7 hours a day and the percentage was reportedly high among the younger groups. In additions, respondents maintain walking/cycling for at least 10mins a day, only 15.4% (±3.4) without such pattern.

The survey shows that the proportions of low level exercise were peaked at younger middle-age in both sexes and declining thereafter. In fact, low incentives of both mild and moderate exercise were comparatively found in men. For types of physical exercise, running (20.9%) and hiking (19.8%) were the most popular activities, followed by Dancing, Tai-chi and swimming.

The Department of Health insist that at least 5 days a week of 30 minutes moderate exercise is good enough to provide health benefits. However, only 22.6% (±4.0) of the overall respondents has reached this suggestion and most of them were women (23.8% ±4.9), the youngest samples were commonly without such pattern. Likewise,



low physical activity<sup>6</sup> was prevalent in men and both sexes reported that the percentage of low physical activity decreased in age. For personal willingness on exercise, the survey pointed out that 17.2% of sample was unwilling to adopt the suggested exercise level even if they knew it was good for health and the reasons were commonly due to tight schedule and no interests.

Table 12 shows that respondents in Tsuen Wan who were without any exercise dropped by nearly 20% and at the same time with the increased in the frequency of exercise (16.7%), the proportion was nearly 3 times than the DH survey.

	N		Both Sexes		Men		Women	
	DH (TN=2013)	TW (TN=430)	DH	TW	DH	TW	DH	TW
None	1080	158	53.7%	36.7%	46.7%	45.0%	59.6%	33.3%
1-3 times per week	628	140	31.2%	32.6%	37.4%	29.8%	25.9%	33.7%
4-6 times per week	180	52	9.0%	12.1%	9.5%	8.9%	8.5%	13.4%
≥ 7 times per week	121	72	6.0%	<u>16.7%</u>	6.1%	15.3%	5.9%	17.3%

### 4.3 Health Condition and Measurements

#### 4.3.1 Personal Illness

Samples were interviewed with a set of NCD<sup>7</sup> which listed in Question.52 and they were required to identify the illness that has been diagnosed. The survey reported that 29.8% of the surveyed samples diagnosed with 1 type of chronic illness, followed by 6.7% (2 types) and 1.8% (3 types). Male respondents tend to be at higher risk in terms the number of NCDs.

No. of Personal Illness	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
Diagnosed with 1 NCDs	47.2% (± 17.2)	35.6% (± 10.0)	<u>38.9%</u> (± 8.6)	29.5% (± 11.8)	32.6% (± 7.9)	31.7% (± 6.5)	14.8% (± 14.3)	15.4% (± 8.2)	15.2% (± 7.0)	31.5% (± 8.2)	29.1% (± 5.1)	29.8% (± 4.3)
Diagnosed with 2 NCDs	13.9% (± 11.9)	7.8% (± 5.6)	<u>9.5%</u> (± 5.2)	6.6% (± 6.3)	6.5% (± 4.2)	6.5% (± 3.5)	7.4% (± 10.6)	2.6% (± 3.6)	3.8% (± 3.7)	8.9% (± 5.1)	5.9% (± 2.6)	6.7% (± 2.4)
Diagnosed with 3 NCDs	2.8% (± 5.6)	2.2% (± 3.1)	<u>2.4%</u> (± 2.7)	1.6% (± 3.3)	2.2% (± 2.4)	2.0% (± 2.0)	3.7% (± 7.6)	0.0%	1.0% (± 1.8)	2.4% (± 2.8)	1.6% (± 1.5)	1.8% (± 1.3)

<sup>6</sup> Low physical activity has been classified as those who having low level of work-related exercise and less than 3 times moderate exercise a week

<sup>7</sup> The options of NCD listed in the questionnaire are :Stroke, Heart Disease, Angina Pectoris, Hypertension, High Cholesterol, Diabetes, Central Obesity and Cancers

### 4.3.2 Overweight and Obesity

**Table 14: Overweight and Obesity**

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
<b>Physical measurements</b>												
Mean Height (cm)	168.9 (± 2.1)	156.1 (± 1.0)	158.8 (± 1.3)	166.6 (± 1.5)	155.6 (± 0.9)	158.9 (± 1.1)	164.3 (± 1.9)	154.2 (± 1.1)	157.6 (± 1.4)	166.4 (± 1.0)	155.4 (± 0.6)	158.6 (± 0.6)
Mean Weight (kg)	73.5 (± 4.4)	55.8 (± 2.0)	59.6 (± 2.2)	67.5 (± 2.6)	57.1 (± 1.4)	60.3 (± 1.4)	64.7 (± 3.3)	58.4 (± 2.0)	60.5 (± 1.9)	68.0 (± 1.9)	57.0 (± 1.1)	60.1 (± 1.0)
Mean BMI (kg/m <sup>2</sup> )	22.9 (± 2.2)	<u>30.1</u> (± 1.4)	28.5 (± 1.4)	21.9 (± 1.4)	<u>31.4</u> (± 1.0)	28.5 (± 1.0)	20.1 (± 1.7)	<u>32.6</u> (± 1.6)	28.3 (± 1.7)	21.6 (± 1.0)	<u>31.2</u> (± 0.7)	28.5 (± 0.7)
Mean Waist Circumference (cm)	89.5 (± 3.1)	74.9 (± 1.8)	78.0 (± 1.9)	87.0 (± 2.2)	77.3 (± 1.3)	80.3 (± 1.3)	85.6 (± 2.8)	78.2 (± 1.8)	80.7 (± 1.7)	87.1 (± 1.5)	76.7 (± 0.9)	79.7 (± 0.9)
Overweight (BMI ≥ 25-29.9%)	25.9% (± 17.7)	29.3% (± 9.1)	28.6% (± 8.0)	24.6% (± 11.1)	29.0% (± 7.7)	27.6% (± 6.3)	19.4% (± 13.6)	23.2% (± 10.2)	21.9% (± 8.0)	23.4% (± 7.5)	<u>27.8%</u> (± 5.0)	26.5% (± 4.2)
Obesity (BMI ≥ 30%)	11.1% (± 12.7)	<u>47.5%</u> (± 10.0)	39.7% (± 8.6)	<u>6.6%</u> (± 6.3)	<u>57.2%</u> (± 8.4)	65.2% (± 11.5)	2.8% (± 5.6)	41.7% (± 6.9)	43.8% (± 9.7)	6.5% (± 4.3)	<u>55.9%</u> (± 5.6)	41.6% (± 4.7)
Central obesity	<u>37.0%</u> (± 19.5)	18.2% (± 7.7)	22.2% (± 7.4)	31.1% (± 12.0)	33.3% (± 8.0)	32.7% (± 6.5)	22.2% (± 14.3)	33.3% (± 11.4)	29.5% (± 8.9)	<u>29.8%</u> (± 8.3)	28.4% (± 5.1)	28.8% (± 4.3)
Severe obesity	14.8% (± 14.3)	7.1% (± 5.1)	8.7% (± 5.0)	6.6% (± 6.3)	4.3% (± 3.5)	5.0% (± 3.1)	5.6% (± 7.8)	8.7% (± 6.8)	7.6% (± 5.2)	<u>8.1%</u> (± 4.8)	6.2% (± 2.7)	6.7% (± 2.4)
<b>Diagnosis and Medications</b>												
Undergoing Weight Control	7.4% (± 10.6)	3.0% (± 3.5)	4.0% (± 3.4)	3.3% (± 4.6)	2.2% (± 2.4)	2.5% (± 2.2)	5.6% (± 7.8)	2.9% (± 4.1)	3.8% (± 3.7)	4.8% (± 4.0)	2.6% (± 1.8)	3.3% (± 1.6)
Undergoing Central Obesity Control	0	0	0	3.3% (± 4.6)	0	1.0% (± 1.4)	0	2.9% (± 4.1)	1.9% (± 2.7)	1.6% (± 2.3)	0.7% (± 0.8)	0.9% (± 0.9)
Diagnosed with Central Obesity	11.1% (± 12.7)	4.0% (± 4.0)	5.6% (± 4.0)	6.6% (± 6.4)	8.7% (± 4.8)	8.0% (± 3.9)	2.8% (± 5.6)	8.7% (± 6.8)	6.7% (± 4.8)	6.5% (± 4.3)	7.2% (± 2.9)	7.0% (± 2.4)

### Height and Weight

Weight and height were used to compute Body Mass Index (BMI) in classifying overweight and obesity in adult respondents. The survey indicated that men were on average heavier than women across all age. The mean height and weight of the survey population were 158.6cm (±0.7) and 60.1kg (±1).

### BMI Category

The World Health Organization (WHO) defined "overweight" as BMI ≥ 25.0 kg/m<sup>2</sup> and "obesity" as BMI ≥ 30.0 kg/m<sup>2</sup>. As shown in Table 14, the mean BMI of the overall population was 28.5kg/m<sup>2</sup> which obviously exceed normal range. In total, 41.6% (±4.6) of the surveyed samples reported by obesity which was almost a double than the prevalence of overweight. Comparatively, obesity tend to happen among the young middle-aged and in terms of sex, women dominated high proportion in obesity across all ages and a sharp proportion was found in age 51-60. (57.2% ±8.4).

### Waist Circumference

Waist circumference was assessed as a measure of central obesity in which people with more weight around their waist are at greater risk of lifestyle related disease such as cardiovascular diseases. With reference to the 2005 International Diabetes Foundation (IDF), Central Obesity defined as men's waist between 90 -99cm while

women at 80-89cm and Severe Obesity is classify as measurements that exceed these ranges. The average waist circumference was 79.7cm ( $\pm 0.9$ ). Tough that the mean waist circumference of both sexes was at normal range, the measurements were marginal among middle-aged men (89.5cm $\pm 3.1$ ) and old women (78.2cm  $\pm 1.8$ ).

Meanwhile, respondents also reported by substantial high percentages on central obesity (28.8%) and severe obesity (6.7%). Men were having relatively higher proportions in both cases in compared to women. The highest proportion of central and severe obesity were found in age 51-60 (32.7%) and age 41-50 (8.7%) respectively. In fact, there were 7.2% of women and 6.5% of men had been diagnosed with central obesity but women were less likely approached to seek medical advices.

### 4.3.3 Blood Pressure and Hypertension

**Table 15: Blood Pressure and Hypertension**

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
<b>Physical measurements</b>												
Mean Systolic blood pressure (mmHg)	128.8 ( $\pm 5.8$ )	116.7 ( $\pm 3.5$ )	119.3 ( $\pm 3.1$ )	133.5 ( $\pm 5.9$ )	123.9 ( $\pm 3.0$ )	126.8 ( $\pm 2.8$ )	137.3 ( $\pm 6.8$ )	129.0 ( $\pm 4.8$ )	131.8 ( $\pm 4.0$ )	133.6 ( $\pm 3.7$ )	122.7 ( $\pm 2.1$ )	125.8 ( $\pm 1.9$ )
Mean Diastolic blood pressure (mmHg)	82.6 ( $\pm 4.6$ )	75.0 ( $\pm 2.0$ )	76.6 ( $\pm 1.9$ )	82.0 ( $\pm 2.9$ )	77.7 ( $\pm 1.4$ )	79.0 ( $\pm 1.4$ )	81.5 ( $\pm 3.1$ )	77.2 ( $\pm 2.3$ )	78.7 ( $\pm 1.9$ )	82.0 ( $\pm 1.9$ )	76.7 ( $\pm 1.0$ )	78.2 ( $\pm 1.0$ )
Hypertension (BP $\geq$ 140/90mmHg)	<u>18.5%</u> ( $\pm 15.7$ )	3.0% ( $\pm 3.5$ )	6.3% ( $\pm 4.4$ )	<u>16.4%</u> ( $\pm 9.6$ )	3.6% ( $\pm 3.2$ )	7.5% ( $\pm 3.7$ )	<u>11.1%</u> ( $\pm 10.8$ )	4.3% ( $\pm 5.0$ )	6.7% ( $\pm 4.8$ )	15.3% ( $\pm 6.5$ )	3.6% ( $\pm 2.1$ )	7.0% ( $\pm 2.4$ )
<b>Diagnosis and Medications</b>												
Undergoing Raised Blood Pressure Control	<u>14.8%</u> ( $\pm 14.3$ )	4.0% ( $\pm 4.0$ )	6.3% ( $\pm 4.4$ )	<u>23.0%</u> ( $\pm 10.8$ )	9.4% ( $\pm 5.0$ )	13.6% ( $\pm 4.8$ )	<u>47.2%</u> ( $\pm 17.2$ )	23.2% ( $\pm 10.2$ )	31.4% ( $\pm 9.1$ )	28.2% ( $\pm 8.0$ )	10.8% ( $\pm 3.5$ )	15.8% ( $\pm 3.5$ )
Diagnosed with Raised Blood Pressure	<u>11.1%</u> ( $\pm 12.7$ )	8.1% ( $\pm 5.4$ )	8.7% ( $\pm 5.0$ )	<u>26.2%</u> ( $\pm 11.4$ )	13.0% ( $\pm 5.7$ )	17.1% ( $\pm 5.3$ )	<u>50.0%</u> ( $\pm 17.2$ )	26.1% ( $\pm 10.6$ )	34.3% ( $\pm 9.2$ )	50.0% ( $\pm 17.2$ )	26.1% ( $\pm 10.6$ )	34.3% ( $\pm 9.2$ )

Raised blood pressure is known risk factor for Cerebrovascular Disease and people could be at high risk if their blood pressure persistently higher than 140/90mmHg. The mean blood pressure of the overall respondents shown in Table 15 was 125/78.2mmHg. On average, the mean blood pressure was slightly higher in among men than in women.

Off the 7% of overall respondents reported by hypertension, the majority was found in men (15.3%  $\pm 6.4$ ) that almost 5 folds than women, meanwhile, half of the male respondents diagnosed with raised blood pressure. In addition, 15.8% ( $\pm 3.5$ ) of the surveyed population undergoing blood pressure control and the demand of medical advices on hypertension among the old-age was by 5 times higher than the younger middle-aged.

### 4.3.4 Blood Glucose and Diabetes

Blood glucose comes from carbohydrate foods and it can cause damage to eyes, kidney and blood vessel, it is also useful to check for diabetes. Glucose level varies on or before meals and the survey takes 3 different cut-off points to indicate the overall risks of raised blood glucose as well as representing the risk of diabetes.

- Mild Risk                      Blood glucose  $\geq 7.8$ -8.9 mmol/L
- Moderate Risk                Blood glucose  $\geq 9.0$ -10.9 mmol/L
- High Risk                      Blood glucose  $\geq 11.0$  mmol/L

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
<b>Biomedical measurements</b>												
Mean Blood Glucose (mmol/L)	6.2 ( $\pm 1.1$ )	5.4 ( $\pm 0.3$ )	5.6 ( $\pm 0.3$ )	6.4 ( $\pm 0.5$ )	5.7 ( $\pm 0.2$ )	5.9 ( $\pm 0.2$ )	6.0 ( $\pm 0.4$ )	5.6 ( $\pm 0.4$ )	5.7 ( $\pm 0.3$ )	6.2 ( $\pm 0.4$ )	5.6 ( $\pm 0.2$ )	5.7 ( $\pm 0.2$ )
Mild Risk (Blood glucose $\geq 7.8$ -8.9)	0% ( $\pm 0$ )	3.0% ( $\pm 3.5$ )	2.4% ( $\pm 2.7$ )	3.3% ( $\pm 4.6$ )	4.3% ( $\pm 3.5$ )	4.0% ( $\pm 2.8$ )	<u>5.6%</u> ( $\pm 7.8$ )	1.4% ( $\pm 2.9$ )	2.9% ( $\pm 3.2$ )	3.2% ( $\pm 3.2$ )	3.3% ( $\pm 2.0$ )	3.3% ( $\pm 1.6$ )
Moderate Risk (Blood glucose $\geq 9.0$ -10.9)	0% ( $\pm 0$ )	0% ( $\pm 0$ )	0% ( $\pm 0$ )	6.6% ( $\pm 6.3$ )	2.2% ( $\pm 2.4$ )	2.0% ( $\pm 1.2$ )	0% ( $\pm 0$ )	0% ( $\pm 0$ )	0% ( $\pm 0$ )	3.2% ( $\pm 3.2$ )	1.0% ( $\pm 1.0$ )	1.6% ( $\pm 1.2$ )
High Risk (Blood glucose $\geq 11.0$ )	3.7% ( $\pm 7.6$ )	2.0% ( $\pm 2.8$ )	2.4% ( $\pm 2.7$ )	3.2% ( $\pm 3.2$ )	0.7% ( $\pm 4.3$ )	3.5% ( $\pm 1.2$ )	3.2% ( $\pm 3.2$ )	1.4% ( $\pm 2.9$ )	1.0% ( $\pm 1.8$ )	<u>3.2%</u> ( $\pm 3.2$ )	1.3% ( $\pm 1.3$ )	1.9% ( $\pm 1.2$ )
<b>Diagnosis and Medications</b>												
Undergoing Blood Glucose Control	<u>7.4%</u> ( $\pm 10.6$ )	4.0% ( $\pm 4.0$ )	4.8% ( $\pm 3.7$ )	3.3% ( $\pm 4.6$ )	2.9% ( $\pm 2.8$ )	3.0% ( $\pm 2.4$ )	<u>16.7%</u> ( $\pm 12.8$ )	1.4% ( $\pm 2.9$ )	6.7% ( $\pm 4.8$ )	8.1% ( $\pm 4.9$ )	2.9% ( $\pm 1.9$ )	4.4% ( $\pm 2.0$ )
Diagnosed with Diabetes	3.7% ( $\pm 7.6$ )	5.1% ( $\pm 4.3$ )	4.8% ( $\pm 3.7$ )	3.3% ( $\pm 4.6$ )	2.9% ( $\pm 2.8$ )	3.0% ( $\pm 2.4$ )	11.1% ( $\pm 10.8$ )	4.3% ( $\pm 5.0$ )	6.7% ( $\pm 4.8$ )	<u>5.6%</u> ( $\pm 4.2$ )	3.9% ( $\pm 2.2$ )	4.4% ( $\pm 2.0$ )

Table 16 shown that the mean blood glucose was 5.7mmol/L ( $\pm 0.2$ ) and men were having comparatively higher mean glucose across all ages. The overall percentage indicated that more sample population at mild risk of raised blood glucose. Men were more prone to the risk of raised blood glucose in terms of the high percentages among a) three risk levels, b) medications c) the rate of diabetes. Whereas, women were generally under mild or moderate risk and 3.9% ( $\pm 2.2$ ) of women were diagnosed with diabetes.

In regards to age, a sharp percentage (16.7%  $\pm 12.8$ ) was reported among the old-aged men who were undergoing glucose control as well as being diagnosed with diabetes. Meanwhile, respondents who reported by abnormal glucose level over 11mmol/L typically found in aged 51-60, followed by aged 41-50.

#### 4.3.5 Total Cholesterol

For elevated total blood cholesterol, a cut-off point  $\geq 5.0$  mmol/L was used to classify participants as being in a high-risk group for cardiovascular disease (Kiribati STEPs report, 2009). Table 17 indicated the average total cholesterol of the sample population was marginally at 5.2 mmol/L ( $\pm 0.1$ ) and relatively found higher in women.

	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
<b>Biomedical measurements</b>												
Mean Total Cholesterol (mmol/L)	5.2 (± 0.3)	4.9 (± 0.1)	4.9 (± 0.2)	5.0 (± 0.2)	5.4 (± 0.1)	5.3 (± 0.1)	4.9 (± 0.3)	5.4 (± 0.2)	5.2 (± 0.2)	5.0 (± 0.1)	5.2 (± 0.1)	5.2 (± 0.1)
High Cholesterol Rate (Total cholesterol ≥5.0)	56.0% (± 20.9)	41.8% (± 10.0)	44.7% (± 8.9)	41.7% (± 12.8)	57.2% (± 8.4)	52.5% (± 7.0)	44.4% (± 17.1)	66.7% (± 11.4)	59.0% (± 9.6)	45.5% (± 9.0)	54.4% (± 5.6)	51.9% (± 4.8)
<b>Diagnosis and Medications</b>												
Undergoing Cholesterol Control	7.4% (± 10.6)	2.0% (± 2.8)	3.2% (± 3.1)	4.9% (± 5.6)	6.5% (± 4.2)	6.0% (± 3.4)	16.7% (± 12.8)	7.2% (± 6.3)	10.5% (± 5.9)	8.9% (± 5.1)	5.2% (± 2.5)	6.3% (± 2.3)
Diagnosed with Raised Cholesterol	14.8% (± 14.3)	7.1% (± 5.1)	8.7% (± 5.1)	8.2% (± 7.1)	16.7% (± 6.3)	14.1% (± 4.8)	11.1% (± 10.8)	18.8% (± 9.5)	16.2% (± 7.2)	10.5% (± 5.5)	14.1% (± 3.9)	13.0% (± 3.2)

Around half of the female respondents (54.4% ±5.6) were reported by high cholesterol. Among women, the proportions of high cholesterol rate generally increased in age that peaked in the old-aged (66.7%). Whereas, men's proportion in high cholesterol peaked at aged 41-50 years and declining thereafter.

The survey revealed that the number of medication and diagnosis of cholesterol increased in age. In total, 13% of the respondents diagnosed by raised cholesterol and 6.3% reported by cholesterol controls. For those who were undergoing cholesterol controls, the highest proportion lies in the old-age by nearly 3 times greater than reported among the young middle-aged.

#### 4.4 Combined Risk Factors

With reference to the WHO, the STEPs approach identified the number of risk factor varies the chances of each individual prone to NCD. Followed by the STEPs protocol, the sample population was classified into 3 risk levels: High (with 3-5 risk factors), Moderate (with 1-2 risk factors) and Low risk (0 factor). The combined NCD risk factors are summarized as follow and the frequency were listed in Table 11:

- current smoker
- less than 5 servings of fruits & vegetables a day
- low level of activity (low frequency on work-related exercise and less than 3 times a week of moderate exercise)
- Overweight (BMI ≥ 25.0 kg/m<sup>2</sup>)
- Raised BP or currently on medication for raised BP

**Table 18: Combined Risk Factors**

Level of Risk	41-50			51-60			61-65			All Ages		
	M (N=27)	F (N=99)	Both Sexes (N=126)	M (N=61)	F (N=138)	Both Sexes (N=199)	M (N=36)	F (N=69)	Both Sexes (N=105)	M (N=124)	F (N=306)	Both Sexes (N=430)
Low Risk (0 factors)	6 (22.2%)	47 (47.5%)	53 (42.1%)	19 (31.1%)	66 (47.8%)	85 (42.7%)	9 (25%)	28 (40.5%)	37 (35.2%)	34 (27.4%)	107 (35%)	141 (32.8%)
Moderate Risk (1-2 factors)	20 (74.1%)	52 (52.5%)	72 (57.1%)	34 (55.7%)	70 (50.7%)	104 (52.3%)	25 (69.4%)	41 (59.4%)	66 (62.9%)	79 (63.7%)	163 (53.3%)	<u>242</u> <u>(56.3%)</u>
High Risk (≥3 factors)	1 (3.7%)	0	1 (0.8%)	<u>8</u> <u>(13.1%)</u>	2 (1.4%)	<u>10</u> <u>(5.0%)</u>	2 (5.6%)	0	2 (1.9%)	11 (8.9%)	2 (0.7%)	13 (3.0%)

Approximately half of the sample population (56.3%) reported by having 1-2 captioned risk factors and 32.8% of the overall population classified as low risk for NCD. Male respondents accounted for 8.9%, probably 1 in 10 male were at high NCD risk.

In regards to age, the percentage of low risk group declined as age increase which showing that the risks accumulated in age too. Among all, a remarkable proportion of high NCD risk (5%) has been found at age 51-60 and typically in men.

## Chapter 5: Discussion and Way forward

### 5.1 Health risks different in sex

Obesity, diabetes and hypertension were identified as the leading health risks in the district. Obesity (55.9%) and overweight (27.8%) prevailed in women with average BMI exceed normal range ( $31.2\text{kg/m}^2$ ). The survey reported that samples with obesity or overweight were significantly correlated to those who had heart disease. Although men were reported by normal BMI, their weight tended to concentrate around the waist and the conditions had been supported by the prevalence of male's central and severe obesity.

Results indicated that hypertension and diabetes were predominated in men which highly associated to their unhealthy lifestyle. A significant correlation supported that the consumption of outdoor meal in men was at least 4 days a week together with inadequate consumption of vegetables, this pattern reflected that men were more prone to the risk of excessive sodium/sugar in-take. In fact, the Department of Health has taken actions to deal with the growing concern of unhealthy eating habit, in which "EatSmart@restaurant.hk" Campaign has been launched to encourage restaurants promoting healthy dishes. Unfortunately, the focus group participants commented that these 'so-called' healthy dishes remains full of fat and oil, meanwhile, less choice was offered from the EatSmart menu and the dishes were comparatively less appetitive.

Central obesity, smoking, alcohol consumption were comparatively common in men and the survey revealed that these risk factors were significantly correlated to the raise of glucose as well as blood pressure. There were 23.7% and 32.9% of the working male were smokers and consume alcohol on a regular basis. In total, 50% and 5.6% of the male respondents has been diagnosed with hypertension and diabetes respectively.

### 5.2 Environmental factors alter personal behaviors

The WHO stated that higher levels of education are associated with better health, though not entirely related to the association between higher earning potentials and higher education levels (Stein and Moritz, 1999). This statement is to certain extend verify by the findings as we found out that employment status, education level and income highly correlated to certain risk factors that individual exposed to. (Table 19)

**Table 19: Correlation between socio-economic factors and personal lifestyle**

Lifestyle risks	High Education Group	Working Group	Low Income (<5,999)	Middle Income	High Income (\$20,000 +)
a. Outdoor lunch 4+ a week	.133**	.244**	-.275**	.165**	.197**
b. Outdoor dinner 4+ a week	0.07	.230**	-.254**	.177**	.147**
c. Irregular lunch time	-.166**	0.016	0.019	-0.009	-0.016
d. Irregular dinner time	-0.09	.191**	-.144**	0.089	.099*
e. Frequent home meals	-0.086	-.161**	.181**	-.155**	-0.062
f. Obtained knowledge on 2 Plus 3 A Day	0.095	-0.041	-0.029	0	0.045
g. Obtained knowledge on 3:2:1	.122*	-0.063	-0.039	0.046	-0.005
h. Obtained knowledge on 3 Low 1 High	.127**	-.096*	0.047	-0.025	-0.039
i. No practice of 2 Plus 3 A Day	-0.095	.114*	-0.063	0.078	-0.013
j. No practice of 3:2:1	-.130**	.110*	-0.071	0.027	0.074
k. No practice of 3 Low 1 High	-.097*	.148**	-.129**	.126**	0.022
l. Current Smoker	-.128**	.150**	-.133**	.105*	0.058
m. Daily Smoker	-.131**	.126**	-.102*	0.063	0.07
n. Obtained regular drinking habits	0.08	.111*	-.166**	.121*	0.087
o. Frequently consume alcohol	0.085	0.028	-0.078	-0.006	.132**
p. Sitting for 7+ hours a day	.109*	.193**	-.190**	0.082	.182**
q. Low level of physical activity	.134**	.150**	-.134**	-0.009	.226**
r. Manage to walk/cycling for 10mins a day	-0.037	-0.019	0.06	0.059	-.181**

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Table 19 listed out the correlation between samples from different socio-economic background and key NCD risk. A very significant correlation supported that samples from high education, work engagement and higher income sectors were the majority of outdoor meal consumptions. The working group was significantly correlated to irregular dinner time and this condition had been further confirmed by the focus group participants as they claimed that they usually off work at late night.

It is generally accepted that people with higher education perceived better healthy living concept and this situation had been supported, as high education group was significantly associated to the understanding as well as adoption of “3:2:1proportion” and “3 Low 1 High”. However, the working samples were positively correlated to non-adoption of all such practices and the reasons were mostly given by the focus group participants that healthy choices were limited at working area.

Speaking of smoking and alcohol consumption, the survey reported that current smokers and smoking on daily basis were positively correlated to the working samples and those with low education. In addition, a mild correlation also supported that people with regular drinking habit were the earning groups at middle income range.



Referred to physical activity, the survey reported that literate samples with higher earning ability were positively correlated to longer sitting hours and low exercise level. Sedentary lives were common among high education as well as higher earning samples since that these people usually engage in non-manual work as well as attached to office-setting which allow very limited physical activity at work; meanwhile, exercise also being treated as the least popular leisure activity. On the contrary, low income group was negatively correlated to sedentary lives which indicated that these samples usually engage in manual work that required high level of physical activity.

Though that employment status and personal earning are the decisive factors alter individual's physical activity, the focus group participants all agreed that the underlying reason of not exercising enough was obviously due to personal incentive and one's own priority of health. However, they pointed out that peer influence could improve the motivation.

To conclude, the study revealed that obesity, hypertension and diabetes were the leading health risks among the middle-aged in Tsuen Wan where men's health is consequently becomes a growing concern. Apart from understanding how behavioral risk factors attribute to NCD, the study also discussed the importance of understanding individual's socio-economic components such as employment, education and financial status, these factors somehow provides a broader reason for behavioral changes that beyond individual's control.

Following the recommended strategy on NCD controls is taking life-course approach, the planning of prevention should stress on early education and health promotion among the younger generation who has the greatest possibility and ability to modify behavioral risks. Based on the study, there are several recommendations we suggested as follow:

*For district needs,*

- Provide intervention programs for those who are at risk of obesity, hypertension and diabetes
- Arrange health promotion programs that fit into the needs of people from all ages
- Expand health profile to residents from all ages and to construct a representative profile.

*For further strategy in Hong Kong,*

- Repeat health profile study in different district in Hong Kong:
- Making district comparison to provide comprehensive overview of NCD prevalence as well as effective prevention strategy for Hong Kong.

## References

### Appendix 1

#### Data Collection Sites and Schedules

	Date	Time	Venue	Valid Questionnaires
1	27.06.2010	10:00-13:00	荃灣中心一期禮堂	0#
2	22.07.2010	* Cancelled due to poor weather condition		
3	11.08.2010	12:00-14:00	荃景圍尹立強敬老中心	19
4	31.08.2010	10:00-13:00	深井靈光堂新地帶	51
5	27.09.2010	11:00-13:00	雅麗珊社區中心	67
6	07.10.2010	14:00-16:00	雅麗珊社區中心	55
7	08.10.2010	10:00-13:00	祈德尊新	33
8	13.10.2010	10:00-13:00	柏麗灣藍色會所	30
9	17.10.2010	11:00-13:00	荃灣中心一期禮堂	38
10	24.10.2010	14:00-17:00	深井麗都花園	24
11	31.10.2010	14:00-16:00	荃灣中心一期禮堂	26
12	12.11.2010	10:00-12:00	荃灣香車街街市	32
13	19.11.2010	15:00-17:00	圓玄學院	31
14	05.12.2010	10:00-13:00	荃灣中心一期禮堂	32
15	23.01.2011	10:00-13:00	荃灣中心一期禮堂	2

# There were 48 questionnaires had been done on 27.06.2010 but some items of the health check data were missing due to malfunction health check instrument.