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The Nature And Effectiveness Of A Community-based Volunteer-delivered Health Education Program: A New Zealand Based Case Study

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The Nature And Effectiveness Of A Community-based Volunteer-delivered Health Education Program: A New Zealand Based Case Study

Presented in partial fulfilment of the requirements of:

Master of Education

School of Education
Avondale College of Higher Education
16 October, 2012

Kathryn Louise Matteo
BEd (Secondary)

Student Declaration

I, Kathryn Louise Matteo hereby declare that:

I. This thesis is my own work,

II. all persons consulted, and all assistance rendered are fully acknowledged

III. all references used are indicated in the text and accurately reported in the list of references,

IV. the substance of this thesis has not been presented, in whole, or part by me, to any University for a degree.

Date: 16 October 2012 Signature: Kathryn L Matteo

Acknowledgements

This project would never have been possible if not for the valuable support of the following individuals. To you all I offer my sincerest appreciation.

A very big thank you to Dr Peter Morey, for the all the time you invested in helping and guiding me through this project. Your support and confidence in my ability to complete this task made all the difference.

To Dr Darren Morton, thank you for giving me the opportunity to do this research. I feel this process has given me invaluable learning experiences.

To my husband, thank you for encouraging me each step of way and for taking the kids to give me an opportunity to complete this task.

Thank you to my family for being so supportive and proud of me for even attempting this project. You made me believe that it was all possible.

Finally, a huge thank you to God for directing my paths to undertake this challenge and for all the lessons you have taught me along the way. I know that this work is only possible through you.

Abstract

Cardiovascular disease (CVD) is increasingly becoming one of the largest contributors to preventable death globally each year. This disease is predominately caused by poor lifestyle choices such as unhealthy diet, inactivity, smoking and the harmful use of alcohol. Modern treatments of CVD are often surgical and pharmaceutical which can be both invasive and expensive and do not necessarily address the causation or prevention of the disease. Research is now being done in preventative health to study the effects that a healthy lifestyle has in both reducing and even reversing CVD. Lifestyle intervention programs are a part of this preventative health phenomenon. This study aims to explore the nature and effectiveness of the Coronary Health Improvement Program (CHIP), in its ability to reduce CVD risk factors.

Data was collected from a set of volunteer-delivered CHIP programs that were conducted in Hawera, New Zealand. The sample consisted of 284 participants who responded voluntarily to local program advertising. Participants were given a blood screening and questionnaire which was conducted at the commencement and conclusion of the 30 day intervention. The blood screening was given to measure baseline biometrics (BMI, total cholesterol, low density lipoprotein, high density lipoprotein, triglycerides and glucose) and the questionnaire was a tool used to gather information about the participants' basic demographics, lifestyle, and family and medical histories. The data was then analysed to determine changes in the blood screening biometrics post intervention. Also these changes were further examined to determine the impact, if any, of participants' lifestyle and family medical histories. An analysis of the nature of the program and its delivery was also conducted through interviews with the program facilitator.

Participants' blood screening results post intervention indicated a significant reduction in their biometrics from the baseline scores with reductions of 4% to 23%. In particular, participants who recorded high baseline figures recorded the most significant changes after the 30 days. There were significant differences across gender, marital status and age in the reduction of a number of the participants' biometrics.

This study provides valuable evidence suggesting that a volunteer-delivered, community based, CHIP lifestyle education program is effective in improving the health of participants and, in particular, reducing CVD risk factors. These findings will be important for the designing and delivery of lifestyle education programs for the prevention and treatment of CVD for the future.

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Chapter One

Rationale

The World Health Organization states that 63% of all global deaths in 2008 were a result of non-communicable diseases (WHO, 2008). More specifically, 36 million out of a total of 57 million deaths globally in 2008 were attributed to lifestyle diseases. The four biggest killers were cardiovascular disease, cancer, respiratory diseases and diabetes. These diseases mainly occur as a result of poor lifestyle choices, in particular tobacco use, physical inactivity, unhealthy diet, and the harmful use of alcohol. It is clearly evident that lifestyle disease is becoming a huge problem. Up until recently the current paradigms for management of these diseases have been surgical and pharmaceutical. This type of management is putting enormous pressure on the health care systems. However the emergence of lifestyle medicine and prevention is becoming increasingly widespread.

Lifestyle education programs are being developed in response to the emerging research being done in this area of preventative health. Two programs in particular are currently operating with great success in reducing CVD. They are the Pritikin Longevity Centre and the Ornish Lifestyle Centre. Whilst the Pritikin and Ornish residential education programs have proven to be effective in improving health for patients, they are very costly and often inaccessible to some people who, for whatever reason, are unable to stay in a residential facility. Another program, the Coronary Health Improvement Program (CHIP) has demonstrated significant reductions in cardiovascular risk factors (Englert et al. 2007). Whilst this program was initially designed by Dr. Hans Diehl for

people with coronary health issues, the program is being delivered to participants in view to improve all aspects of health. The CHIP program aims to educate participants on making lifestyle changes that involves a diet which is whole plant food based, with little or no animal products. As well as modifying their nutrition, it also recommends participants engage in at least 30 minutes of daily exercise. Identifying and implementing ways to reduce stress and cease smoking is also part of the programs guidelines for holistic health.

A volunteer delivered CHIP lifestyle education program mentioned above, has been functioning in America for a number of years. It is a low cost and easily accessible alternative to the residential based programs. A study of the results of these programs was conducted with up to 4500 participants. These participants overall recorded significant changes to their biometrics. The two most significant changes included an 11% decrease in total cholesterol and a 13% decrease in low density lipoprotein post intervention. Analysis of this data from these CHIP programs indicated that this program was effective in reducing cardiovascular risk factors (Rankin et al. 2012).

Whilst this study was conducted in an American context, no studies have determined the effectiveness of the CHIP program within a New Zealand setting. Therefore, there is a need to explore the effectiveness of the CHIP program in reducing CVD risk factors in a New Zealand context. Further analysis of the nature of the delivery of this education program is also required.

This case study aims to meet this need by accessing data from a series of volunteer delivered CHIP programs that have taken place in the city of Hawera, New Zealand.

Research Question

This study is directed by the following research questions:

1) What are the key components of the volunteer delivered CHIP lifestyle education program with reference to Hawera based programs?

2) How effective were the CHIP programs conducted in Hawera in reducing CVD risk factors of the participants? And further, what impact does participants demographics, previous lifestyle patterns and initial health conditions have on these outcomes?

Structure of the Thesis

This thesis consists of six chapters and is presented in the following manner. Chapter one focuses on the purpose, rationale and aims for this study. It also identifies the questions that the study attempts to answer. Chapter Two will discuss the relevant literature relating to lifestyle education programs. Chapter Three identifies the methodologies chosen, including information on the sample and data analysis processes. Chapter Four will explore the nature of the program including program delivery, team membership, advertising and community response. Chapter 5 discusses the results in terms of overall data and specific analysis of biometrics categories. The final chapter discusses the results outlined previously as well as identifying any

limitations and implications for future studies.

Chapter Two

Literature Review

Introduction

Studies being done in the area of preventative health indicate poor lifestyle choices are causing major diseases in individuals. One such article states that the world is feeling the impact of a global chronic disease epidemic which it terms “diseases of comfort” cause by poor lifestyle choices. (Choi et al., 2005)

Cardiovascular disease is one of these diseases that is responsible for millions of deaths globally each year and yet it is largely preventable through lifestyle change. It is important to therefore identify risk factors for cardiovascular disease and the lifestyle changes that can be made to reduce and even reverse this killer.

Cardiovascular Disease

Cardiovascular disease (CVD) refers to diseases relating to the heart or blood vessels. The World Health Organisation (WHO) report, published in September 2011, states that CVDs are the leading cause of death and disability in the world. These statistics are quite concerning, especially considering that many forms of CVDs are preventable through simple lifestyle changes. The Framingham study which commenced in 1948 was the first study which identified the major risk factors for CVD. This study indicated that cigarette smoke, increased cholesterol levels, elevated blood pressure, obesity and inactivity were the major risk factors associated with CVD (O’Donnell & Elosua, 2008).

Since then, many studies have been done to identify the various risk and biometric factors which contribute to CVD. As previously identified indicated tobacco use, physical inactivity, unhealthy diet and harmful use of alcohol are the main risk factors to these diseases (WHO, 2008). The INTERHEART study which was completed in 2004 and involved over 52 countries identified diabetes, hypertension, psychological factors and a lack of consumption of fruit and vegetables as additional risk factors for CVD. (Yusuf et al., 2004) These risk factors can be grouped into two categories; lifestyle habits and biometric risk factors. The lifestyle related risk factors include; smoking, diet, inactivity and mental health, whilst the biometric risk factors include cholesterol, blood pressure, obesity and diabetes.

Lifestyle Related Risk Factors

Smoking

A study by Ambrose and Barua (2004) into the pathophysiology of cigarette smoking and CVD identified that smoking in any form contributes to cardiovascular morbidity and mortality. Burns (2003) attributes some 140,000 premature deaths that occur each year to CVD from smoking. The effect of smoking on the cardiovascular system is clear and studies have found that cigarette smoking predisposes the individual to several different cardiovascular effects including; angina, acute coronary syndromes, sudden death and stroke. (Ambrose & Barua 2004) Interestingly however the damage to the cardiovascular system from smoking also relates to those who are exposed to cigarette smoke through passive environmental smoking. Taylor, Johnson and Kazemi (1992) identify the effects of environmental tobacco smoke as affecting cardiovascular function,

platelet function, neutrophil function and plaque formation which are all probable factors leading to heart disease. Benowitz (2009) identifies that cessation of smoking at any age can dramatically reduce these risks associated with smoking. However he goes on to say that quitting is often difficult given the addictive nature of tobacco.

Diet

Reddy (2010) identifies that diet, and the nutrients that are consumed, are major determinants which can initiate and influence the course of cardiovascular disease. A poor dietary intake is related to a number of cardiovascular risk factors which can include; hypertension, abnormal blood lipids and abdominal obesity (Yusef et al., 2004). A cohort of studies done on nutrition and cardiovascular disease showed that a diet consisted primarily of a high consumption of plant based foods (such as fruits, vegetables, nuts and whole grains) was associated with significantly lower incidences of coronary artery disease and stroke (Hu, 2003).

Physical Inactivity

An article written for the Cancer Journal for Clinicians (Eyre et al., 2004) argues that there is evidence to suggest that physical activity reduces chronic disease risk both directly in its impact on hormone levels and indirectly through its impact on weight control. A statement from the Council on Clinical Cardiology (Subcommittee on Exercise, Rehabilitation, and Prevention) and the Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity) identified that habitual physical activity not only can prevent the development of coronary artery disease but also reduce

the symptoms in patients who already have established coronary disease. In a study conducted by Blair (2001) the greatest cardiovascular disease benefits were obtained by those who exercised vigorously.

Mental Health

Whilst smoking, diet and physical activity are more commonly known risk factors for cardiovascular disease, psychological factors are also contributors. In a study by Ford and colleagues (1998), it was revealed that clinical depression was in fact an independent risk factor for coronary heart disease. Yusuf (2004) also identified other psychological factors such as prolonged stress and anxiety (which can lead to a state of disequilibrium) over time can result in heart disease. Katon Lin & Kroenke (2007), in analysing the results of 31 studies with 16922, patients identify that depression and anxiety can be strongly associated with cardiovascular disease and other chronic medical diseases.

Biometric Risk Factors

Cholesterol

Whilst cholesterol is important for normal body function, elevated cholesterol levels are strongly linked with cardiovascular diseases (Krauss et al., 2000). Total cholesterol is made up of low density lipoproteins (LDL) and high density lipoproteins (HDL). HDL is considered to be very important for good health as it takes cholesterol away from the cells and tissues and to the liver for excretion. The function of LDL is to take cholesterol to the places it is required in the body. High levels of LDL however can result in a build-

up of cholesterol and cause hardening of artery walls leading to cardiovascular diseases. Studies have found that a reduction in the level of LDL in the body can decrease the risk of a cardiac event (Assmann, G, 1998: Wilson, Anderson, Castelli & Kannel, 1991). It has also been suggested that an increase in HDL levels can decrease the risk of a cardiac event (Brown et al., 2001).

Blood Pressure

High blood pressure is associated with an increased risk of cardiovascular disease (Vasan et al., 2001). This risk factor increases as blood pressure reaches above normal range, i.e. <120 systolic and <80mmHG diastolic. (Stamler, Stamler & Neaton, 1993). A study done to determine the impact of high normal blood pressure on cardiovascular disease found that those with high normal blood pressure had an increased risk of disease by 2.5% amoung women and 1.5% amoung men (Vasan et al., 2001). Studies have concluded that adopting a healthy lifestyle eating plan and reducing sodium consumption can lower blood pressure substantially (Sacks et al., 2001).

Obesity

Sowers (1998) identifies obesity as a risk factor for cardiovascular disease. He found that obesity can often lead to diseases such as diabetes and hypertension which can, in turn, further contribute to the risk of cardiac disease. Obesity is a metabolic disorder. The excess fat stored by the body in various places can in fact increase risk of coronary artery diseases such as dyslipidemia, hypertension, glucose intolerance, inflammatory

markers, and the prothrombotic state (Poirier & Eckel, 2000). The results of a study to identify the impact excess body weight had on CVD found that the increase in excess body weight of individuals increased the prevalence of cardiovascular disease. For individuals with a normal weight the prevalence of CVD was 20%, for overweight individuals the rate increased to 28% and in obese individuals, 29% (Wang et al., 2002).

Diabetes

Diabetes is considered to be one of the major risk factors of CVD (Grundy et al., 1999). One study identifies CVD as the cause of death for 65% of people with diabetes (Gieuss, 1995). Individuals with type 2 diabetes are at a greater risk of cardiac disease due to the likelihood of developing hyperglycemia, hypertension, and dyslipidemia (Gaede et al., 2003).

Lifestyle Medicine: Key Players

Dean Ornish

Dr Dean Ornish is well known as one of the founders of preventative health. In 1977, Dr Ornish discovered through research that lifestyle changes could stop and reverse coronary heart disease and many other chronic diseases. These lifestyle changes included eating a whole foods plant based diet, engaging in moderate exercise, ceasing smoking and using stress management techniques such as yoga and meditation as well as having psychosocial support (Ornish Spectrum, 2012). He and his colleagues developed a program called ‘Dr Ornish’s Program For Reversing Heart Disease’ which

targets four basic lifestyle elements; what you eat, how much activity you have, how you respond to stress and how much love and support you have. (Ornish Spectrum, 2012) Dr Ornish outlines below the important role that lifestyle plays in individual health and wellbeing.

> “People often think that advances in medicine have to be a new drug, a new laser, or a surgical intervention to be powerful—something really high-tech and expensive. They often have a hard time believing that the simple choices that we make in our lives each day—what we eat, how we respond to stress, whether or not we smoke, how much we exercise and the quality of our relationships—can make such a powerful difference in our health, our well-being, and our survival, but they often do” (Ornish Spectrum, 2012).

Caldwell Esselstyn

In 2007, Dr Esselstyn (who is an internationally known surgeon, researcher and clinician at the Cleveland Clinic) wrote the book entitled; *Prevent and Reverse Heart Disease*. He identified that patients who were treated surgically or pharmaceutically to reduce the impact of symptoms but little preventative treatment was prescribed. After analysing the results on a 20 year study on nutrition, Dr Esselstyn advocated that a strict vegan diet can prevent and reverse heart disease. Dr Esselstyn outlines his idea of medicine as being more than just surgical.

> "Beyond surgery" does not mean one must relinquish the cherished burden of operative responsibility, but it does imply that we must participate in the endeavor to eliminate and prevent diseases by nonsurgical methods of lifestyle changes (Esselstyn, 1991).

Lifestyle Education Programs

Lifestyle education programs are being developed in response to the emerging research being done in the area of preventative health. Two programs in particular are currently operating with great success in this area. They are the Pritikin Longevity Centre and the Ornish Lifestyle Centre.

Pritikin Longevity Centre

The Pritikin Longevity Centre was developed in the early 1980 by Nathan Pritikin. He initially designed a 3 week residential lifestyle program. His program targets three main areas; nutrition, exercise and mind body health. The nutrition involves eating minimally processed plant foods such as fruits, vegetables and whole grains, as well as modest amounts of non-fat dairy, soy and fish. Eating these types of foods as well as taking regular exercise and minimising stress is the key message of the Pritikin Longevity Centre. A study which was conducted on 4587 participants of the program recorded a 23% decrease in total cholesterol, 33% decrease in trigylcerides, and 23% decrease in LDL cholesterol (Barnard, 1991).

Ornish Lifestyle Centre

As mentioned previously Dean Ornish developed a program that is aimed at targeting lifestyle changes. This program divides all foods into a spectrum of choices. These range from those choices which are very healthful (fruits, vegetables, grains) to those which are least healthful (cakes, fried foods). However, with regards to reversing heart disease specifically, Ornish has identified some specific guidelines including; limiting fat

intake to no more than 10%, a cessation of animal products except non-fat dairy products, limiting sugar intake, a cessation of caffeine and limiting alcohol consumption. Several studies have been done on this program to ascertain its effectiveness in reversing heart disease. One particular study conducted with 48 patients (20 patients were the control and the other 28 completed the lifestyle intervention program) indicated a decrease in low density lipoprotein (LDL) of 37.2% compared with the control group of 1.2% after just one year. Also patients involved with the lifestyle changes recorded fewer cardiac events in the 5 years post the intervention (Ornish et al., 1990).

CHIP Program

Whilst the Pritikin and Ornish residential education programs have proven to be effective in improving health for patients, they are very costly and often inaccessible to people who are unable to stay in a residential facility, due to commitments such as family and work. A lifestyle education program which is run in the community has proven to be a low cost and easily accessible program for people wanting to improve their health and lifestyle. The Coronary Health Improvement Program (CHIP) has demonstrated significant reductions in biometric risk factors (Englert et al. 2007).

Whilst other lifestyle intervention programs are professionally delivered, the CHIP program has been designed to be delivered by a team of volunteers. These volunteers participate in a weekend training program and are accredited to deliver the CHIP program in their respective communities. The expertise is not provided by the leaders

of the program but rather through the viewing of the DVDs presented by the developer of the program.

This intensive education program involves participants attending sixteen, 2 hour sessions over a period of four to five weeks. These sessions aim to provide participants with the knowledge and ability to make lifestyle changes to improve their health. The educational pre-recorded lectures which are presented by Dr Hans Diehl, inform participants about the causation of diseases and how lifestyle changes can prevent and reduce these health concerns.

There have been over 20 articles on CHIP which have been published to date. A 2007 article, analysed data from over 1500 participants in five CHIP programs conducted in Rockford, Illinios. The results indicated highly significant reductions in participants' total cholesterol, LDL, triglycerides, blood glucose and blood pressure (Englert et al., 2007). This article concluded that a well-designed community based education program is effective in improving health for participants. (Englert et al., 2007)

One of the more recent articles which involved over 5000 CHIP participants similarly demonstrated significant reductions in the participants' body mass, blood pressure, total cholesterol, low density lipoprotein, triglycerides and fasting plasma glucose. Of these participants, those who were considered most at risk recorded the greatest improvements to their health (Rankin et al., 2011).

It is evident that cardiovascular disease is a major problem and burden today. The biometric and risk factors pertaining to these diseases have been well identified. Lifestyle education programs such as CHIP have proven to be effective in achieving positive changes to participant's lifestyle through reductions of those risk factors. The CHIP program, comparative to other intervention programs, is very effective with its low cost, high accessibility and volunteer delivery.

Chapter Three

Methodology

Introduction

This chapter presents a rationale and description of the research orientation used in the study. This study looks at the effectiveness of a volunteer delivered lifestyle education program in reducing risk factors associated with cardiovascular disease. Limited research has been conducted to ascertain the effectiveness of volunteer based delivery of lifestyle education programs. But such studies have been based in the United States and have accessed data from a number of delivery sites. The aim of this study is to evaluate the effectiveness of a New Zealand based, volunteer-delivered program conducted from a single site. To fulfil this aim, the research adopted a case study approach, which was observational quasi-experimental and quantitative in its orientation.

This study will explore the changes in participants' biometrics risk factors (total cholesterol, low density lipoprotein, high density lipoprotein, triglycerides and fasting plasma glucose, BMI and blood pressure) pre and post involvement in a 30 day CHIP program (refer to Chap 4). The biometric and demographic data taken from the CHIP survey instrument and blood screening results recorded by the program co-ordinators and will be accessed by the researcher. Participants consented to have their data collected and used for research purposes. Access to the data was obtained with the permission from the Lifestyle Medicine Institute (New Zealand).

Sample

Data will be sourced for this case study from seven programs run independently by group leader Dr T in Hawera, NZ. Participation in the CHIP program is voluntary and is as a response to formal and informal advertising conducted by the local CHIP team. Each program was run under the leadership of Dr T and around five core support personnel. Hawera is a rural town with a population of approximately 11,000 people situated in dairy farming province of Taranaki.

Quantitative Measures

From the CHIP survey and blood screening process the demographic, biometric, lifestyle habits, family story and medical history statistics will be determined.

Demographic Measures

Through the survey instrument, data will be collected relating to the participants general demographic features of age, gender, marital status and religious affiliation.

Biometric Measures

Data will be obtained from blood samples collected from participants at the commencement and conclusion of the CHIP program and sent to the pathology laboratories for biometric analysis. This blood screening will include measures for total

cholesterol, high density lipoprotein, low density lipoprotein, triglycerides, and fasting blood glucose levels.

Other biometric measures that will be collected from the CHIP survey include: height, weight and waist circumference. From this data the participants Body Mass Index (BMI) will be calculated and recorded. Along with this the participants will have their systolic and diastolic blood pressure taken pre and post intervention.

For each of the biometric measures identified, participants will be placed in respective risk factor classification groupings.

Biometric Risk Factor Classifications

The National Cholesterol Education Program Adult Treatment Panel III classification system 7 will be used to categorise participants for all risk factors excluding total cholesterol (National Cholesterol Education Program, 2002). The Framingham classification will be used for the stratification of the total cholesterol data (Wilson et al., 1998). This classification identified five categories of cholesterol levels which allows for a more detailed analysis to be made of the effects of the intervention for the highest risk participants than the National Cholesterol Education Program Adult Treatment Panel III classification system 7.

Lifestyle Measures

Data will be obtained from the CHIP survey questions relating to specific lifestyle habits such as exercise levels and smoking status both before and after the CHIP program to determine lifestyle measures.

Family and Medical History Measures

Data will be obtained from the CHIP survey questions relating to the participants' health history and family history of cardiovascular disease and diabetes, in order to generate family and medical history measures. In particular their histories of asthma, diabetes and cardiac events will be accessed.

Data Analysis

The data from the CHIP survey and blood screening will be entered into the statistical software package SPSS 17.0 (SPSS 17.0 for Windows, SPSS Inc). Descriptive statistics for each measure and sub measure will be determined. Dependent and Independent group t-tests and independent one way between groups ANOVA with post-hoc comparisons will be run to locate any area of significant difference between participant group or subgroup measures. Cohen's d will be calculated to determine the effect size of the CHIP intervention with respect to each of the measured biometrics for participant groups and sub groups.

Chapter Four

The CHIP Program

Elements Of The Program

CHIP stands for Coronary Health Improvement Program, but it involves much more than the name suggests. Whilst the program was initially designed by Dr. Hans Diehl for people with coronary health issues, the program is being delivered to participants in view to improve all aspects of health. CHIP aims to educate participants on making lifestyle changes that involve a diet which is whole plant food based, with little or no animal products. As well as modifying their nutrition, it also recommends participants engage in at least 30 minutes of daily exercise. Identifying and implementing ways to reduce stress and ceasing smoking is also part of the programs guidelines for holistic health.

Participants begin the program by fasting for 8 hours and undergoing a blood screening. The blood sample is sent away to be analysed for cholesterol levels, (HDL, triglycerides, total cholesterol and LDL) and fasting plasma glucose levels. The participants are also weighed, their height is measured, their blood pressure tested and they have their resting pulse recorded for further evaluative tests such as body mass index (BMI). Participants are also required to complete a questionnaire which asks questions about dietary and exercise habits, their past exposure/histories of smoking, obesity, diabetes, high blood pressure, and cardiac events as well as common questions about age, gender and religious affiliation. Another aspect of the questionnaire involves collecting

information on the attendee's family history of diabetes, cancer and coronary health. This process is then repeated post-intervention to measure the participants' progress.

Once the preliminary testing is completed, the face to face meetings commence. The program consists of approximately 40 hours of face to face meetings conducted over a period of 16 sessions, usually within a four or five week period of time. Each meeting includes the viewing of a DVD, a cooking demonstration and a group discussion. Whilst the meeting does not include an exercise component, participants are encouraged each session with tips on how to exercise. One of the meetings also includes a shopping tour where participants are shown how to make informed and effective dietary choices using produce and groceries from their local supermarket.

The topics covered in the DVD viewing time and group discussion include:

- modern medicine: its accomplishments and limitations
- atherosclerosis
- coronary risk factors
- smoking
- exercise
- dietary fibre
- cholesterol
- the optimal diet
- obesity
- diabetes
- hypertension

- hyperlipidaemia
- lifestyle and health
- behavioural change
- self-worth (Englert, Diehl et al., 2004)

After the program is completed participants are given their final blood screening and questionnaire and are encouraged to join the CHIP Alumnus which meets once a month to keep participants informed and encouraged on maintaining their healthy lifestyle choices.

Delivery

CHIP was designed to be conducted in a non- medical environment, delivered by volunteer directors. This is made possible by supplying the directors with the DVD's which contain all the information presentations. This provides the essential information needed for the team leaders to pass onto the participants at the meetings. In order to equip these volunteer directors with the necessary tools to effectively conduct a CHIP program, each volunteer is required to complete an intensive weekend of training. At this training weekend volunteer directors are given materials and attend workshops which teach them the skills necessary to deliver the CHIP program in their local area.

Hawera Based CHIP Program

Dr T is the facilitator for the CHIP programs that were conducted in Hawera. The data collected from these programs forms the basis for this case study. Dr T is a General Practitioner who is passionate about preventative health. He completed training to be a leader for the CHIP program at a weekend CHIP summit at the Gold Coast, Australia. He has since conducted 7 CHIP programs in Hawera.

Team

There were a core team of helpers who assisted Dr T in delivering the CHIP program in Hawera. The team for each program was different but was made up of approximately 5 core members and extra volunteers. These members were assigned various jobs, including welcoming, data collection, kitchen help and technical support. Dr T was the main presenter for each program. After the initial program was conducted, some participants from that program volunteered to support Dr T in facilitating other programs.

Program Delivery

The number of participants for each of the seven programs varied from 15 to 100 participants. Dr T suggested that the smaller groups were more effective in achieving group based discussion and more individualised attention for participants. There have been over 300 people who have completed the CHIP program in the Hawera area under his direction. The standard program delivery of 16 sessions in a 4 week period was extended with additional meetings once a week for a further 8 weeks before the graduation. This was done with the intention to support participants more in their

lifestyle changes. The program delivery for the meetings included cooking demonstrations and the viewing of the DVD and workbook materials that were supplied. The cost for participants was $440 for couples and for singles $300. Participants were given an option to pay a deposit and then pay the remainder of the fee in weekly instalments.

Data Collection

The data from the questionnaires and blood tests was collected and entered into the CHIP assistant computer program by Dr T and his wife.

Advertising

There were many different mediums of advertising used to promote CHIP in Hawera. Pamphlets which were designed by Dr T were placed in strategic places such as hospitals, doctor's surgeries and noticeboards. Dr T visited the local Lions and Rotary clubs and gave short presentations on CHIP to encourage support and awareness of the program. Newspaper and radio advertisements were also used. Some patients of Dr T were also encouraged to attend the CHIP meetings and were sent information regarding upcoming programs in the area. He estimated about 50% of all participants that attended the programs in Hawera were patients in his surgery. Dr T commented that the best medium of advertising was word of mouth from previous CHIP participants. He said that word of mouth along with the newspaper advertisements were the most beneficial in bringing participants to the program.

Community Response

Dr T indicated that the community response towards the program had been very positive. A visit from Dr Hans Diehl, the creator of the program was very effective in generating interest in Hawera about CHIP. In addition, the local newspaper had written a feature article in the weekend edition which also generated a good response from the community.

Strengths and Weaknesses

Upon reflection of the CHIP programs, DR T, identified two main weaknesses which required further attention. Firstly, the duration of each nightly meeting needed to be shortened. The guidelines for running a CHIP program indicate the evening sessions to run for two and half hours however Dr T identified this as being too long for the participants and therefore adjusted it accordingly. The meetings each night were reduced to one and a half hour sessions. Another difficulty that was identified was in relation to the entry of data from the participants. Dr Hurlow found that the CHIP assistant computer program was not user friendly and there were therefore many difficulties experienced in entering the data. He concluded that a review of this program needed to be conducted to prevent future complications. Despite these small setbacks, he found the programs to be an extremely positive event for the community.

The Educational Orientation of The CHIP Program

There are many elements that contribute towards the success or failure of an education program. The participants' ability to acquire knowledge and skills, make behaviour changes where applicable and achieve measurable results are just some of the important elements that are required. The CHIP program conducted by Dr T and his team in Hawera involved the following key elements.

Motivation

Participants in this program were self-selected through an individual response to various advertising mediums. The fact the people from the community chose to participate in this program indicates a high level of motivation in achieving personal goals. This motivation is a key factor in the success of the program.

Reputable Leadership

The CHIP program was conducted by a local family medical practitioner. His rapport within the community for the work he does in his general practise, as well as being a medical doctor, contributed to the effectiveness of the program. In general, participants respond well when they have trust in the knowledge and skills of the leadership and the team.

CHIP Support Team

Some of the members of the community who had previously completed the CHIP program subsequently chose to become involved in the delivery of the new programs.

These previous participants were an invaluable resource as they encouraged the new group just beginning their journey. All of the team members, including the group facilitator, volunteered their time and effort into conducting these programs. One of the many benefits of this volunteer based delivery is the passion that leaders have in educating the community to live healthier lives. Participants may find it easier to approach the team leaders and ask questions because they know they are volunteering their time and are therefore willing to help.

Practical Skills

As well as delivering information and knowledge to participants, this program aimed to provide practical applications through cooking demonstrations and tastings. This process enabled participants to see how to prepare healthy foods for themselves and their families. One of the meetings involved a trip to the local supermarket to show participants how to source local produce and products that are healthy. In addition, they were given recipe books as part of their CHIP literature and the leadership team demonstrated recipes from this book at each meeting. These simple lessons provided opportunities for participants to gain the skill sets required in sourcing and producing healthy food.

Literature

Participants were given a workbook, as well as other materials, that they could use to gather more information. The workbooks provided a written way to apply their knowledge by answering questions and engaging in group dialogue with the responses.

This technique can provide enriched learning experiences for participants as they contribute ideas and information.

Positive Reinforcement

Positive reinforcement is essential in developing and sustaining good habits (Elder et al., 1999). Participants are continually given positive reinforcement from their team leaders, as well as each other during the course of the program. This is done in response to feedback about meals cooked at home and exercise activities the participants engaged in. In particular the re-testing which is conducted at the end of the program gives participants feedback on the changes they have made. These results offer a practical measurement of improvements and success during the course of the program. Finally, all participants who finish the group attend a graduation ceremony where, once again, the positive results they have achieved are celebrated by the group.

Alumni

Once participants graduate from the program they are invited to be a part of the CHIP Alumni which aims to help participants maintain their focus on living a healthy lifestyle. The ability to be able to seek continual support from other participants and leaders as they make lifelong changes can have a significant impact on their success.

Whilst the results of this program indicate success in improving the health of participants in many areas, further research is required to ascertain the long term effectiveness. No studies have been done yet to determine whether or not participants

have continued applying the knowledge that they were taught after the program concluded.

Chapter Five

Results

Sample

The sample consisted of 284 participants with a mean age of 59.17 years and a standard deviation of 11.19 years. 65.1% of this population were female (185) and 34.9% were male (99). The age distribution for each gender is illustrated in Figure 1.0.

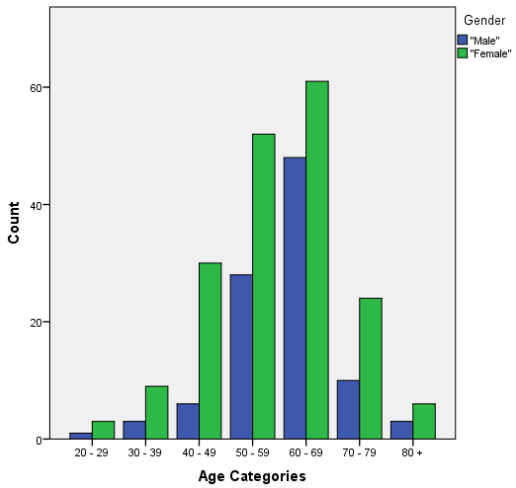

Figure 1.0 The distribution of participants ages for both males and females.

The marital status of the participants is shown below in Figure 2.0: 5.6% were single, 79.6 were married, 4.9% were divorced and 4.9% were widowed.

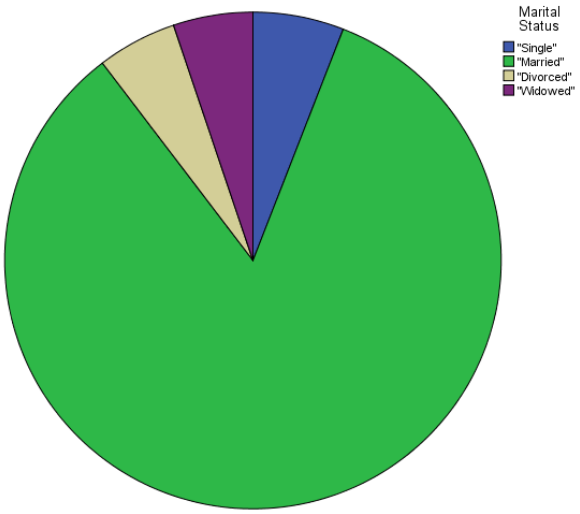

Figure 2.0 The distribution of the participants marital status.

Of the participants 9.2% reported a previous family history of cardiovascular disease mortality, and 3.2% a family history of diabetes myelitis, 2.1% had a previous history of stroke, 0.7% a previous history of heart failure and 3.5% a history of bypass.

Change in Biometrics

Combined Data

The mean absolute and percentage changes from baseline to post intervention in the selected biometrics (weight, body mass index, systolic blood pressure, diastolic blood pressure, total cholesterol, low density lipoprotein, high density lipoprotein, triglycerides, fasting plasma glucose) were calculated (Table 1). The distribution of these changes for each biometric was tested for normality. The change distribution for all the respective biometrics were found to be either normal or near normal. Paired t-tests

were then calculated for each of the respective biometrics to determine if the changes were statistically significant.

Table 1: Mean changes in selected chronic diseases risk factors (biometrics) from baseline to post-intervention.

Factor	N**	Baseline Mean (SD)*		Post-intervention Mean (SD)*		Mean Change	% Change	t statistic	p value	Cohen's d
Weight (kg)	284	88.29	18.78	84.50	17.77	-3.78	-4.21	28.64	<0.001	0.207
Body mass index (kg/m^2)	284	31.86	6.36	30.51	6.10	-1.35	-4.22	30.48	<0.001	0.216
Systolic blood pressure (mmHg)	284	131.93	14.72	124.85	13.10	-7.08	-4.86	9.78	<0.001	0.508
Diastolic blood pressure (mmHg)	284	77.24	10.94	73.20	10.45	-4.04	-4.38	6.72	<0.001	0.377
Total cholesterol (mmol/L)	284	5.30	1.09	4.32	1.00	-.96	-18.09	25.62	<0.001	0.936
Low density lipoprotein (mmol/L)	284	3.30	.96	2.53	.86	-.77	-22.79	23.23	<0.001	0.844
High density lipoprotein (mmol/L)	284	1.29	.33	1.17	.28	-.13	-8.66	12.40	<0.001	0.392
Triglycerides (mmol/L)	284	1.55	.81	1.38	.65	-.17	-4.60	4.65	<0.001	0.231
Fasting plasma glucose (mmol/L)	284	5.96	1.62	5.48	.96	-.48	-5.67	6.44	<0.001	0.360

*SD – Standard deviation. **N – Number of participants

There was statistically significant lowering of all the biometric risk factors with the greatest change in low density lipoprotein (22.79%) and total cholesterol (18.09%) (Table 1). Even though the weight change was significant at the .001 level it was the smallest percentage change (4.21%) of the biometrics measured and even so is still clinically significant. This lower change is probably due to the short time period of the intervention and there is normally a time lag between change of lifestyle patterns and weight change.

The effect size of the change for each biometric was determined using Cohen's d; where values around 0.2 indicate a small change, values around 0.5 indicate a moderate change and values around 0.8 indicate a large change. Both total cholesterol and low density lipoprotein recorded a large change with Cohen's d values of 0.936 and 0.844 respectively. Systolic and diastolic blood pressure, high density lipoprotein, and fasting plasma glucose recorded moderate changes with Cohen's d values of 0.508, 0.377, 0.397, 0.360, whilst weight, body mass index and triglycerides recorded a small change in Cohen's d values of 0.216 and 0.231.

The lifestyle intervention program resulted in significant reductions across all the biometric risk factors measured: weight, body mass index, systolic blood pressure, diastolic blood pressure, total cholesterol, low density lipoprotein, high density lipoprotein, triglycerides and fasting plasma glucose. These reductions were greatest for low density lipoprotein and total cholesterol. The reduction recorded for weight, body mass index and triglycerides were small comparative to the changes in the other risk factors, however, they were still significant at the 0.001 level.

These results indicate that these Hawera volunteer-delivered 30 day CHIP based lifestyle intervention programs were effective in reducing biometrics and thus lowering the potential risk of cardiovascular disease.

Stratified Data

The biometric data was further analysed by first stratifying the data for each biometric in terms of initial risk condition categories, using 'The National Cholesterol Education Program Adult Treatment Panel III, 2002' convention or the Framingham Classification. Each participant's initial (baseline) reading for the respective biometric groups was categorised according to this convention, from lowest to highest risk (Table 2). Body mass index was divided into 3 risk categories: 18.5 - 24.9 kg/m^2, 25 – 30 kg/m^2 and >30 kg/m^2. Systolic Blood Pressure was divided into 4 risk categories: <120, 120-139, 140-160 and >160. Diastolic Blood Pressure was divided into 4 risk categories: <80, 80-89, 90-100 and >100. Total Cholesterol was divided into 5 risk categories: <4.00, 4.00-5.20, 5.21-5.99, 6.00-6.99 and >7.00. Low density lipoprotein was divided into 4 risk categories: <2.50, 2.50-2.99, 3.00-4.00 and >4.00. High density lipoprotein was divided into 3 risk categories: <1.00, 1.00-1.55, >1.55. Triglycerides were divided into 3 risk categories: <1.00, 1.00-2.25 and >2.25. Finally fasting plasma glucose was also divided into 3 risk categories: <5.60, 5.60-7.00 and >7.00.

For each risk category across all the biometrics, a paired t-test was performed to determine whether there was a significant reduction in the post intervention results due to the lifestyle change. Initially the percentage change (reduction or increase) for each risk category across all biometrics were calculated and then for each change the effect size was estimated using Cohen's d (Table 2). The percentage of the sample within each risk category was calculated for baseline and post intervention to enable an analysis of the change in risk category numbers due to the lifestyle education intervention.

Table 2: Changes in chronic disease risk factor levels within 30 days according to initial risk factor classification.

Risk Factor	N Baseline	N Post-intervention	Baseline Mean (SD)		Post-intervention Mean (SD)		Mean Change	% Mean Change	p	t	Cohen's d
Body mass index (kg/m^2)											
18.5 - 24.9	33 (11.6%)	42 (15.1%)	23.37	1.23	22.54	1.23	-0.83	-3.55%	<0.001	9.458	.674
25 – 30	93 (32.8%)	108 (38.7%)	27.85	1.42	26.66	1.36	-1.19	-4.27%	<.001	21.550	.855
> 30	157 (54.4%)	129 (46.23%)	36.02	5.44	34.47	5.28	-1.55	-4.30%	<.001	23.731	.289
Systolic blood pressure (mmHg)											
<120	59 (20.77%)	109 (38.38%)	111.69	6.86	113.28	9.57	1.59	1.42%	>.208	-1.274	-0.190
120-139	150 (52.81%)	139 (48.94%)	130.78	4.80	124.57	10.84	-6.21	-4.75%	<.001	6.725	0.741
140-160	70 (24.64%)	34 (11.97%)	148.61	6.52	133.37	11.31	-15.24	-10.25%	<.001	12.465	1.651
>160	5 (1.76%)	2 (.704%)	171.80	10.42	150.4	12.48	-21.4	-12.46%	>.005	5.570	1.861
Diastolic blood pressure (mmHg)											
<80	156 (54.92%)	199 (70.07%)	69.50	7.01	68.13	7.832	-1.37	-1.97%	>.876	.156	0.184
80-89	92 (32.39%)	74 (26.05%)	74.67	2.654	76.51	2.851	1.84	2.46%	<0.001	7.221	-0.668
90-100	31 (10.91%)	11 (3.873%)	92.61	2.89	80.35	13.27	-12.26	-13.23%	<.001	5.285	1.2
>100	5 (1.76%)	0	109.00	4.63	86.60	4.27	-22.4	-20.55%	<.001	10.161	.76

Risk factor	N Baseline	N Post Intervention	Baseline Mean (SD)		Post-intervention Mean (SD)		Mean Change	% Mean Change	p	t	Cohen's d
Total cholesterol (mmol/L)											
< 4.00	25 (8.80%)	102 (35.91%)	3.31	.424	2.83	.577	-0.48	-14.50%	<.001	4.633	.948
4.00–5.20	111 (60.32%)	136 (47.88%)	4.62	.342	3.80	.529	-0.82	-17.75%	<.001	18.288	1.840
5.21–5.99	67 (23.59%)	27 (9.50%)	5.60	.203	4.59	.575	-1.01	-18.0%	<.001	14.518	2.342
6.00–6.99	66 (23.23%)	17 (5.98%)	6.36	.299	5.08	.754	-1.28	-20.12%	<.001	13.840	2.231
>7.00	15 (5.28%)	2 (0.70%)	7.54	.403	6.06	.940	-1.48	-19.63%	<.001	7.266	2.047
Low density lipoprotein (mmol/L)											
<2.50	64 (22.53%)	152 (53.52%)	2.04	.493	1.57	.520	-0.48	-23.03%	<.001	9.795	0.928
2.50-2.99	47 (16.55%)	54 (19.01%)	2.80	.144	2.21	.383	-0.59	-21.07%	<.001	9.739	2.039
3.00-4.00	104 (36.61%)	64 (22.53%)	3.47	.290	2.67	.512	-.08	-23.05%	<.001	16.860	1.923
>4.00	69 (24.29%)	14 (4.92%)	4.539	.415	3.44	.702	-1.099	-24.21%	<.001	13.566	1.906
High density lipoprotein (mmol/L)											
<1.00	56 (19.71%)	87 (30.63%)	.874	.907	.860	.115	-0.14	-1.60%	.33	.977	0.021
1.00-1.55	162 (57.04%)	169 (59.50%)	1.25	.160	1.14	.179	-.011	-8.8%	<.001	10.384	0.648
>1.55	66 (23.23%)	28 (9.85%)	1.76	.168	1.49	.229	-0.27	-15.34%	<.001	10.234	1.344

Risk factor	N Baseline	N Post Intervention	Baseline Mean (SD)		Post-intervention Mean (SD)		Mean Change	% Mean Change	p	t	Cohen's d
Triglycerides (mmol/L)											
<1.00	77 (27.11%)	89 (31.33%)	.799	.140	.889	.277	0.09	11.56%	.001	-3.445	-0.410
1.00-2.25	162 (57.04%)	172 (66.56%)	1.50	.309	1.40	.503	-0.1	-6.66%	.008	2.666	0.239
>2.25	45 (15.84%)	23 (8.09%)	2.99	.825	2.10	.854	-0.89	-29.76%	<.001	6.150	1.059
Fasting plasma glucose (mmol/L)											
<5.60	147 (51.76%)	194 (68.30%)	5.13	.373	5.07	.377	-0.06	-1.16%	.098	1.665	0.159
5.60-7.00	105 (36.97%)	74 (26.05%)	5.99	.385	5.53	.461	-0.46	-7.68%	<.001	10.458	1.083
>7.00	32 (11.26%)	16 (5.63%)	9.65	2.33	7.17	1.81	-2.48	25.7%	<.001	5.016	1.188

SD – Standard deviation.

There were significant reductions due to the intervention across nearly all the risk categories for each of the biometrics studied. However, participants in the lowest risk factor categories for the systolic and diastolic blood pressure, high density lipoprotein and fasting plasma glucose biometrics did not register a significant change between the baseline and post intervention readings. For all other categories in these biometrics there was a significant change at the 0.05 level. For body mass index, total cholesterol, low density lipoprotein and triglycerides there were significant reductions across all the risk factor categories.

With respect to the risk factor levels for each biometric there was a trend in terms of percentage change post intervention where the participants in the highest risk factor levels most often recorded the greatest percentage reduction. In general as the participants' risk factor increased, the percentage change in the respective biometrics also increased. However there were some instances where the top two risk factor levels recorded similar percentage changes rather than continuing to increase.

For diastolic blood pressure, total cholesterol, low density lipoprotein, triglycerides and fasting plasma glucose the percentage change recorded for the highest risk factor level ranged from 19 to 29%. Whereas the percentage change for the lowest risk factor levels for most of the biometrics ranged from around 1 to 4%.

The size of the pre to post change across the chronic disease baseline risk factor levels were analysed using a Cohen's d. This calculation was done to ascertain the CHIP intervention effect size across these factor levels. A Cohen's d effect size of .2 would be considered small, .5 moderate and >.8 is large. There was a trend across the majority of the demographics where the effect size increased as the baseline factor levels increased. There was however a few of the factor groups that had slightly different results from the other groups. The effect size for the change in total cholesterol is the greatest across all the initial risk factor levels. Its distribution of change across the respective risk factors is different in that the effect size increases with each level but peaks at the third level (5.21-5.099) at 2.342 and then starts to reduce again. A possible reasoning for this phenomenon could be that the total amount of cholesterol change that can occur in a month has been reached. Also, the last category is unbound (no upper limit) so you have the potential for a very large standard deviation and this may impact on the effect size for this category. Therefore the continuation of these effects may not be seen over this intervention time but may be seen post intervention. The effect size for BMI is relatively small however when compared to the other biometrics. This is not unexpected as a significant weight loss would not normally be recorded within the 30 days. This could be one of the contributing factors to the smaller effect size results for this biometric.

Demographic Differences in Biometric Changes

Introduction

This section explores the differences in the changes due to the CHIP intervention in the respective biometrics across the following demographics: Gender, Age, Marital Status, Family History of Cardiovascular Disease, Family History of Diabetes, Post Intervention Exercise Change, Baseline Smoking Status and Baseline Biometrics.

Change in Body Mass Index (BMI)

Gender

There was a significant difference between the mean change in BMI for the males (M = -1.560, SD = .893) when compared with the females (M = -1.243, SD = .633). [t (282) = -3.468, p = .001]. The male participants recorded a larger mean change post intervention compared with the female participants.

Age

The mean change in BMI values due to CHIP intervention across the various age groupings are shown in Table 3.0. Post hoc tests indicated significance in the 50-59 and the 60-69 age categories [F (3,283) = 2.717, p <.045].

Table 3.0: Age Change in BMI Values across Age Groups

Age Group	Number	Mean Change (M)	Standard Deviation (SD)
20-49	52	1.286	.770
50-59	80	1.553	.834
60-69	109	1.281	.701
70-80+	43	1.248	.614

The BMI change for the 0-49, 60-69 and 70+ years age groups were similar but the 50-59 years age group recorded a significantly larger change (Figure 3.0 Age – the negative for the mean indicates a reduction in biometric post-intervention).

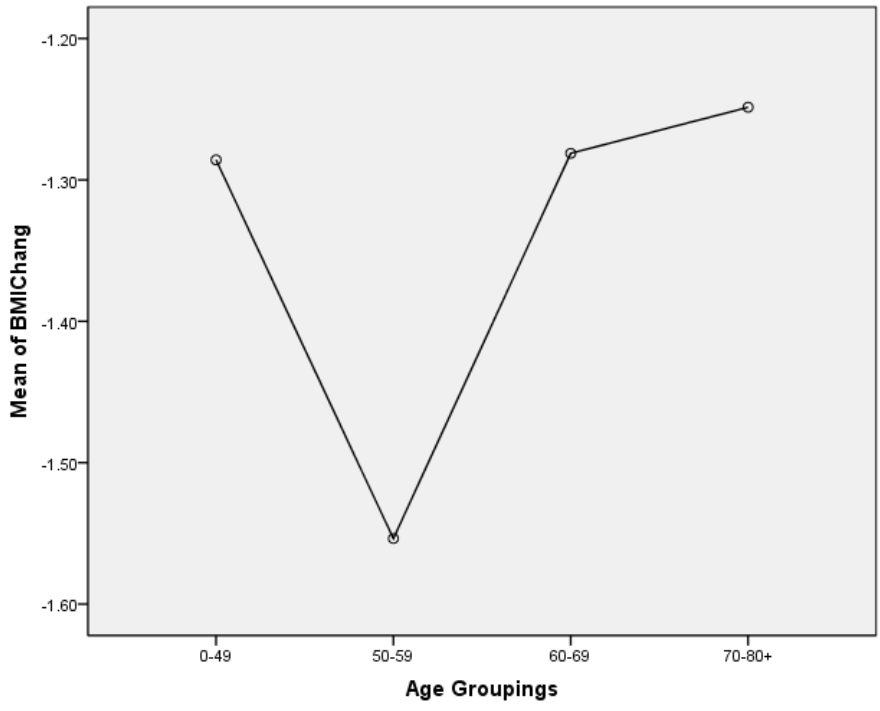

Figure 3.0: The Distribution of BMI Change across Age Groups

Marital Status

There were no significant differences in the mean change in BMI across the various marital status categories. (Table 3.1 Marital Status)

Table 3.1: Change in BMI Values across Marital Status Categories

Marital Status	Mean (M)	Standard Deviation (SD)
Single	-1.22	.702
Married	-1.37	.783
Divorced	-1.67	.493
Widowed	-1.14	.444

Family History of Cardiovascular Disease

There was a significant difference between the mean change in BMI for those with (M = .-1.695, SD = 1.025) or without (M = -1.319, SD = .721) a family history of cardiovascular disease. Post hoc tests indicated that those participants with a family history of cardiovascular disease had a greater mean change than those with no family history. [t (246) = -2.397, p <.017]

Family History of Diabetes

There was no significant differences between the mean change in BMI for those with (M = -1.330, SD = .889) or without (M = -1.344, SD = .756) a family history of diabetes.

Baseline Exercise Levels

The mean change in BMI values due to CHIP intervention across the various baseline exercise levels are shown in Table 3.2 Baseline Exercise Levels. Analysis indicated that there were significant differences in the mean change in BMI across baseline exercise categories [F (3,279) = 4.415, p <.005].

Table 3.2: Change in BMI Values across Baseline Exercise Levels

Exercise Level	Mean (M)	Standard Deviation (SD)
None	-1.55	.780
Mild	-1.35	.805
Moderate	-1.18	.602
Vigorous	-1.00	.512

The higher the participants' exercise level at baseline the less change that was recorded post intervention (Figure 3.1 Exercise Level).

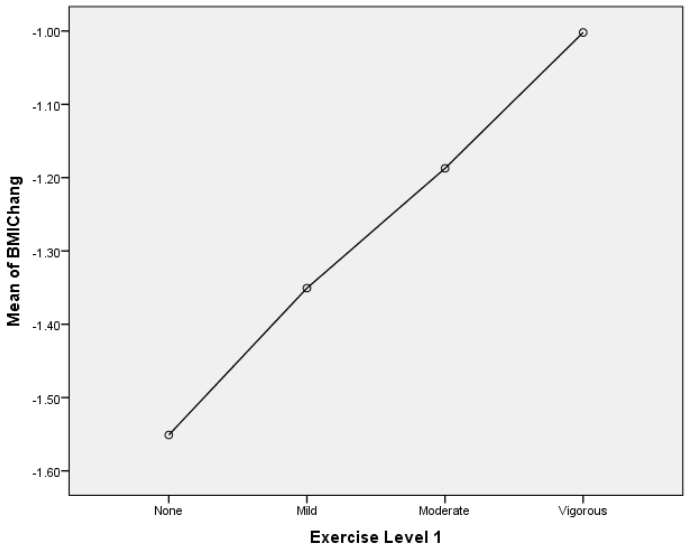

Figure 3.1The Distribution of BMI Change across Baseline Exercise Levels

Post Intervention Exercise Change

The mean change in BMI values due to CHIP intervention across the various post intervention levels are shown in Table 3.3 Post Intervention Exercise Levels. Analysis indicated that there were significant differences in the mean change in BMI across post intervention exercise categories [F (3,275) = 4.332, p <.005].

Table 3.3: Change in BMI Values across Post Intervention Exercise Levels

Exercise Level	Number	Mean (M)	Standard Deviation (SD)
-3	28	-1.576	.692
-2	95	-1.508	.716
-1	105	-1.217	.840
0	48	-1.181	.513

As the participants increased their levels of exercise from baseline, their reduction in BMI increased (Figure 3.2).

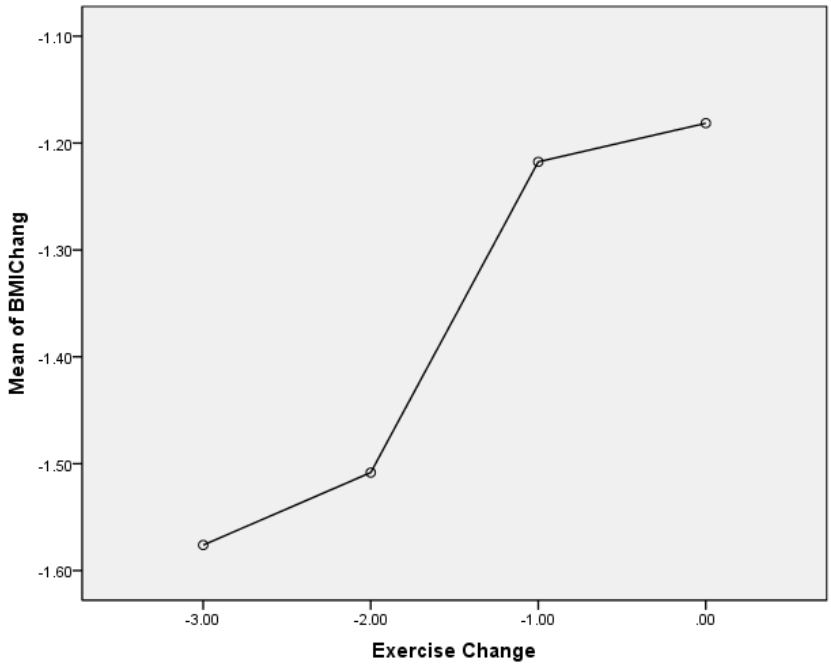

Figure 3.2: The Distribution of BMI Change across Post Intervention Exercise Levels

Baseline Smoking Status

The mean change in BMI values due to CHIP intervention across the various smoking status categories are shown in Table 3.4 Smoking Status. There were no significant differences in the mean change in BMI across the various baseline smoking status categories.

Table 3.4: Change in BMI Values across Baseline Smoking Status

Smoking Status	Mean (M)	Standard Deviation (SD)
Non-Smoker	-1.31	.693
Ex-Smoker	-1.36	.728
Smoker	-1.27	.800
Live with Heavy Smoker	-1.92	1.507

Baseline Biometric (BMI)

The mean change in BMI values due to CHIP intervention across the baseline BMI risk level categories are shown in Table 3.5 Baseline BMI. Analysis indicated that there were significant differences in the mean change in BMI across the various BMI risk level categories [F (2,283) = 17.655, p <.001].

Table 3.5: Change in BMI Values across Baseline Biometric

Baseline BMI	Number	Mean (M)	Standard Deviation (SD)
Normal (18.5 – 24.9kg/m2)	33	-.8317	.505
Overweight (25-30kg/m2)	93	-1.1914	.533
Obese (>30kg/m2)	157	-1.550	.818

Those participants with the greatest baseline BMI reading reported the greatest lowering of their BMI post intervention (Figure 3.3).

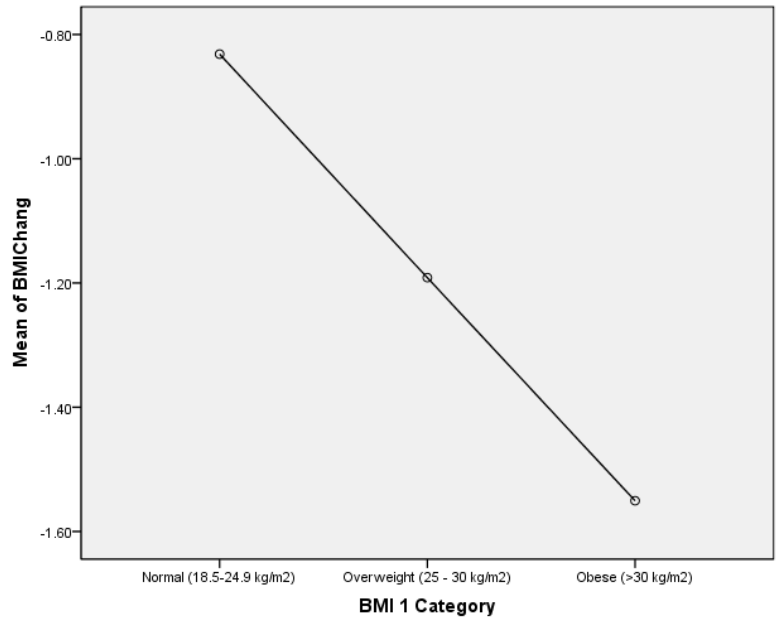

Figure 3.3: The Distribution of BMI Change across Baseline BMI

When comparing the change in BMI levels (post intervention) across the various demographics, there were 7 areas where a significant difference was recorded; gender, age, family cardiovascular history, baseline biometrics, exercise level 1 and exercise change. The male participants recorded a higher level of change to their BMI than the female participants. The age categories of 50-59 and 60-69 recorded a greater change then the other age groupings for their BMI. Those participants with a family history of cardiovascular disease recorded a greater change in their BMI post intervention than those without a family history. Those participants with the greatest baseline BMI reading reported the greatest lowering of their BMI post intervention. Those participants who had a baseline exercise level of none and had increased their physical activity to moderate or vigorous during the intervention recorded the most significant lowering of the BMI score post intervention.

Change in Blood Pressure Systolic (BP SYS)

Gender

There was no significant differences between the mean change in BP SYS for the males (M = 8.21, SD = 12.229) when compared with the females (M = .721, SD = .530).

Age

There were no significant differences in the mean change in BP SYS across the various age groupings. (Table 4.0)

Table 4.0: Change in BPSYS Values across Age Groups

Age Group	Mean (M)	Standard Deviation (SD)
20-29	.75	6.397
30-39	3.25	12.174
40-49	5.81	11.664
50-59	8.20	12.168
60-69	8.39	11.383
70-79	3.44	15.551
80+	8.00	10.124

Marital Status

There were no significant differences in the mean change in BP SYS across the various marital status categories. (Table 4.1)

Table 4.1: Change in BPSYS Values across Marital Status Groups

Marital Status	Mean (M)	Standard Deviation (SD)
Single	7.50	9.805
Married	7.60	12.246
Divorced	5.36	10.609
Widowed	1.36	13.659

Family History of Cardiovascular Disease

There was no significant differences between the mean change in BP SYS for those with (M = 9.19, SD = 15.922) or without (M = 7.10, SD = 11.927) a family history of cardiovascular disease.

Family History of Diabetes

There was no significant differences between the mean change in BP SYS for those with (M = 13.00, SD = 14.500) or without (M = 7.13, SD = 12.283) a family history of diabetes.

Baseline Exercise Levels

There were no significant differences in the mean change in BP SYS across the various baseline exercise categories. (Table 4.2)

Table 4.2: Change in BPSYS Values across Baseline Exercise Levels

Exercise Level	Mean (M)	Standard Deviation (SD)
None	6.69	11.830
Mild	6.43	13.614
Moderate	7.70	11.056
Vigorous	6.50	9.477

Post Intervention Exercise Change

There were no significant differences in the mean change in BP SYS across the various post intervention exercise change levels. (Table 4.3)

Table 4.3: Change in BPSYS Values across Post Intervention Exercise Levels

Exercise Level	Number	Mean (M)	Standard Deviation (SD)
-3	28	2.21	12.621
-2	95	7.40	11.911
-1	105	6.55	12.120
0	48	7.94	11.566
1	1	24.00	
2	1	31.00	

Baseline Smoking Status

There were no significant differences in the mean change in BP SYS across the various baseline smoking status categories. (Table 4.4)

Table 4.4: Change in BPSYS Values across Baseline Smoking Status Categories

Smoking Status	Mean (M)	Standard Deviation (SD)
Non-Smoker	6.46	11.775
Ex-Smoker	7.30	13.752
Smoker	7.00	11.874
Live with Heavy Smoker	9.78	13.944

Baseline Biometric: BP SYS

The mean change in BP SYS values due to CHIP intervention across the baseline BP SYS risk level categories are shown in Table 4.5. Analysis indicated that there

were significant differences in the mean change in BP SYS across the various BP SYS risk level categories [F (3,284) = 29.962, p <.001].

Table 4.5: Change in BPSYS Values across Baseline Biometric

Baseline BP SYS	Number	Mean (M)	Standard Deviation (SD)
<120	59	-1.59	9.603
120.1 - 139	150	6.21	11.304
140-160	70	15.24	10.231
>160	5	21.40	8.591

Those participants with the greatest baseline BP SYS reading reported the greatest lowering of their BP SYS levels post intervention. (Figure 4.0)

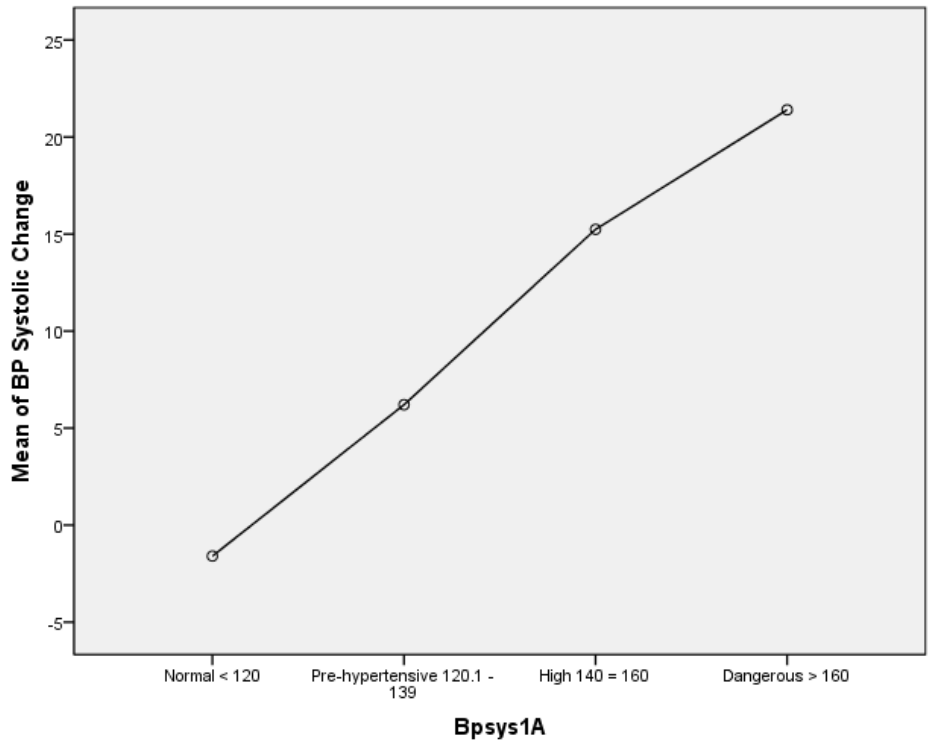

Figure 4.0: The Distribution of BP SYS Change across Baseline BP SYS

When comparing the change in BP SYS (post intervention) across the various demographics, only the baseline BP SYS registered a significant difference. In this situation those participants with the greatest BP SYS pressure reading reported the greatest lowering of their BP SYS levels post intervention.

Change in Blood Pressure Diastolic (BP DIA)

Gender

There was no significant differences between the mean change in BP DIA for the males (M = 4.161, SD = 9.909) when compared with the females (M = 3.968, SD = 10.265).

Age

There were no significant differences in the mean change in BP DIA across the various age groupings. (Table 5.0)

Table 5.0: Change in BP DIA Values across Age Groups

Age Group	Mean (M)	Standard Deviation (SD)
20-29	-1.500	6.806
30-39	4.666	11.452
40-49	4.361	11.151
50-59	3.225	10.434
60-69	4.779	9.978
70-79	2.558	9.468
80+	8.111	6.153

Marital Status

There were no significant differences in the mean change in BP DIA across the various marital status categories. (Table 5.1)

Table 5.1: Change in BP DIA Values across Marital Status Categories

Marital Status	Mean (M)	Standard Deviation (SD)
Single	3.875	8.898
Married	4.508	10.479
Divorced	1.785	5.767
Widowed	1.214	8.059

Family History of Cardiovascular Disease

There was no significant differences between the mean change in BP DIA for those with (M = 4.846, SD = 10.212) or without (M = 4.301, SD = 10.261) a family history of cardiovascular disease.

Family History of Diabetes

There was no significant differences between the mean change in BP DIA for those with (M = 5.667, SD = 9.797) or without (M = 4.426, SD = 10.260) a family history of diabetes.

Baseline Exercise Levels

There were no significant differences in the mean change in BP DIA across the various baseline exercise categories. (Table 5.2)

Table 5.2: Change in BP DIA Values across Baseline Exercise Levels

Exercise Level	Mean (M)	Standard Deviation (SD)
None	3.814	10.805
Mild	4.096	10.582
Moderate	3.963	9.214
Vigorous	3.285	8.597

Post Intervention Exercise Change

There were no significant differences in the mean change in BP DIA across the various post intervention exercise change levels. (Table 5.3)

Table 5.3: Change in BP DIA Values across Post Intervention Exercise Change Levels

Exercise Level	Number	Mean (M)	Standard Deviation (SD)
-3	28	.714	10.366
-2	95	3.652	9.250
-1	105	4.295	10.616
0	50	5.5400	10.167

Baseline Smoking Status

There were no significant differences in the mean change in BP DIA across the various baseline smoking status categories. (Table 5.4)

Table 5.4: Change in BP DIA Values across Baseline Smoking Status Levels

Smoking Status	Mean (M)	Standard Deviation (SD)
Non-Smoker	3.689	9.757
Ex-Smoker	3.787	11.001
Smoker	10.333	15.612
Live with Heavy Smoker	3.888	6.972

Baseline Biometric: BP DIA

The mean change in BP DIA values due to CHIP intervention across the baseline BP DIA risk level categories are shown in Table 5.5. Analysis indicated that there were significant differences in the mean change in BP DIA across the various BP DIA risk level categories [F (3,284) = 29.574, p <.001].

Table 5.5: Change in BP DIA Values across Baseline Biometric

Baseline BP DIA	Number	Mean (M)	Standard Deviation (SD)
Normal <80	156	.096	7.700
Pre-hypertensive 80-89	92	6.945	9.226
High 90-100	31	12.258	12.915
Dangerous >100	5	22.400	4.929

Those participants with the greatest BP DIA pressure reading reported the greatest lowering of their BP DIA levels post intervention. (Figure 5.0)

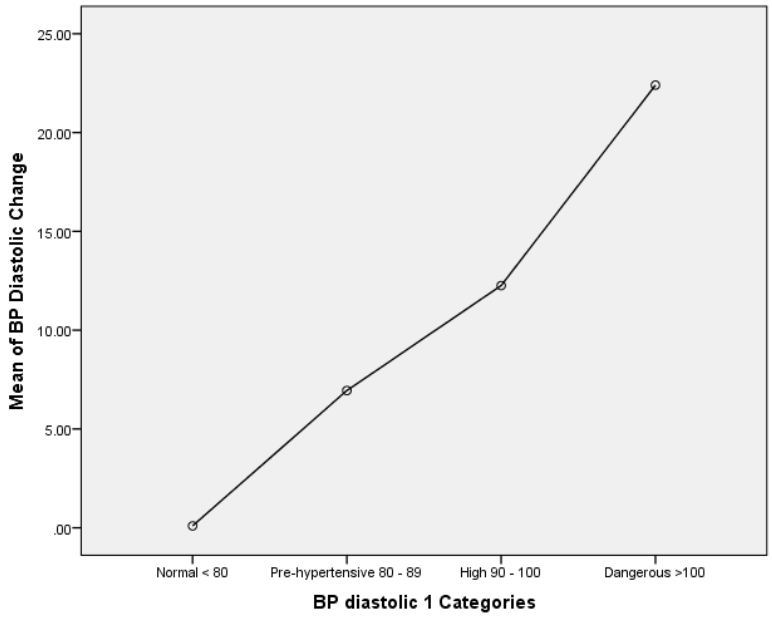

Figure 5.0: The Distribution of BP DIA Change across Baseline BP DIA

When comparing the change in BP DIA (post intervention) across the various demographics, only the baseline BP DIA registered a significant difference. In this situation those participants with the highest BP DIA readings reported the greatest lowering of their BP DIA levels post intervention.

Change in Total Cholesterol (All values given in mmol/L)

Gender

There was no significant differences between the mean change in total cholesterol for the males (M = 1.074, SD = .680) when compared with the females (M = .922, SD = .615).

Age

There were no significant differences in the mean change in total cholesterol across the various age groupings. (Table 6.0)

Table 6.0: Change in Total Cholesterol Values across Age Groups

Age Group	Mean (M)	Standard Deviation (SD)
20-29	1.025	.512
30-39	1.008	.918
40-49	.863	.613
50-59	1.132	.665
60-69	.9606	.616
70-79	.850	.562
80+	.622	.589

Marital Status

There were no significant differences in the mean change in total cholesterol across the various marital status categories. (Table 6.1)

Table 6.1: Change in Total Cholesterol Values across Marital Status

Marital Status	Mean (M)	Standard Deviation (SD)
Single	.800	.419
Married	.976	.637
Divorced	1.092	.719
Widowed	.871	.785

Family History of Cardiovascular Disease

There was no significant differences between the mean change in total cholesterol for those with (M = 1.038, SD = .485) or without (M = .949, SD = .640) a family history of cardiovascular disease.

Family History of Diabetes

There was no significant differences between the mean change in total cholesterol for those with (M = .566, SD = .447) or without (M = .967, SD = .630) a family history of diabetes.

Baseline Exercise Level

There were no significant differences in the mean change in total cholesterol across the various baseline exercise categories. (Table 6.2)

Table 6.2: Change in Total Cholesterol Values across Baseline Exercise Levels

Exercise Level	Mean (M)	Standard Deviation (SD)
None	.987	.710
Mild	.903	.601
Moderate	1.050	.648
Vigorous	.965	.552

Post Intervention Exercise Level Change

There were no significant differences in the mean change in total cholesterol across the various post intervention exercise change levels. (Table 6.3)

Table 6.3: Change in Total Cholesterol Values across Post Intervention Exercise Levels

Exercise Level	Number	Mean (M)	Standard Deviation (SD)
-3	28	1.000	.673
-2	95	1.018	.598
-1	105	.949	.633
0	48	.918	.745
1	1	2.100	

Baseline Smoking Status

There were no significant differences in the mean change in total cholesterol across the various baseline smoking status categories. (Table 6.4)

Table 6.4: Change in Total Cholesterol Values across Baseline Smoking Status

Smoking Status	Mean (M)	Standard Deviation (SD)
Non-Smoker	.993	.617
Ex-Smoker	.977	.729
Smoker	.644	.477
Live with Heavy Smoker	.911	.645

Baseline Total Cholesterol

The mean change in Total Cholesterol values due to CHIP intervention across the baseline Total Cholesterol risk level categories are shown in Table 6.5. Analysis indicated that there were significant differences in the mean change in Total Cholesterol across the various Total Cholesterol risk level categories [F (4,279) = 13.494, p <.001].

Table 6.5: Change in Total Cholesterol Values across Baseline Biometric

Baseline Total Cholesterol	Number	Mean (M)	Standard Deviation (SD)
Optimal <4.00	25	.480	.518
Elevated (4.00-5.20)	111	.819	.472
High (5.21-5.99)	67	1.004	.566
Very High (6-6.99)	66	1.281	.752
Dangerous (>7.00)	15	1.480	.789

Those participants with the greatest baseline cholesterol reading reported the greatest lowering of their total cholesterol levels post intervention. (Figure 6.0)

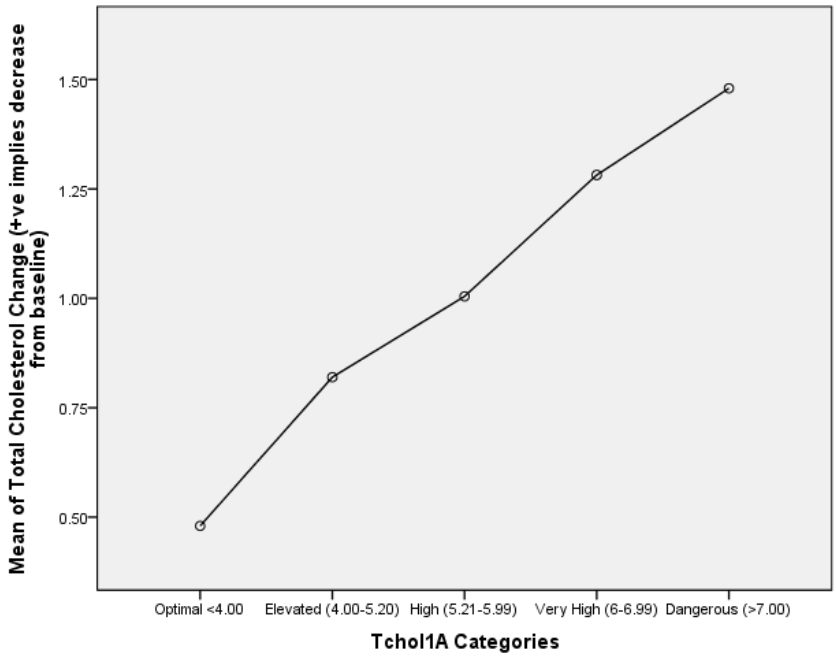

Figure 6.0: The Distribution of Total Cholesterol Change across Baseline Total Cholesterol

When comparing the change in total cholesterol (post intervention) across the various demographics, only the baseline total cholesterol registered a significant difference. In this situation those participants with the greatest baseline cholesterol reading reported the greatest lowering of their total cholesterol levels post intervention.

Change in Low Density Lipoprotein (LDL) (mmol/L)

Gender

There was no significant differences between the mean change in LDL for the males (M = .847, SD = .592) when compared with the females (M = .721, SD = .530).

Age

The mean change in LDL values due to CHIP intervention across the various age groupings are shown in Table 7.0. Post hoc tests indicated significance in the 40-59 and the 50-59 age categories [F (6,283) = 2.211, p <.042].

Table 7.0: Change in LDL Values across Age Groups

Age Group	Mean (M)	Standard Deviation (SD)
20-29	.675	.221
30-39	.866	.697
40-49	.583	.599
50-59	.918	.553
60-69	.747	.538
70-79	.691	.472
80+	.522	.530

The LDL change for the 0-49 and 70+ years age groups were similar but the 50-59 years age group recorded a significantly larger change (Figure 7.0).

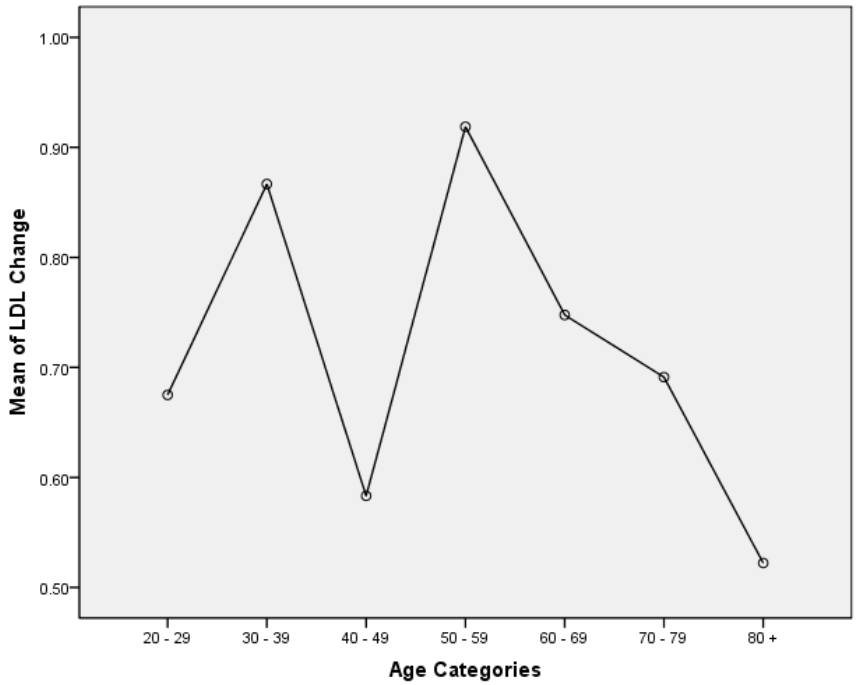

Figure 7.0: The Distribution of LDL Change across Age Categories

Marital Status

There were no significant differences in the mean change in LDL across the various marital status categories. (Table 7.1)

Table 7.1: Change in LDL Values across Marital Status Groups

Marital Status	Mean (M)	Standard Deviation (SD)
Single	.593	.399
Married	.756	.555
Divorced	.978	.615
Widowed	.678	.635

Family History of Cardiovascular Disease

There was no significant differences between the mean change in LDL for those with (M = .780, SD = .342) or without (M = .745, SD = .563) a family history of cardiovascular disease.

Family History of Diabetes

There was no significant differences between the mean change in LDL for those with (M = .411, SD = .325) or without (M = .756, SD = .549) a family history of diabetes.

Baseline Exercise Levels

There were no significant differences in the mean change in LDL across the various baseline exercise categories. (Table 7.2)

Table 7.2: Change in LDL Values across Baseline Exercise Levels

Exercise Level	Mean (M)	Standard Deviation (SD)
None	.770	.634
Mild	.717	.512
Moderate	.822	.549
Vigorous	.750	.478

Post Intervention Exercise Change

There were no significant differences in the mean change in LDL across the various post intervention exercise change levels. (Table 7.3)

Table 7.3: Change in LDL Values across Post Intervention Exercise Levels

Exercise Level	Number	Mean (M)	Standard Deviation (SD)
-3	28	.757	.655
-2	95	.792	.521
-1	105	.762	.525
0	48	.718	.634
1	1	1.900	
2	1	.600	

Baseline Smoking Status

There were no significant differences in the mean change in LDL across the various baseline smoking status categories. (Table 7.4)

Table 7.4: Change in LDL Values across Baseline Smoking Status

Smoking Status	Mean (M)	Standard Deviation (SD)
Non-Smoker	.785	.557
Ex-Smoker	.768	.599
Smoker	.400	.316
Live with Heavy Smoker	.700	.264

Baseline Biometric: LDL

The mean changes in LDL values due to CHIP intervention across the baseline LDL risk level categories are shown in Table 7.5. Analysis indicated that there were significant differences in the mean change in LDL across the various LDL risk level categories [F (3,283) = 19.054, p <.001].

Table 7.5: Change in LDL Values across Baseline Biometric

Baseline LDL	Number	Mean (M)	Standard Deviation (SD)
Optimal <2.5	64	.475	.387
Elevated 2.50-3.00	47	.583	.410
High 3.00-4.00	104	.804	.486
Very High >4.00	69	1.098	.672

Those participants with the greatest baseline LDL reading reported the greatest lowering of their LDL levels post intervention. (Figure 7.1)

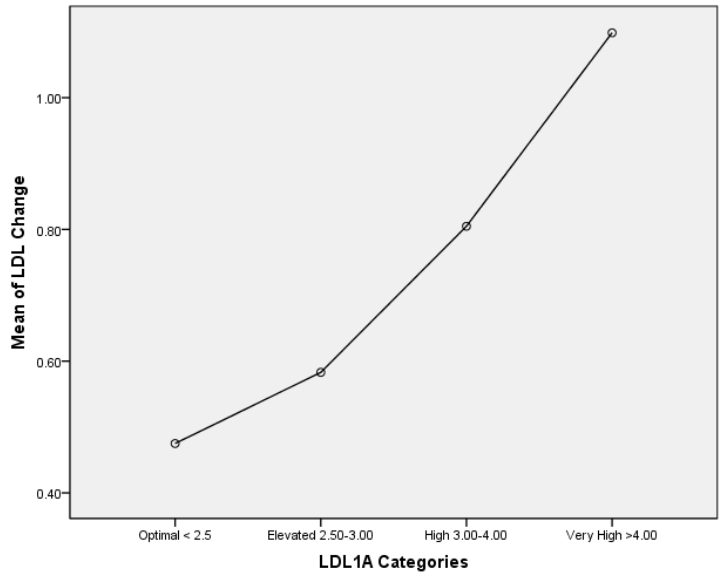

Figure 7.1: The Distribution of LDL Change across Baseline LDL

When comparing the change in LDL levels (post intervention) across the various demographics, only the baseline LDL and the 40-40 – 50-59 age categories registered a significant difference. In this situation those participants with the greatest baseline LDL reading reported the greatest lowering of their LDL levels post intervention.

Change in High Density Lipoprotein (HDL) (mmol/L)

Gender

There was a significant difference between the mean change in HDL for the males (M = .0928, SD = .140) when compared with the females (M = .147, SD = .187). The female participants recorded a greater mean change in their high density lipoprotein levels [t (282) = -2.536, p <.012].

Age

There were no significant differences in the mean change in HDL across the various age groupings (Table 8.0).

Table 8.0: Change in HDL Values across Age Groups

Age Group	Mean (M)	Standard Deviation (SD)
20-29	.170	.161
30-39	.060	.176
40-49	.136	.192
50-59	.162	.197
60-69	.115	.156
70-79	.120	.144
80+	.052	.182

Marital Status

There were no significant differences in the mean change in HDL across the various marital status categories. (Table 8.1)

Table 8.1: Change in HDL Values across Marital Status Groups

Marital Status	Mean (M)	Standard Deviation (SD)
Single	.197	.196
Married	.118	.178
Divorced	.143	.165
Widowed	.162	.130

Family History of Cardiovascular Disease

There was no significant differences between the mean change in HDL for those with (M = .130, SD = .201) or without (M = .122, SD = .174) a family history of cardiovascular disease.

Family History of Diabetes

There was no significant differences between the mean change in HDL for those with (M = .083, SD = .213) or without (M = .123, SD = .174) a family history of diabetes.

Baseline Exercise Levels

There were no significant differences in the mean change in HDL across the various baseline exercise levels. (Table 8.2)

Table 8.2: Change in HDL Values across Baseline Exercise levels

Exercise Level	Mean (M)	Standard Deviation (SD)
None	.109	.194
Mild	.117	.159
Moderate	.152	.170
Vigorous	.139	.178

Post Intervention Exercise Change

There were no significant differences in the mean change in HDL across the various post intervention exercise change levels. (Table 8.3)

Table 8.3: Change in HDL Values across Post Intervention Exercise Levels

Exercise Level	Number	Mean (M)	Standard Deviation (SD)
-3	28	.122	.161
-2	95	.126	.168
-1	105	.127	.186
0	48	.133	.172
1	1	-0.050	
2	1	.190	

Baseline Smoking Status

There were no significant differences in the mean change in HDL across the various baseline smoking status categories. (Table 8.4)

Table 8.4: Change in HDL Values across Baseline Smoking Status

Smoking Status	Mean (M)	Standard Deviation (SD)
Non-Smoker	.128	.153
Ex-Smoker	.143	.198
Smoker	-.035	.180
Live with Heavy Smoker	.124	.333

Baseline Biometric: HDL

The mean changes in HDL values due to CHIP intervention across the baseline HDL risk level categories are shown in Table 8.5. Analysis indicated that there were significant differences in the mean change in HDL across the various HDL risk level categories [F (2, 284) = 43.517, p <.001].

Table 8.5: Change in HDL Values across Baseline Biometric

Baseline HDL	Number	Mean (M)	Standard Deviation (SD)
<1.00	56	.014	.109
1.00 – 1.55	162	.111	.136
>1.55	66	.266	.211

Those participants with the greatest baseline HDL reading reported the greatest lowering of their HDL levels post intervention. (Figure 8.0)

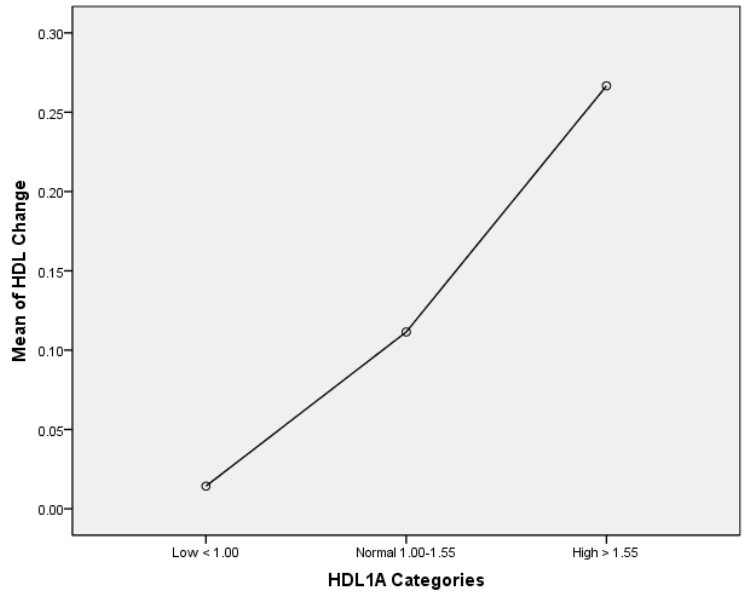

Figure 8.0: The Distribution of HDL Change across Baseline HDL

When comparing the change in HDL levels (post intervention) across the various demographics, only the baseline HDL, and gender categories registered a significant difference. In this situation those participants with the greatest baseline HDL reading reported the greatest lowering of their HDL levels post intervention. The female participants also recorded a greater change than the male participants with their HDL levels.

Change in Triglycerides (TRIG)

Gender

There was a significant difference between the mean change in TRIG for the males (M = .295, SD = .575) when compared with the females (M = .100, SD = .619). [t (282) = 2.591, p <.010]. The change in mean for males was greater than the females post intervention.

Age

There were no significant differences in the mean change in TRIG across the various age groupings. (Table 9.0)

Table 9.0: Change in TRIG Values across Age Groups

Age Group	Mean (M)	Standard Deviation (SD)
20-29	.397	1.405
30-39	.182	.718
40-49	.240	.950
50-59	.105	.581
60-69	.207	.472
70-79	.098	.539
80+	.114	.280

Marital Status

There were no significant differences in the mean change in TRIG across the various marital status categories (Table 9.1).

Table 9.1: Change in TRIG Values across Marital Status Groups

Marital Status	Mean (M)	Standard Deviation (SD)
Single	.002	.528
Married	.212	.633
Divorced	-.092	.464
Widowed	.055	.434

Family History of Cardiovascular Disease

There was no significant differences between the mean change in TRIG for those with (M = .274, SD = .458) or without (M = .164, SD = .652) a family history of cardiovascular disease.

Family History of Diabetes

There was no significant differences between the mean change in TRIG for those with (M = -.166, SD = .653) or without (M = .188, SD = .635) a family history of diabetes.

Baseline Exercise Levels

There were no significant differences in the mean change in TRIG across the various baseline exercise categories (Table 9.2).

Table 9.2: Change in TRIG Values across Baseline Exercise Levels

Exercise Level	Mean (M)	Standard Deviation (SD)
None	.208	.754
Mild	.158	.554
Moderate	.137	.579
Vigorous	.144	.239

Post Intervention Exercise Change

There were no significant differences in the mean change in TRIG across the various post intervention exercise change levels (Table 9.3).

Table 9.3: Change in TRIG Values across Post Intervention Exercise Levels

Exercise Level	Number	Mean (M)	Standard Deviation (SD)
-3	28	.262	1.017
-2	95	.233	.562
-1	105	.086	.558
0	48	.151	.514
1	1	.540	
2	1	-.020	

Baseline Smoking Status

There were no significant differences in the mean change in TRIG across the various baseline smoking status categories. (Table 9.4)

Table 9.4: Change in TRIG Values across Baseline Smoking Status

Smoking Status	Mean (M)	Standard Deviation (SD)
Non-Smoker	.159	.610
Ex-Smoker	.137	.587
Smoker	.588	.799
Live with Heavy Smoker	.192	.604

Baseline Biometric: TRIG

The mean changes in TRIG values due to CHIP intervention across the baseline TRIG risk level categories are shown in Table 9.5. Analysis indicated that there were significant differences in the mean change in TRIG across the various TRIG risk level categories [F (2,284) = 54.561, p <.001].

Table 9.5: Change in TRIG Values across Baseline Biometric

Baseline TRIG	Number	Mean (M)	Standard Deviation (SD)
Optimal <1.00	77	-.091	.230
Above Optimal 1.00-2.24	162	.091	.434
High >2.25	45	.888	.969

Those participants with the greatest baseline TRIG reading reported the greatest lowering of their TRIG levels post intervention. (Figure 9.0)

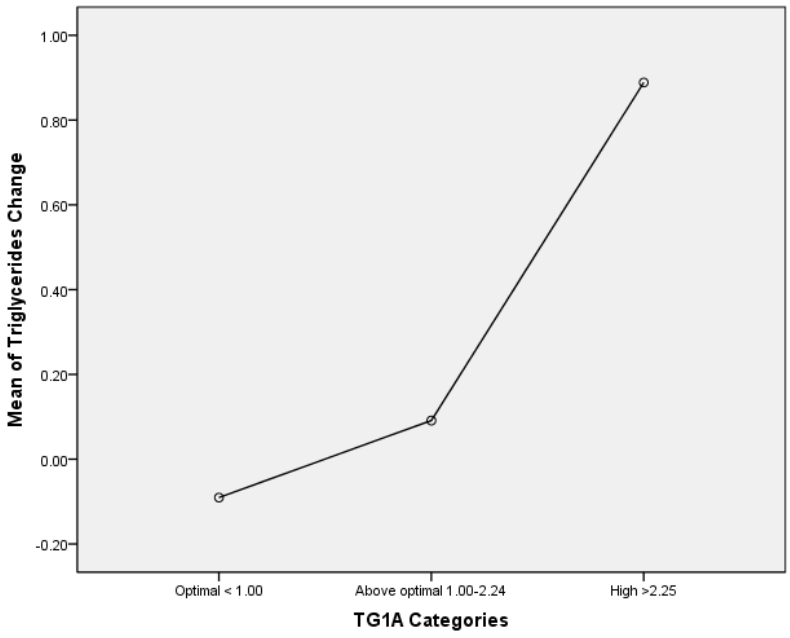

Figure 9.0: The Distribution of HDL Change across Baseline HDL

When comparing the change in TRIG levels (post intervention) across the various demographics, only the baseline TRIG and gender registered a significant difference. In this situation those participants with the greatest baseline t TRIG reading reported the greatest lowering of their TRIG levels post intervention. The male participants also scored a greater lowering of their TRIG levels post intervention than the female participants.

Change in Glucose

Gender

There was no significant differences between the mean change in glucose for the males (M = .674, SD = 1.681) when compared with the females (M = .391, SD = .952).

Age

There were no significant differences in the mean change in glucose across the various age groupings. (Table 10.0)

Table 10.0: Change in Glucose Values across Age Groups

Age Group	Mean (M)	Standard Deviation (SD)
20-29	.050	.129
30-39	.241	.394
40-49	.455	1.184
50-59	.702	1.769
60-69	.445	1.073
70-79	.320	.718
80+	.166	.430

Marital Status

The mean changes in Glucose values due to CHIP intervention across the marital status categories are shown in Table 10.1. Analysis indicated that there were significant differences in the mean change in Glucose for the divorced marital status only [F (3,270) = 6.498, p <.000].

Table 10.1: Change in Glucose Values across Marital Status Groups

Marital Status	Mean (M)	Standard Deviation (SD)
Single	.012	.364
Married	.440	.960
Divorced	1.750	3.615
Widowed	.135	.501

Those participants who identified as being divorced had a greater mean change in their glucose level post intervention than the other marital status categories. (Figure 10.0)

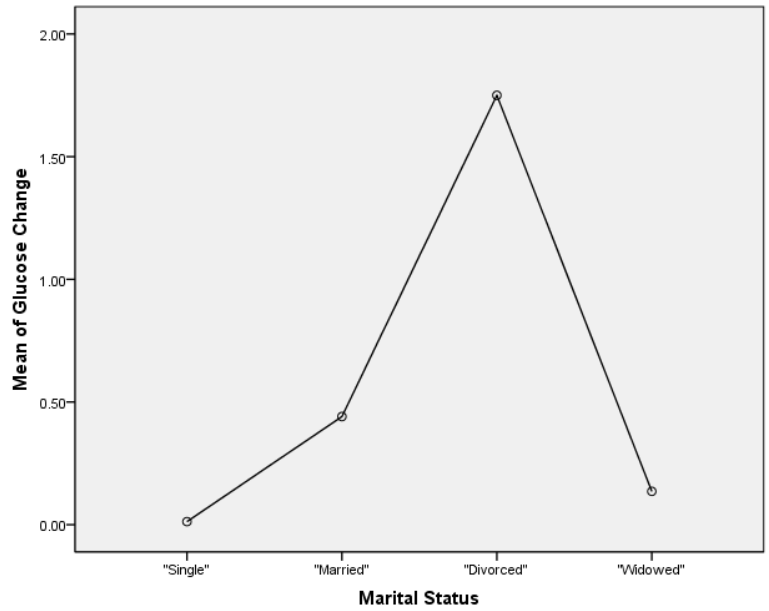

Figure 10.0: The Distribution of Glucose Change across Marital Status Groups

Family History of Cardiovascular Disease

There was no significant differences between the mean change in glucose for those with (M = .407, SD = .545) or without (M = .550, SD = 1.388) a family history of cardiovascular disease.

Family History of Diabetes

There was no significant differences between the mean change in glucose for those with (M = .422, SD = .578) or without (M = .545, SD = 1.357) a family history of diabetes.

Baseline Exercise Levels

There were no significant differences in the mean change in glucose across the various baseline exercise categories. (Table 10.2)

Table 10.2: Change in Glucose Values across Baseline Exercise Levels

Exercise Level	Mean (M)	Standard Deviation (SD)
None	.493	.785
Mild	.601	1.852
Moderate	.343	.665
Vigorous	.392	.695

Post Intervention Exercise Change

There were no significant differences in the mean change in glucose across the various post intervention exercise change levels. (Table 10.3)

Table 10.3: Change in Glucose Values across Post Intervention Exercise Levels

Exercise Level	Number	Mean (M)	Standard Deviation (SD)
-3	28	.417	.734
-2	95	.469	1.093
-1	105	.582	1.688
0	48	.322	.659
1	1	.200	
2	1	.600	

Baseline Smoking Status

There were no significant differences in the mean change in glucose across the various baseline smoking status categories. (Table 10.4)

Table 10.4: Change in Glucose Values across Baseline Smoking Status

Smoking Status	Mean (M)	Standard Deviation (SD)
Non-Smoker	.423	.801
Ex-Smoker	.565	1.989
Smoker	.555	1.303
Live with Heavy Smoker	.522	.473

Baseline Biometric: Glucose

The mean changes in Glucose values due to CHIP intervention across the baseline Glucose risk level categories are shown in Table 10.5. Analysis indicated that there were significant differences in the mean change in Glucose across the various baseline Glucose categories [F (2,284) = 73.384, p <.001].

Table 10.5: Change in Glucose Values across Baseline Biometric

Baseline Glucose	Number	Mean (M)	Standard Deviation (SD)
<5.6	147	.063	.460
5.6-7	105	.456	.446
>7	32	2.481	2.798

Those participants with the greatest baseline glucose reading reported the greatest lowering of their glucose levels post intervention. (Figure 10.1)

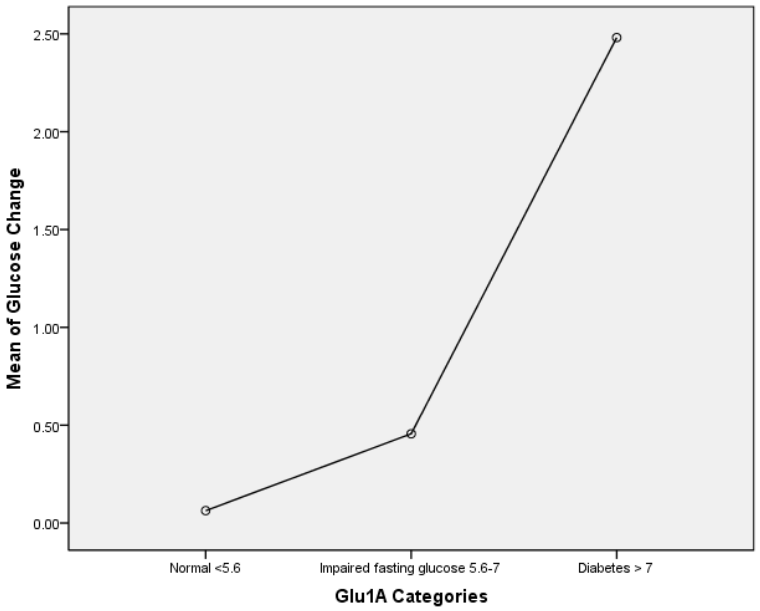

Figure 10.1: The Distribution of Glucose Change across Baseline Glucose

When comparing the change in glucose levels (post intervention) across the various demographics, only the baseline glucose level and those participants with a divorced marital status registered a significant difference. In this situation those participants with the greatest baseline glucose reading reported the greatest lowering of their glucose levels post intervention. In addition, those participants with a divorced marital status had the greatest lowering of their glucose levels compared with the rest of the participants.

Chapter Six

Discussion of Results

The blood screening results of the Coronary Health Improvement Program (CHIP) conducted in Hawera after the 30 days indicated considerable improvement in participants biometrics overall. The chronic disease risk factors from baseline to post-intervention all recorded improvement; from 4% (weight, BMI, systolic blood pressure, diastolic blood pressure) to 23 % (low density lipoprotein). In particular a minimum of 20% improvement was recorded for those participants who were in the highest classification groups of total cholesterol (20%), LDL (24%), triglycerides (30%) and glucose (26%).

Each of the chronic disease risk factors excluding total cholesterol were further divided into risk factor levels according to the guidelines specified in The National Cholesterol Education Program Adult Treatment Panel III classification system. Total cholesterol was divided into 5 levels according to the Framingham study. These risk factor levels provided a more descriptive analysis to be conducted to analyse the movement of participants through the levels from baseline to post intervention.

One of the effects of the 30 day intervention was to reduce the number of participants classified in the higher risk factor levels. Out of 284 participants, 173 (60.9%) were classified in the top two risk factor levels for LDL. This figure decreased by 33.5% to 78 participants post intervention. Participants that were categorised in the top two levels for total cholesterol at baseline comprised of 28.5% of the total participants. Remarkably this percentage decreased to just 6.68% post

intervention giving an overall decrease of 28.8%. Whilst LDL and total cholesterol recorded the most significant decreases in the percentage of participants in these risk factor levels; reductions were recorded for the other biometrics. Participants decreased by 16.5% in the highest factor levels for fasting plasma glucose. BPSYS showed a decrease of 13.7%, HDL (10.9%), BPDIA (8.8%), TRIG (7.7%) and finally BMI had a decrease of (2.5%).

All biometric changes when compared with the baseline figures recorded a significant difference. However, participants with the highest baseline risk levels recorded the greatest lowering of these levels post intervention.

Of the demographic factors studied, only gender, age and marital status had a statistically significant impact on the change in some post intervention biometrics. Regarding the impact of gender on the biometrics, male participants recorded a higher level of change for their BMI score and triglyceride levels than the female participants. However the female participants recorded a greater change to their HDL levels than the males. The age group of 50-59 and 60-69 recorded a greater change than the other age groupings for their BMI whereas the 40-49 and 50-59 age categories recorded greater change in the LDL levels than the other age groups. For glucose levels, those participants with a divorced marital status recorded a higher change then participants from all the other marital status categories.

It is evident from the results above that CHIP conducted in Hawera was effective in reducing the cardiovascular disease risk factors for participants. However it is also important to understand the significance of these results when they are compared with other programs.

The overall mean change percentages of the biometrics in this case study was compared to the results of the study of the CHIP programs which were conducted in America (Rankin et al., 2012). The results of this community based program study were comparable biometric reductions (BMI, BPDia, LDL and HDL) or better reductions BMI had a 3.22% greater reduction, BPDia 0.18%, LDL 5.79% and HDL 3.96% than the American study (Rankin et al., 2012). These results indicate the success of the Hawera based volunteer-delivered community- based CHIP program in reducing the probability of developing cardiovascular disease.

It is difficult to make comparisons between the results of this Hawera case study and that of the Ornish Spectrum and Pritikin lifestyle centres in their effectiveness in reducing cardiovascular disease for their participants. Whilst all programs have proven to be successful in their own way by reducing cardiovascular disease risk factors, the mediums of measurement of change was vastly different and thus difficult to draw direct comparisons between the programs. However it is important to note that the results achieved by the CHIP program were accomplished in a community based setting with a team of volunteers. The CHIP program is undoubtedly an effective low cost alternative to the more costly residential based programs.

This success of this program in reducing cardiovascular disease risk factors can in part be attributed to the distinctive delivery of Dr T and his team. Unlike the American programs, which were conducted by a different team of professionals each time, the Hawera programs were run under the same leadership.

As mentioned previously there are many key elements that are required to conduct a successful community education program. Dr T and his team were proactive in delivering a program with a style that would give participants every opportunity to succeed in making healthy improvements to their lifestyle. The program had a strong leadership team which was volunteer based, including Dr T who is well respected in the community. In addition, his support team also consisted of previous CHIP participants. The dynamics of this leadership team were a real asset for the program delivery. Firstly, the participants felt they could put their trust in Dr T, and they could also relate to those team members who had already completed this program. Another important aspect in the delivery of this program was the focus on practical applications for the theory that was being delivered via DVD. Participants were given course material that they were required to complete and discuss as a group. This process facilitated rich learning experiences for participants as they were able to reflect and gather new ideas from each other. Practical cooking demonstrations and tastings also gave participants the skills they needed to implement healthy eating practices in their own homes.

Those involved in the CHIP programs in Hawera were self-selecting and their willingness to sign up for the program indicated that they were motivated to learn and make changes. Positive reinforcement was given verbally by the leadership team throughout the meetings and the final blood screening results enabled participants to see the positive improvements they had made to their health in those 30 days. Finally, at the conclusion of the program the graduates were invited to join the CHIP alumni which would be able to offer support and encouragement long term while participants continued their healthy lifestyle journey. These factors contributed significantly to the success of the CHIP program.

Whilst this study has aimed to assess the nature and effectiveness of the CHIP program in Hawera in reducing cardiovascular disease risk factor it also provides opportunity for greater research to be conducted in the area of preventative health.

A limitation of this study is assessing the results of the program beyond the 30 day intervention. Many questions about the long term success of the program lie in the ability to measure the effectiveness of participants in maintaining these lifestyle changes in future years.

Further research should also be done to determine how compliant participants were in applying the principles of health that were taught during the program and how these compliance levels reflected in the final results.

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Appendices

Appendix 1 CHIP Questionnaire

CHIP Lifestyle Evaluation

Name: _____ Today's date: _____

Address: _____

Phone (home) _____ Business/Mobile: _____

Occupation: _____ Your doctor: _____

Age: _____ ☐ Male ☐ Female Marital status _____

One or both parents died before 60: Of heart disease? ☐Yes ☐No; Of diabetes? ☐Yes ☐ No

Check (X) if you have ever been told by a physician that you have any of the following:

☐Angina (Yr)? _____	☐Abnormal EKG (last 3 yrs)	☐Gall bladder trouble	☐Ulcers
☐Heart attack (yr)? _____	☐Irregular heartbeats	☐Nervous breakdown	☐Osteoarthritis
☐Angioplasty (Yr)? _____	☐Stroke (Yr)? _____	☐Kidney disease	☐Rheumatoid arthritis
☐Bypass (Yr)? _____	☐High blood pressure highest ever? ____/____	☐Chronic bronchitis	☐Overweight
☐Heart failure (Yr)? ____	☐High cholesterol	☐Emphysema	☐Gout
☐Blood clotting problem	☐High triglycerides	☐Thyroid disorder	☐Diabetes

Please fill in the number of servings you eat or drink weekly. If you don't use, then mark "0". Please fill in every space.

Meat or shellfish _____	Salad dressings _____
Fowl or fish _____	Mayonnaise _____
Whole milk or 2% ___	Margarine _____
Cottage cheese _____	Gravies _____
Butter or cream _____	Soymeat/gluten _____
Cheese _____	Soy milk _____
Sour cream _____	Water _____
Ice cream/ice milk ___	Alcohol _____
Yoghurt _____	Coffee/tea _____
Liver/organ meats ___	Soft drinks _____
Sausage/hot dogs ____	Sugar or sweets _____
Eggs _____	Sugary desserts _____
Fried foods _____	Honey or syrup _____
Salty snacks _____	Jam/jelly/custard _____

Rest & stress

☐Evening is the biggest meal

☐Eat little or no breakfast

☐6 hrs sleep or ☐less/night

☐Sleep restlessly

☐Suffer insomnia

Exercise
(beyond everyday occupation)

☐None

☐Mild, at least 4x/wk

☐Moderate, at least 4x/wk

☐Vigorous, at least 4x/wk

OFFICE USE ONLY

Height _____ Wt. _____

Frame: ☐Small ☐Medium ☐Large

Ideal weight _____

Blood pressure ____/____

Pulse (resting) _____/min.

Results of blood test

Recommendation to improve your health based on tests and

☐Increase daily water to 8-10 glasses
☐Lose weight _____ kg
☐Reduce or eliminate salt
☐Avoid cholesterol intake (meats, sausages, fowl, fish, egg yolks, liver, ice cream, cheese)
☐Reduce all dietary fat
☐Reduce refined sugar in diet
☐Increase aerobic/walking exercise
☐Substitute fruit, vegetables, potatoes for processed, refined foods
☐Stop smoking
☐Eliminate caffeine drinks
☐Increase rest and relaxation
☐Make breakfast a bigger meal
☐See your doctor

Recommended program:

☐Weight management

☐Stress management

☐Stop smoking

☐Low cholesterol meal management

☐Low salt cookery

☐Exercise/walking program