http://researchspace.auckland.ac.nz

ResearchSpace@Auckland

Copyright Statement

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

This thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.
- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of this thesis, and due acknowledgement will be made to the author where appropriate.
- You will obtain the author's permission before publishing any material from their thesis.

To request permissions please use the Feedback form on our webpage. http://researchspace.auckland.ac.nz/feedback

General copyright and disclaimer

In addition to the above conditions, authors give their consent for the digital copy of their work to be used subject to the conditions specified on the Library Thesis Consent Form.

The Effectiveness and Cost-Effectiveness of the Green Prescription Physical Activity Intervention: a Cluster Randomised Controlled Trial in Primary Health Care

By Carolyn (Raina) Elley

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in General Practice,

The University of Auckland, 2003

PHILSON LIBRARY
Faculty of Medical & Health Sciences
Park Road, Grafton
AUCKLAND

Abstract

This thesis assesses the effectiveness and cost-effectiveness of the 'Green Prescription' physical activity intervention amongst less-active adults in primary care, using the Auckland Heart Study (AHS) questionnaire to assess change in activity.

The validity of two physical-activity questionnaires, the AHS and the GSS questionnaires, was assessed initially, comparing their performance with 7-day activity diaries and pedometers amongst less-active adults in primary care. A cluster randomised controlled trial was then conducted in the Waikato region of New Zealand, with 42 general practices randomised to give the Green Prescription or 'usual care'. A systematic screening process identified less-active 40-79 year-old patients. Main outcome measures included change in physical activity, quality of life (SF-36), coronary risk, and blood pressure, over a twelve-month period. Costs of the programme and offset costs of primary and secondary health care utilisation, productivity, and exercising, were collected prospectively for cost-effectiveness analysis from a societal perspective.

The AHS questionnaire was found to have adequate reliability and validity, and to be the most appropriate measurement tool for use in primary care research. In the Green Prescription trial, 74% of general practitioners (n=117) and 66% of screened eligible patients (n=878) participated. Follow-up rate, at one year, was 85% (n=750). Mean total energy expenditure increased by 9.4 kcal/kg/week (p=0.001) and leisure exercise by 2.7 kcal/kg/week (p=0.02) or 34 minutes/week more in the intervention group than the control group (p=0.04). The proportion of the intervention group undertaking 2½ hours/week of leisure exercise increased by 9.72% (p=0.003) more than in the control group (NNT=10.3). SF-36 measures of 'general health', 'role-physical', 'vitality', and 'bodily pain' improved significantly more in the intervention group ($p<0.05$), as a result of the Green Prescription intervention. There was a trend towards decreasing blood pressure, no increase in adverse events, and no statistically significant difference in four-year risk of coronary heart disease. The cost of delivering the Green Prescription was $170.45 per participant from a funder's perspective and $37.16 (95%CI:-$945.21,$1019.53) from a societal perspective. To increase leisure-time exercise by one

hour per week cost $25.36 per month from a programme funder's perspective and $5.47 (95%CI:-$138.90,$149.84) per month from a societal perspective.

The AHS questionnaire was considered reliable and valid. The Green Prescription intervention is effective in increasing physical activity and improving quality of life over 12 months without evidence of adverse effects. The intervention is more cost-effective than other physical activity interventions reported in the literature and may be cost-saving in terms of long-term health gains.

Acknowledgements

I would like to acknowledge my supervisors, Dr Ngaire Kerse and Associate Professor Bruce Arroll, for their continued support and advice, without which this thesis would not have been possible. I would also like to thank Professor Boyd Swinburn for his supervision during the first year of the PhD and for his sound advice about the design of this study.

I would also like to acknowledge the financial support of this study from the New Zealand Heart Foundation, the Hillary Commission (Sport and Recreation, New Zealand), the Waikato Medical Research Foundation, the Royal New Zealand College of General Practitioners Research and Education Charitable Trust, and the University of Auckland Department of General Practice and Primary Health Care Research Fund. Thank you also to the Auckland Medical Research Foundation, and the Maurice and Phyllis Paykell Trust for their travel grants for the dissemination of the results of this study at national and international conferences.

Many people have helped make this study possible, not least of all the general practitioners, practice nurses, receptionists, practice managers, and patients of the participating general practices in the Waikato. In addition, I would like to thank the Pinnacle Independent Practitioners' Association for assisting with the administration and organisation of this study. The assistance of Dr Brett Anderson in the development of the ACCESS software for the data entry and calculation of the physical activity and cardiovascular variables was invaluable. Thank you, also, to the research assistants, Jan Gaskin, Moira Johnson, Sharon Matangi-Nixon, Hayley Gaddes, Helen Dunn, Chris Drent and Ruth Boyce for their enthusiasm and dedication to the project.

The statistical advice and support provided by Elizabeth Robinson was much appreciated, as was the critical appraisal of the design of the study, by the reference group. The reference group included Professor Rod Jackson, Associate Professor Toni Ashton, and Professor David Thomas, amongst others, from the University of Auckland and Diana O'Neill from the, then, Hillary Commission. I am also indebted to Associate Professor Richard Milne for the inspiration and advice about the design of the cost-

effectiveness study. Thank you also to the TADs team of the University of Auckland Goodfellow Unit, in particular, Dr Richard Fox who provided the motivational interviewing training to the intervention clinicians. I am also indebted to Drs Shanti Ameratanga and Tim Kenealy for their feedback and support in the PhD writing group.

I am very grateful to my mother, Val Elley, for her encouragement and practical support. I owe a huge debt to my father, Warwick Elley, for the many hours he spent discussing the ideas for this thesis, and his pain-staking proof reading of this thesis. Most importantly, thank you to my partner, David, and our children, Ben and Leo, for their unfailing tolerance, support, and encouragement.

Table of Contents

ABSTRACT II

ACKNOWLEDGEMENTS IV

TABLE OF CONTENTS VI

LIST OF TABLES X

LIST OF FIGURES XIII

LIST OF ABBREVIATIONS XV

1 INTRODUCTION 1

1.1 Rationale for the Thesis 1

1.2 Objectives of the Thesis 6

1.3 Structure of the Thesis 7

2 LITERATURE REVIEW 8

2.1 Introduction 8

2.2 Background 8

2.2.1 Physical Inactivity and Cardiovascular Disease 8

2.2.2 Prevalence of Physical Inactivity in New Zealand 18

2.2.3 Measurement of Cardiovascular Risk 21

2.2.4 Physical Inactivity and Quality of Life 23

2.2.5 Development and Implementation of the Green Prescription Intervention 24

2.3 Systematic Review of Physical Activity Questionnaire Reliability and Validity Studies 27

2.3.1 Introduction 27

2.3.2 Measurement of Physical Activity using Self-report Instruments 28

2.3.3 Previous Reviews of Physical Activity Questionnaires 32

2.3.4 Methods 34

2.3.5 Studies Identified and Critical Appraisal 39

2.3.6 Discussion of the Review 39

2.4 Systematic Review of Physical Activity Intervention Trials in Primary Health Care ... 50

2.4.1 Introduction 50

2.4.2 Methods 51

2.4.3 Systematic Reviews Identified and Critical Appraisal 53

2.4.4 Identification and Critical Appraisal of Additional Physical Activity Intervention Trials in Primary Health Care 63

2.4.5 Discussion of the Review 68

2.5 Systematic Review of Cost-Effectiveness Studies of Physical Activity Interventions in Primary Health Care 70

2.5.1 Introduction 70

2.5.2 Methods 71

2.5.3 Studies Identified and Critical Appraisal 73

2.5.4 *Discussion of the Review* 80

2.6 Rationale for the Cluster Randomised Control Trial Design **82**
2.6.1 *Introduction* 82
2.6.2 *Randomised Controlled Trials* 82
2.6.3 *Methodological Issues of Lifestyle Intervention Trials* 83

2.7 Conclusions of the Literature Review **90**

3 METHODS **92**

3.1 Introduction **92**

3.2 Methods of Physical Activity Questionnaire Validity and Reliability Study **92**
3.2.1 *Aims* 92
3.2.2 *Physical Activity Questionnaire Selection and Adaptation* 92
3.2.3 *Study Population* 94
3.2.4 *Reliability* 94
3.2.5 *Validity* 95
3.2.6 *Physical Activity Diary and Pedometer* 95
3.2.7 *Analysis* 95

3.3 Methods of Cluster Randomised Control Trial of the Green Prescription Intervention in Primary Health Care **97**
3.3.1 *Introduction* 97
3.3.2 *Aims* 97
3.3.3 *Pilot Study Design* 98
3.3.4 *Cluster Randomised Control Trial Design* 99
3.3.5 *Study Population* 100
3.3.6 *Sample Size and Power Estimation* 101
3.3.7 *Randomisation* 104
3.3.8 *Study Protocol* 104
3.3.9 *The Intervention* 108
3.3.10 *Outcome Measures* 109
3.3.11 *Follow-up Visit: Description and Schedule* 114
3.3.12 *Patient and General Practitioner Feedback* 116
3.3.13 *Data Management* 116
3.3.14 *Analysis* 118
3.3.15 *Organisation* 121

3.4 Methods of Cost Effectiveness Study **123**
3.4.1 *Aims* 123
3.4.2 *Design* 124
3.4.3 *Outcome Measures* 124
3.4.4 *Analysis* 129

3.5 Conclusion of Methods **129**

4 RESULTS **130**

4.1 Introduction **130**

4.2 Results of the Physical Activity Questionnaire Validity and Reliability Study **130**
4.2.1 *Introduction* 130
4.2.2 *Participation Rates* 130
4.2.3 *Participant Characteristics* 131
4.2.4 *Reliability of the AHS Questionnaire* 133
4.2.5 *Validity of the AHS and the GSS Questionnaires* 133
4.2.6 *Summary* 137

4.3 Results of the Cluster Randomised Controlled Trial of the Green Prescription **137**
4.3.1 *Introduction* 137
4.3.2 *Results of the Pilot Study* 138
4.3.3 *Results of the Cluster Randomised Controlled Trial of Green Prescription Intervention* 144

4.3.4 *Participation Rates* ... 144
4.3.5 *Participant Characteristics* ... 149
4.3.6 *The Relationship between Cardiovascular Risk and Usual Level of Physical Activity* ... 156
4.3.7 *Quality of Life Characteristics* ... 160
4.3.8 *Adequacy of Randomisation* ... 163
4.3.9 *Positive Predictive Value of Screening Question* ... 168
4.3.10 *Rates of Intervention Delivery* ... 168
4.3.11 *Final Outcomes* ... 168
4.3.12 *Sensitivity Analyses* ... 174
4.3.13 *Intraclass Correlation Coefficients* ... 178
4.3.14 *Summary* ... 181

4.4 Results of the Green Prescription Cost-Effectiveness Study ... 181
4.4.1 *Introduction* ... 181
4.4.2 *Programme Costs* ... 182
4.4.3 *Offset Costs* ... 187
4.4.4 *Incremental Cost-effectiveness Ratios and Cost-effectiveness* ... 195
4.4.5 *Summary* ... 197

5 DISCUSSION ... 199

5.1 Introduction ... 199

5.2 Discussion of the Physical Activity Questionnaire Reliability and Validity Study ... 199
5.2.1 *Main Findings* ... 199
5.2.2 *How the Findings relate to Previous Research* ... 199
5.2.3 *Strengths and Limitations of the Study* ... 203
5.2.4 *Implications and Recommendations for Future Research* ... 205

5.3 Discussion of the Green Prescription Cluster Randomised Controlled Trial ... 205
5.3.1 *Pilot Study Findings* ... 205
5.3.2 *Baseline Analysis of the Randomised Controlled Trial* ... 206
5.3.3 *Main Findings of the Cluster Randomised Controlled Trial* ... 209
5.3.4 *Methodological Strengths and Limitations of the Study* ... 210
5.3.5 *How the Findings relate to Previous Research* ... 218
5.3.6 *Implications of the Findings* ... 223
5.3.7 *Recommendations for Future Research and Potential Implementation* ... 226

5.4 Discussion of the Cost-Effectiveness Study ... 228
5.4.1 *Main Findings* ... 228
5.4.2 *Strengths and Limitations of the Study* ... 230
5.4.3 *How the Findings relate to Previous Research* ... 232
5.4.4 *Implications and Recommendations for Future Research* ... 235

6 CONCLUSION ... 240

REFERENCES ... 245

APPENDICES ... 269

1 Auckland Heart Study (AHS) Physical Activity Questionnaire

2 Green Script Study (GSS) Physical Activity Questionnaire

3 Physical Activity Questionnaire Reliability and Validity Studies Evidence Tables

4 Seven-Day Physical Activity Diary

5 Study Participation Screening Form

6	Study Participant Information Sheet
7	Study Participant Consent Form
8	Current Physical Activity Status (Stage of Change)
9	The Green Prescription (developed by the Hillary Commission)
10	Form Faxed to Exercise Specialists
11	Baseline Research Protocol
12	Baseline Recording Sheet
13	Notice For Practice Waiting Rooms
14	Medication Codes
15	Medical Condition Codes
16	Practice Information Form
17	Form for Recording Excluded Patients
18	Clinician Consent Form
19	Clinician Questionnaire
20	Follow-up Recording Sheet
21	Follow-up Research Protocol
22	Patient Feedback Form
23	Patient Letter of Results
24	General Practitioner Letter of Results
25	Record of Visits to the General Practitioner

List of Tables

Table 2-1 Relative Risk of Cardiovascular Mortality for Inactive compared with Active Individuals, and the estimated Cardiovascular Mortality attributable (Attributable Fraction) to Inactivity for Middle-aged and Older Adults in New Zealand. 21

Table 2-2 Literature Search Strategy of Electronic Databases, and Subject Headings used to locate Test-Retest Reliability and Validity Studies of Physical Activity Questionnaires from 1990 to 2002 36

Table 2-3 Literature Search Strategy of Electronic Databases, and Subject Headings used to locate Trials and Systematic Reviews of Physical Activity Counselling in Primary Health Care 51

Table 2-4 Summary of Systematic Reviews of Counselling for Physical Activity in Health-Care Settings 57

Table 2-5 Physical Activity Counselling Trials based in Primary Care that have not previously been Reviewed by Systematic Reviews 65

Table 2-6 Literature Search Strategy of Electronic Databases, and Subject Headings used to locate Cost-Effectiveness Studies of Physical Activity Interventions in Primary Health Care 72

Table 2-7 Evidence Table of Cost-Effectiveness Studies undertaken of Interventions that included Physical Activity Promotion within Primary Health Care or the Community 74

Table 3-1 Sample Size Calculations for Different Variables for the Green Prescription Cluster Randomised Controlled Trial 103

Table 4-1 Estimated Means for Total Energy Expenditure (kcal/kg/wk), Total Moderate and Leisure Moderate Activity (hours/week) from the AHS Questionnaire, 7-day Diary and GSS Questionnaire 132

Table 4-2 Test-Retest Reliability of the AHS questionnaire: Intraclass Correlation Coefficients (ICC) and Spearman's Correlation Coefficients (SCC) for Total Energy Expenditure, Total Moderate and Vigorous Activity and Leisure-time Moderate Activity 133

Table 4-3 Validity of the AHS Questionnaire and the GSS Questionnaire compared with the 7-day Diary for Total Energy Expenditure, Total Moderate Activity and Leisure Moderate and Vigorous Activity using Spearman's Correlation Coefficients 134

Table 4-4 Validity of the AHS Questionnaire, and the GSS Questionnaire, compared with the Pedometer recording for Total Moderate Activity and Total Energy Expenditure using Spearman's Correlation Coefficients 137

Table 4-5 Pilot Study Mean Baseline Characteristics of Intervention and Control Patients 139

Table 4-6 Patients found to have Medical Reasons for Exclusion Post-Enrolment 148

Table 4-7 Characteristics of General Practitioners 149

Table 4-8 Physical Activity and Cardiovascular Measures of the Study Population at Baseline 154

Table 4-9 National Non-Māori Population Estimates[#] compared with Non-Māori Study Participant Means for Cardiovascular Risk Factors (with 95% confidence intervals) 155

Table 4-10 Relationship of Four-year Cardiovascular Risk [a] of Study Participants to Health, Activity and Demographic Variables (Multiple linear regression analysis, grouped by medical practice) 157

Table 4-11 Relationships of Variables to Total Energy Expenditure (Natural Log) of Study Participants. (Univariate linear regression analysis, grouped by practice) 158

Table 4-12 Relationships of Variables to Total Energy Expenditure (Natural Log) of Study Participants (Multiple linear regression analysis, grouped by practice) 159

Table 4-13 Baseline Demographic and Clinical Characteristics of Less-active 40-79 year-old Patients in General Practice, by Intervention and Control Group. Mean values and (standard deviations) are presented, unless otherwise specified. 166

Table 4-14 Baseline Physical Activity Characteristics of the Intervention and Control Groups. Mean values and (standard deviations) are presented, unless otherwise specified. 167

Table 4-15 Mean Baseline SF-36 Quality of Life Scores (and standard deviations) for Intervention and Control Patients 167

Table 4-16 Mean Changes in Physical Activity, Cardiovascular and Quality of Life Outcomes in the Control and Intervention Groups, at 12 Months. 169

Table 4-17 Changes in Antihypertensive Medication Use from Baseline to Follow-up, amongst the Intervention and the Control groups 171

Table 4-18 Change in Weight, Body Mass Index and Serum Cholesterol Concentration of Intervention and Control Groups over 12-months 172

Table 4-19 Multi-level, Time-series Analysis of Adverse Events for Intervention and Control Patients (comparing the year prior to study enrolment with the year following study enrolment) 172

Table 4-20 Average Change in Leisure-time Physical Activity and Total Energy Expenditure by Baseline Stage of Change amongst Intervention Participants 174

Table 4-21 Per-protocol Sensitivity Analyses of Primary Outcome Measures 175

Table 4-22 Sensitivity Analysis using Multiple Regression of Change in Physical Activity, Clinical, and Significant Quality of Life Outcomes for the Intervention Group compared with the Control Group, after adjusting for Age, Gender, Socio-economic Status, and Clustering 176

Table 4-23 Sensitivity Analysis using Multiple Regression of Change in Physical Activity, Clinical, and Significant Quality of Life Outcomes for the Intervention Group compared with the Control Group, after adjusting for Baseline Outcome Measures and Clustering 177

Table 4-24 Intra-class Correlation Coefficients (ICCs) for Demographic and Clinical Characteristics in a Consecutively Screened Sample of Less-active 40-79 year-old Patients selected in Clusters from 42 General Practices 179

Table 4-25 Intra-class Correlation Coefficients (ICCs) for Physical Activity Characteristics in a Consecutively Screened Sample of Less-active 40-79 year-old Patients selected in Clusters from 42 General Practices 180

Table 4-26 Intra-class Correlation Coefficients (ICCs) for Change in Variables from Baseline to 12-month Follow-up amongst Less-active 40-79 year-old Patients selected in Clusters from 42 General Practices 180

Table 4-27 Costs of Set-up and Co-ordination of the Green Prescription Programme Nationally 183

Table 4-28 Costs of Sports Trust attributable to the Green Prescription Study Participants for 12 months (2001/2002) 185

Table 4-29 General Practice Staff Costs of Delivering the Green Prescription Intervention 186

Table 4-30 Average Cost of Follow-up Advice from General Practitioner or Practice Nurse during the 12 months following Intervention Delivery 186

Table 4-31 Offset Patient Costs Associated with Exercising for the Year between Baseline and Follow-up 187

Table 4-32 Change in Primary Health Care Use by Study Participants for the Year-Before and the Year-After Baseline (adjusted for inflation and discounted at 5%) 189

Table 4-33 Change in Costs of Public Hospital Admissions and Outpatient Use for the Year-before and the Year-after Study Enrolment (costs adjusted for inflation) 190

Table 4-34 Change in the Cost of Days of Work due to Sickness or Accident during the Year-before compared with the Year-after Study Enrolment for Intervention and Control Study Participants 191

Table 4-35 Offset Costs per Patient for the Intervention Group compared with the Control Group (Intention-to-treat Analysis) 192

Table 4-36 Incremental Cost per Patient of the Green Prescription Programme, including Programme and Offset Costs and Savings, by Intention-to-treat 193

Table 4-37 Incremental Monthly Cost-Effectiveness Ratios (CER) for the Green Prescription vs. Usual Care from Programme-Funder and Societal Perspectives with Sensitivity Analysis 196

Table 4-38 Cost Effectiveness Ratios for the Green Prescription Compared with Project Active 'Lifestyle' and 'Structured' Physical Activity Promotion Programmes [a] 197

List of Figures

Figure 3-1 Waikato Region of New Zealand and Location of the Green Prescription Study..... 100

Figure 3-2 Flow Diagram of the Design of the Cluster Randomised Controlled Trial of the Green Prescription Intervention 107

Figure 4-1 Participation Rates in the Physical Activity Questionnaire Reliability and Validity Study... 131

Figure 4-2 Bland-Altman Graphs of the Auckland Heart Study (AHS) and Green Script Study (GSS) Questionnaires compared with the 7-day Diary Estimations of Total Moderate Activity and Total Energy Expenditure (TEE)..... 135

Figure 4-3 Pilot Study Mean Changes in Physical Activity Variables, Leisure-time Moderate and Vigorous-Intensity Activity (minutes per week) and Total Energy Expenditure (kcal/kg/week), for Intervention and Control Patients..... 140

Figure 4-4 Pilot Study Mean Change in Systolic and Diastolic Blood Pressure for the Intervention and Control Patients, from Baseline to 2-month Follow-up..... 141

Figure 4-5 Pilot Study Mean Changes in Lipid Concentrations (mmol/l) and 5-year Cardiovascular Relative Risk Reduction (proportion) for Intervention and Control Patients from Baseline to 2-Month Follow-up 142

Figure 4-6 Pilot Study Mean Changes in SF-36 Quality of Life Scores for Physical Function, Role Physical and Bodily Pain, for the Intervention and Control Patients from Baseline to 2-month Follow-up 142

Figure 4-7 Pilot Study Mean Changes in SF-36 Quality of Life Scores for General Health, Vitality, Social Functioning, Role Emotional and Mental Health, for the Intervention and Control Patients from Baseline to 2-month Follow-up 143

Figure 4-8 Process of Recruitment of General Practitioners and Randomisation of Practices in the Green Prescription Cluster Randomised Controlled Trial..... 145

Figure 4-9 Progress of Patient Screening, Recruitment and Follow-up Stages of the Trial following Pre-randomisation of Practices 147

Figure 4-10 Prevalence of Hypertension in Study Participants compared with the New Zealand Population Prevalence* (non-Māori only) 151

Figure 4-11 Prevalence of known Diabetes amongst Study Participants compared with New Zealand Population Estimates* 152

Figure 4-12 Prevalence of known Diabetes amongst Study Participants compared with New Zealand estimates by Age and Ethnic Group 152

Figure 4-13 Baseline SF-36 Quality of Life Scores, 'Physical Function', 'General Health', and 'Mental Health', of Study Participants by Age Group..... 160

Figure 4-14 Mean Differences (with 95% confidence intervals) in SF-36 Quality of Life Scores of Male Study Participants 40-64 years of age compared with New Zealand Gender-matched and Age-similar Norms..... 161

Figure 4-15 Mean Differences (with 95% confidence intervals) in SF-36 Quality of Life Scores of Male Study Participants 65-79 years of age compared with New Zealand Gender-matched and Age-similar Norms 161

Figure 4-16 Mean Differences (with 95% confidence intervals) in SF-36 Quality of Life Scores of Female Study Participants 40-64 years of age compared with New Zealand Gender-matched and Age-similar Norms 162

Figure 4-17 Mean Differences (with 95% confidence intervals) in SF-36 Quality of Life Scores of Female Study Participants 65-79 years of age compared with New Zealand Gender-matched and Age-similar Norms 162

Figure 4-18 Practice Sizes of Intervention and Control Practices 163

Figure 4-19 Number of Rural and Urban Practices in the Intervention and Control Groups 164

Figure 4-20 Gender of General Practitioners in the Intervention and Control Groups 165

Figure 4-21 Number of Full-time and Part-time General Practitioners in the Intervention and Control Groups 165

Figure 4-22 Proportions of Participants achieving 2 ½ Hours of Moderate or Vigorous Leisure Activity per Week at Baseline and 12-month Follow-up 170

Figure 4-23 Distribution of Change in Programme and Offset Costs (Offset) for Control Patients (0) and Intervention Patients (1) in New Zealand Dollars for the Year before Baseline compared with the Year following Baseline 194

Figure 4-24 Distribution of Change in Programme and Offset Costs (Offset) for Control Patients (0) and Intervention Patients (1) in New Zealand Dollars for the Year before Baseline compared with the Year following Baseline with Outliers* Removed 195

List of Abbreviations

AHS	Auckland Heart Study physical activity questionnaire (Appendix 1) (Jackson 1989)
BMI	Body Mass Index
BP	Blood Pressure
CER	Cost Effectiveness Ratio
Chol	Cholesterol
CI	Confidence interval
CSC	Community Services Card
CVD	Cardiovascular Disease
DALY	Disability Adjusted Life Years gained
D.eff.	Design Effect (Inflation factor used to increase estimated sample size when using a cluster design)
GP	General Practitioner
GRx	Green Prescription
GSS	Green Script Study physical activity questionnaire (Appendix 2) (Swinburn, Walter et al. 1998)
HDL	High Density Lipoprotein
ICC	Intraclass Correlation Coefficient
IPA	Independent Practitioners' Association
ITT	Intention-to-treat
LDL	Low Density Lipoprotein
LYG	Life Years Gained
Km^2	Square kilometres
Kcal	Kilocalories
Kj	Kilojoules

Kg	Kilograms
MET	Ratio of the associated metabolic rate for a specific activity divided by the resting metabolic rate.
Mm Hg	Millimetres of mercury
Mmol/L	Millimoles per Litre
N	Number in Sample
NNT	Numbers Needed to Treat
QALY	Quality Adjusted Life Year
RCT	Randomised Controlled Trial
RR	Relative Risk
RRR	Relative Risk Reduction
sd	Standard deviation
SES	Socio-Economic Status
SOC	Stage of Change according to the Transtheoretical model of readiness to change
SF-36	Short-form 36 Quality of Life Questionnaire
SF-6D	Short-form 6 Dimension preference measure scale developed by Brazier
SPARC	Sport and Recreation New Zealand (formerly Hillary Commission)
TADS	Tobacco, Alcohol and Other Drug Early Intervention Project, Goodfellow Unit, University of Auckland
TC	Total Cholesterol
TEE	Total Energy Expenditure
TG	Triglycerides
UK	United Kingdom
US	United States
VO2max	Maximum oxygen consumption (with maximum perceived effort)