

**DIETARY INTAKE, PHYSICAL ACTIVITY AND RISK FOR CHRONIC
DISEASES OF LIFESTYLE AMONG EMPLOYEES AT A SOUTH AFRICAN
OPEN-CAST DIAMOND MINE**

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by

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DECLARATION OF AUTHENTICITY

Hereby I, Karen Stadler, declare that this thesis is my own original work and that all sources have been accurately reported and acknowledged, and that this document has not previously, in its entirety or in part been submitted at any university in order to obtain an academic qualification.



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Date: 21 February 2006



ABSTRACT

INTRODUCTION: The study investigated dietary intake, physical activity and risk for chronic diseases of lifestyle (CDL) among employees at a South African open-cast diamond mine.

OBJECTIVES: The aim of the study was to determine the habits and barriers to a healthy lifestyle in order to determine the need for workplace interventions at De Beers Venetia Mine (DB-VM) to decrease the risk for CDL and optimise employee wellness.

DESIGN: An analytical, cross-sectional, observational study.

SAMPLING: A representative proportional stratified sample of 88 permanent employees at DB-VM was randomly selected to participate in the study. The sample was stratified according to work-shift configuration and occupational category. Permanent employees were limited to subjects with at least six months employment at DB-VM. Temporary employees and contractors were excluded from the sample.

METHODS: Subjects were required to complete a validated self-administered socio-demographic-, meal frequency- and physical activity questionnaire. A validated quantified food frequency questionnaire was administered by the investigator. Anthropometric measurements including weight, height and waist circumference were performed by the investigator.

RESULTS: The study documented a high prevalence of obesity among female (45%) and male (32%) employees. A total energy intake above the Estimated Energy Requirement (EER) was found in 38% of males and 64% of female subjects. Forty eight percent of males and 64% of female subjects exceeded the Acceptable Macronutrient Distribution Rate (AMDR) for total fat intake, while the mean saturated fatty acid (SFA) intake was above the recommendation of less than 10% of total energy intake. An inadequate fibre intake was observed for 87% of males and 55% of female subjects. Folate intakes below the Estimated Average Requirement (EAR) were found in 62% male and 82% of female subjects. A “low active” physical activity level (PAL) was found in 91% of females and 67% of professionals. Significantly more females ($p=0.01$) and professionals ($p=0.00005$) demonstrated a “low active” PAL compared to males and other occupational categories. Work-related barriers to a healthy lifestyle such as long working hours, work demands, a long commute and working shifts contributed to skipping of meals and prevention of physical activity participation among employees.

CONCLUSION: The study demonstrated a high prevalence of overweight and obesity among employees characterised by high fat and inadequate fibre intakes, increasing the risk for CDL. Work-related barriers contributed to an unhealthy lifestyle and specific interventions at the workplace would appear necessary to decrease the high prevalence of obesity and risk for CDL.

RECOMMENDATIONS: Wellness interventions should be introduced at DB-VM to improve the health and well-being of employees.

OPSOMMING

INLEIDING: Die studie het die dieetinname, fisieke aktiwiteit en risiko vir chroniese lewenstysiektes (CLS) onder werkers by 'n Suid-Afrikaanse oopgroef diamantmyn ondersoek.

DOEL: Die doel van die studie was om die gewoontes en struikelblokke vir 'n gesonde lewenstyl te ondersoek ten einde te bepaal watter intervensies by De Beers Venetia Myn (DB-VM) ingestel moet word om die risiko vir CLS te verminder en om optimale gesondheid onder werkers te bevorder.

ONTWERP: 'n Analitiese, dwarsnit observasie opname.

STEEKPROEFTREKING: 'n Verteenwoordigende proporsionele gestratifiseerde steekproef van 88 permanente werknemers is ewekansig gekies om aan die studie deel te neem. Die steekproef was gestratifiseer op grond van skofwerkkonfigurasie en beroepsklas. Permanente werknemers het werknemers ingesluit wat vir ten minste ses maande by DB-VM werksaam was. Tydelike werknemers en kontrakteurs het nie deel uitgemaak van die steekproef nie.

METODES: Respondente is versoek om drie gevalideerde vraelyste te voltooi insluitende 'n sosio-demografiese-, maaltydfrekwensie- en fisieke aktiwiteit vraelys. 'n Gevalideerde voedselrekwensievraelys is deur die navorser tydens individuele onderhoude gebruik. Antropometriese metings insluitende massa, lengte en middelomtrek is deur die navorser uitgevoer.

RESULTATE: Die studie het 'n hoë voorkoms van vetsug onder vroulike (45%) en manlike (32%) respondente aangetoon. Agt en dertig persent mans en 64% vroue se energie inname was hoër as die aanbevole daaglikse inname vir aktiewe individue. Die totale vetinname van 38% mans en 64% vroue was hoër as die aanbeveling, terwyl die versadigde vetsuurinname van die steekproef die aanbeveling van minder as 10% van total energie oorskry het. 'n Ontoereikende veselinname het onder 87% mans en 55% vroue voorgekom. Twee en sestig persent mans en 82% vroue het 'n ontoereikende foliensuurinname gehad. 'n "Lae aktiewe" fisieke aktiwiteit is onder 91% vroue en 67% professionele werkers waargeneem. Betekenisvol meer vroue ($p=0.01$) en professionele werkers ($p=0.0005$) het 'n "lae aktiewe" fisieke aktiwiteit gehad as mans en ander beroepsklasse. Sekere werksverwante faktore byvoorbeeld lang werksure, werksvereistes, 'n lang vervoertyd na en van die werksplek asook skofwerk het bygedra tot die oorslaan van maaltye en het werknemers verhoed om aan fisieke aktiwiteit deel te neem.

GEVOLGTREKING: 'n Hoë voorkoms van oormassa en vetsug is in die studie waargeneem, gekenmerk deur hoë vet en ontoereikende veselinnames, wat die risiko vir CLS onder werknemers verhoog. As gevolg van werksverwante faktore wat bygedra het tot die ongesonde lewenstyl onder werkers moet spesifieke intervensies by die werkplek ingestel word om die hoë voorkoms van vetsug en risiko vir CLS aan te spreek.

AANBEVELINGS: Intervensies moet by DB-VM ingestel word om die gesondheid en welsyn van werkers te verbeter.

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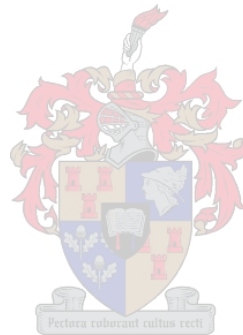
LIST OF ABBREVIATIONS

AI	Adequate Intake
AMDR	Acceptable Macronutrient Distribution Range
BMI	Body mass index
BRISK	Black Risk Factor Study
CDL	Chronic diseases of lifestyle
CHQ	Corporate Head Quarters
CVD	Cardiovascular disease
CORIS	Coronary Risk Factor Study
DAEK	Dietary Assessment and Educational Kit
DBBS	De Beers Benefit Society
DBCM	De Beers Consolidated Mines
DB-VM	De Beers Venetia Mine
DRI	Dietary Reference Intakes
EAR	Estimated Average Requirements
EER	Estimated Energy Requirements
EXCO	Executive Committee
FAO	Food and Agricultural Organization
FPM	Food Photo Manual
FUFS	First Year Female Student
GI	Glycaemic index
IHD	Ischaemic heart disease
MRC	Medical Research Council
MUFA	Mono unsaturated fatty acids
n	Number, referring to sample size
NUM	National Union of Mineworkers
PAL	Physical activity level
PUFA	Poly unsaturated fatty acids
QFFQ	Quantified Food Frequency questionnaire
SD	Standard deviation
SIMRAC	Safety in Mines Research Advisory Committee
THUSA	Transition, Health and Urbanisation in South Africa
UL	Tolerable Upper Intake Level
WHO	World Health Organization
WRFS	Weight and Risk Factor Study

LIST OF DEFINITIONS

Allostatic load	a measure of the long-term impact of stress on the body, measured through a battery of medical tests that combine to establish the presence and impact of key stress hormones such as adrenalin and cortisol
Chronic diseases of lifestyle	diseases including type 2 diabetes, hypertension, stroke, cardiovascular disease and cancer
Daily smokers	subjects smoking every day at the time of the interview
Ex-smokers / quitters	subjects not smoking at the time of the interview, but used to smoke daily
Heavy smokers	subjects smoking ≥ 15 tobacco equivalents per day
Less-skilled workers	subjects with a high school or primary school qualification
Light smokers	subjects smoking 1-14 tobacco equivalents per day or ever-daily smokers smoking occasionally at the time of the interview
Non-smokers	subjects not currently smoking and never smoked before
Operative	assistant to Artisan / Technician
Operator (other)	represent the following Operator categories: Operator (Drilling), Operator (Utilities), Operator (Grader), Operator (Crusher), Operator (Water tanker), Operator (Road construction), Operator (Survey), Operator (Diamond sorting), Operator (Ore preparation), Operator (Water recovery), and Operator (Vacuum cleaning)
Permanent employees	employees appointed at DB-VM for at least six months
Professionals	subjects who obtained a degree or a postgraduate qualification
Regular smokers	subjects who are currently smoking daily or occasionally

Scope of physical work	the degree of physical labour specific to the occupation
Skilled workers	subjects who obtained a diploma or trade
Stress	perceived personal stress measured across five categories, incorporating emotional, behavioural, cognitive, organizational, and physical stress
Wellness (Resilience)	a combination of the 5 P's of De Beers wellness model namely power, purpose, passion, positivity, and people



LIST OF TABLES AND FIGURES

TABLES

Table 1.1	Prevalence of overweight, obesity, diabetes and hypertension of different mining commodities in the South African mining industry.....	3
Table 1.2	DBBS estimated cost of treating employees with CDL per annum.....	9
Table 2.1	Summary of the strength of evidence of nutrient intakes and risk for obesity, type 2 diabetes, cardiovascular disease (CVD) and cancer.....	22
Table 2.2	Nutrients and Dietary Reference Intakes used for evaluation of dietary Intake.....	25
Table 2.3	Conversion table for physical activity levels.....	25
Table 2.4	Physical activity level categories.....	26
Table 2.5	Conversion of work index to occupational activity level.....	26
Table 2.6	Conversion of leisure and sport indices to non-occupational activity level....	26
Table 2.7	Classification of overweight and obesity by body mass index (BMI), waist circumference and associated disease risk.....	28
Table 3.1	Socio-demographic characteristics of the sample population (N=88).....	30
Table 3.2	Occupational characteristics of the sample population (N=88).....	31
Table 3.3	Macronutrient intake for total study population (N=88) and by gender.....	72
Table 3.4	Macronutrient intake for total study population (N=88) and shift by configuration.....	74
Table 3.5	Mean energy intake of employees by BMI category.....	76
Table 3.6	Mean energy intake of employees by age category.....	76

Table 3.7	Macronutrient distribution to total energy for total study population (N=88) and by gender.....	77
Table 3.8	Macronutrient distribution to total energy for total study population (N=88) and by shift configuration.....	79
Table 3.9	Micronutrient intake for total study population (N=88) and by gender.....	81
Table 3.10	Micronutrient intake for total study population (N=88) and by shift configuration.....	82
Table 3.11	Physical activity indices for total study population (N=88) and by gender.....	85
Table 3.12	Physical activity indices of employees by BMI category.....	85
Table 3.13	Physical activity indices of employees by age category.....	86
Table 3.14	Physical activity indices of employees by occupational category.....	86



FIGURES

Figure 1	Diagrammatic representation of literature reported determinants and economic consequences of obesity and chronic diseases of lifestyle (CDL) in the workplace.....	4
Figure 2	Flow diagram of research study.....	15
Figure 3.1	Running water, electricity, food preparation and –storage facilities at home.....	32
Figure 3.2	Self-reporting of previous diagnosis of CDL by the sample population.....	33
Figure 3.3	Classification of smoking status of sample population.....	34
Figure 3.4	Classification of frequency of smoking in daily smokers.....	34
Figure 3.5	BMI classification of total study population.....	35
Figure 3.6	BMI classification of employees by gender.....	36
Figure 3.7	BMI classification of employees by age.....	36
Figure 3.8	Waist circumference above recommended levels by gender.....	37
Figure 3.9 A	Frequency of eating breakfast on work days by permanent day-shift workers	38
Figure 3.9 B	Frequency of eating breakfast on off days (weekends) by permanent day-shift workers.....	38
Figure 3.10 A	Frequency of eating breakfast on day-shift versus night-shift days by rotational shift workers.....	39
Figure 3.10 B	Frequency of eating breakfast on off days (four days) by rotational shift workers.....	39
Figure 3.11	Location of eating breakfast by permanent day-shift versus rotational shift workers.....	40

Figure 3.12 How food for breakfast was obtained on work days by permanent day-shift versus rotational shift workers.....41

Figure 3.13 Reasons for skipping breakfast on work days by the total study population (N=88).....42

Figure 3.14 A Frequency of eating a mid-morning snack on work days by permanent day-shift workers.....43

Figure 3.14 B Frequency of eating a mid-morning snack on off days (weekends) by permanent day-shift workers.....43

Figure 3.15 A Frequency of eating a mid-morning snack on day-shift versus night-shift days by rotational shift workers.....44

Figure 3.15 B Frequency of eating a mid-morning snack on off days (four days) by rotational shift workers.....44

Figure 3.16 A Frequency of drinking a mid-morning beverage on work days by permanent day-shift workers.....45

Figure 3.16 B Frequency of drinking a mid-morning beverage on off days (weekends) by permanent day-shift workers.....46

Figure 3.17 A Frequency of drinking a mid-morning beverage on day-shift versus night-shift days by rotational shift workers.....46

Figure 3.17 B Frequency of drinking a mid-morning beverage on off days (four days) by rotational shift workers.....47

Figure 3.18 A Frequency of eating lunch on work days by permanent day-shift workers....48

Figure 3.18 B Frequency of eating lunch on off days (weekends) by permanent day-shift workers.....48

Figure 3.19 A Frequency of eating lunch on day-shift versus night shift days by rotational shift workers.....49

Figure 3.19 B Frequency of eating lunch on off days (four days) by rotational shift workers49

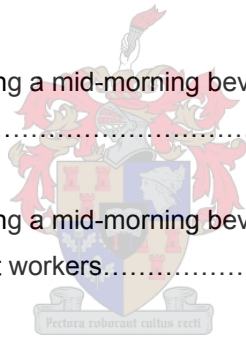


Figure 3.20	Location of eating lunch on work days by permanent day-shift versus rotational shift workers.....	50
Figure 3.21	How food for lunch was obtained on work days by permanent day-shift versus rotational shift workers.....	51
Figure 3.22	Reasons for skipping lunch on work days by the total study population.....	52
Figure 3.23 A	Frequency of eating a mid-afternoon snack on work days by permanent day-shift workers.....	53
Figure 3.23 B	Frequency of eating a mid-afternoon snack on off days (weekends) by permanent day-shift workers.....	53
Figure 3.24 A	Frequency of eating a mid-afternoon snack on day-shift versus night-shift days by rotational shift workers.....	54
Figure 3.24 B	Frequency of eating a mid-afternoon snack on off days (four days) by rotational shift workers.....	54
Figure 3.25 A	Frequency of drinking a mid-afternoon beverage on work days by permanent day-shift workers.....	55
Figure 3.25 B	Frequency of drinking a mid-afternoon beverage on off days (weekends) by permanent day-shift workers.....	56
Figure 3.26 A	Frequency of drinking a mid-afternoon beverage on day-shift versus night shift days by rotational shift workers.....	56
Figure 3.26 B	Frequency of drinking a mid-afternoon beverage on off days (four days) by rotational shift workers.....	57
Figure 3.27 A	Frequency of eating dinner on work days by permanent day-shift workers...	58
Figure 3.27 B	Frequency of eating dinner on off days (weekends) by permanent day-shift workers.....	58
Figure 3.28 A	Frequency of eating dinner on day-shift versus night shift days by rotational shift workers.....	59

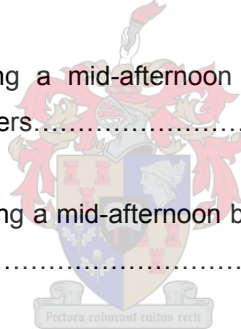
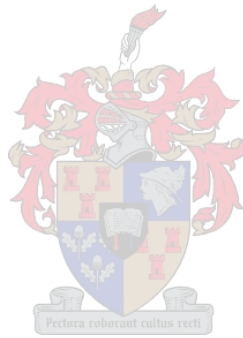


Figure 3.28 B	Frequency of eating dinner on off days (four days) by rotational shift Workers.....	59
Figure 3.29	Location of eating dinner by rotational shift workers when working day-shift and night shift.....	60
Figure 3.30	How food for dinner was obtained on work days by rotational shift workers..	61
Figure 3.31	Reasons for skipping dinner on work days by the total study population (N=88).....	62
Figure 3.32 A	Frequency of eating a late night snack on work days by permanent day-shift workers.....	63
Figure 3.32 B	Frequency of eating a late night snack on off days (weekends) by permanent day-shift workers.....	63
Figure 3.33 A	Frequency of eating a late night snack on day-shift versus night-shift days by rotational shift workers.....	64
Figure 3.33 B	Frequency of eating a late night snack on off days (four days) by rotational shift workers.....	64
Figure 3.34 A	Frequency of drinking a late night beverage on work days by permanent day-shift workers.....	65
Figure 3.34 B	Frequency of drinking a late night beverage on off days (weekends) by permanent day shift workers.....	66
Figure 3.35 A	Frequency of drinking a late night beverage on day-shift versus night-shift days by rotational shift workers.....	66
Figure 3.35 B	Frequency of drinking a late night beverage on off days (four days) by rotational shift workers.....	67
Figure 3.36 A	Frequency of eating an early morning snack on day-shift versus night-shift days by rotational shift workers.....	68

Figure 3.36 B	Frequency of eating an early morning snack on off days (four days) by rotational shift workers.....	68
Figure 3.37 A	Frequency of drinking an early morning beverage on day-shift versus night-shift days by rotational shift workers.....	69
Figure 3.37 B	Frequency of drinking an early morning beverage on off days (four days) by rotational shift workers.....	70
Figure 3.38	Prevalence of energy intake above the EER for active individuals.....	71
Figure 3.39	Prevalence of total fat intake and SFA > 10% of the sample population (N=88).....	78
Figure 3.40	Prevalence of n-6 and n-3 PUFA intake below the recommended intake (AI) for the sample population (N=88).....	78
Figure 3.41 A	Prevalence of micronutrient intakes above the UL by gender.....	83
Figure 3.41 B	Prevalence of micronutrient intakes below the EAR by gender.....	83
Figure 3.42	Scope of physical work of total study population (N=88).....	84
Figure 3.43	Occupational physical activity of total study population (N=88).....	87
Figure 3.44	Non- occupational physical activity of total study population (N=8).....	88
Figure 3.45A	Prevalence of “low active” and “active” PAL for total study population (N=88) and by gender.....	89
Figure 3.45 B	Prevalence of “low active” and “active” PAL of employees by BMI category.....	89
Figure 3.45 C	Prevalence of “low active” and “active” PAL of employees by age.....	90
Figure 3.45 D	Prevalence of “low active” and “active” PAL of employees by occupational category.....	90
Figure 3.45 E	Prevalence of “low active” and “active” PAL of employees by shift configuration.....	91

Figure 3.46	Barriers to physical activity participation for the total study population (N=88).....	92
Figure 4.1	A systematic approach to obesity management based on BMI and other risk factors.....	100



LIST OF APPENDICES

- Appendix 1: Informed consent form
- Appendix 2: First advertisement of research study
- Appendix 3: Information leaflet
- Appendix 4: Second advertisement after completion of pilot study
- Appendix 5: Research schedule
- Appendix 6: Anthropometric questionnaire
- Appendix 7: Socio-demographic questionnaire
- Appendix 8: Meal frequency questionnaire section A
- Appendix 9: Meal frequency questionnaire section B
- Appendix 10: Quantified food frequency questionnaire
- Appendix 11: Physical activity questionnaire

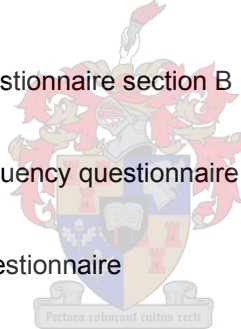


TABLE OF CONTENTS

Declaration of authenticity	ii
Abstract.....	iii
Opsomming.....	iv
Acknowledgements.....	v
List of abbreviations	vi
List of definitions.....	vii
List of tables and figures	ix
List of appendices	xvii

CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT.....1

1.1. THE GLOBAL BURDEN OF CHRONIC DISEASES OF LIFESTYLE (CDL).....	1
1.2. DETERMINANTS AND ECONOMIC CONSEQUENCES OF OBESITY AND CHRONIC DISEASES OF LIFESTYLE (CDL) IN THE WORKPLACE.....	2
1.3. BARRIERS TO A HEALTHY LIFESTYLE	4
1.4. WORKPLACE WELLNESS PROGRAMS	7
1.5. RESEARCH QUESTION	8
1.6. SIGNIFICANCE OF THE STUDY	10

CHAPTER 2: METHODOLOGY11

2.1. STUDY AIM AND OBJECTIVES.....	11
2.2. STUDY DESIGN AND ETHICS.....	11
2.2.1 Study design	11
2.2.2 Ethics	12
2.3. SAMPLING	12
2.3.1 Sample selection procedure	12
2.3.2 Inclusion criteria	12
2.4 DATA COLLECTION.....	13
2.4.1 Socio-demographic questionnaire	16
2.4.2 Meal frequency questionnaire	16
2.4.3 Food frequency questionnaire	17

2.4.4	Habitual physical activity questionnaire.....	23
2.4.5	Anthropometry.....	24
2.5	DATA ANALYSIS.....	24
2.5.1	Dietary intake.....	24
2.5.2	Physical activity.....	25
2.5.3.	Anthropometry.....	26
CHAPTER 3: RESULTS.....		29
3.1	SAMPLE CHARACTERISTICS.....	29
3.1.1	Socio-demographic.....	29
3.1.2	Occupational.....	29
3.1.3	Running water, electricity, food preparation – and storage facilities at home.....	32
3.1.4	Self-reported diagnosis of CDL.....	32
3.1.5	Smoking status.....	33
3.1.6	Anthropometry.....	35
3.1.6.1	BMI.....	35
3.1.6.2	Waist circumference.....	37
3.2	MEAL FREQUENCY.....	37
3.2.1	BREAKFAST.....	37
3.2.1.1	Frequency of eating breakfast on work days and off days.....	37
3.2.1.2	Where breakfast was eaten on work days.....	40
3.2.1.3	How food was obtained on work days.....	41
3.2.1.4	Main reasons for skipping breakfast on work days.....	41
3.2.2	MID-MORNING MEAL / SNACK AND BEVERAGE.....	42
3.2.2.1	Frequency of eating a mid-morning snack on work days and off days.....	42
3.2.2.2	Frequency of drinking a mid-morning beverage on work days and off days.....	45
3.2.3	LUNCH.....	47
3.2.3.1	Frequency of eating lunch on work days and off days.....	47
3.2.3.2	Where lunch was eaten on work days.....	50
3.2.3.3	How food was obtained on work days.....	51
3.2.3.4	Main reasons for skipping lunch on work days.....	51
3.2.4	MID-AFTERNOON MEAL / SNACK AND BEVERAGE.....	51
3.2.4.1	Frequency of eating a mid-afternoon snack on work days and off days.....	52
3.2.4.2	Frequency of drinking a mid-afternoon beverage on work days and off days.....	55
3.2.5	DINNER.....	57
3.2.5.1	Frequency of eating dinner on work days and off days.....	57
3.2.5.2	Where dinner was eaten on work days.....	60
3.2.5.3	How food was obtained on work days.....	61

3.2.5.4	Main reasons for skipping dinner on work days.....	61
3.2.6	LATE NIGHT MEAL / SNACK AND BEVERAGE.....	62
3.2.6.1	Frequency of eating a late night snack on work days and off days.....	62
3.2.6.2	Frequency of drinking a late night beverage on work days and off days.....	65
3.2.7	EARLY MORNING MEAL / SNACK AND BEVERAGE.....	67
3.2.7.1	Frequency of eating an early morning snack on work days and off days.....	67
3.2.7.2	Frequency of drinking an early morning beverage on work days and off days.....	69
3.3	DIETARY INTAKE.....	70
3.3.1.	Macronutrient intake.....	70
3.3.2.	Macronutrient distribution.....	76
3.3.3.	Micronutrient intake.....	80
3.4.	PHYSICAL ACTIVITY.....	84
3.4.1.	Scope of physical work.....	84
3.4.2.	Baecke habitual physical activity indices.....	84
3.4.3.	Physical activity conversion.....	87
3.4.4.	Barriers to physical activity participation.....	91
CHAPTER 4: DISCUSSION.....		93
CHAPTER 5: CONCLUSION AND RECOMMENDATIONS.....		102
5.1.	CONCLUSIONS.....	102
5.2.	RECOMMENDATIONS.....	102
LIST OF REFERENCES.....		103

CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

1.1. THE GLOBAL BURDEN OF CHRONIC DISEASES OF LIFESTYLE (CDL)

Diet and nutrition are important factors in the promotion and maintenance of health throughout the entire life course. Nutrition is coming to the fore as a major modifiable determinant of chronic disease, with scientific evidence increasingly supporting the view that dietary adjustments may not only influence present health, but may determine whether or not an individual will develop such diseases such as cancer, cardiovascular disease and diabetes much later in life¹.

According to a recent report (2003) by the World Health Organization (WHO) and Food and Agricultural Organization (FAO), the growing epidemic of chronic disease afflicting both developed and developing countries is strongly related to dietary and lifestyle changes. Over the past decade rapid changes in diets and lifestyles occurred with industrialisation, urbanisation, economic development and market globalisation, having a significant impact on the health and nutritional status of populations, particularly in developing countries and countries in transition¹.

This observed change in dietary patterns is characterised by increased portion sizes, an increased consumption of energy-dense diets high in fat, particularly saturated fat (mostly from animal sources), a greater role of fat and added sugars in foods, and reduced intakes of unrefined carbohydrates, dietary fibre, fruit and vegetables. In addition, these dietary patterns are combined with a decline in energy expenditure that is associated with a sedentary lifestyle¹. All these lifestyle factors favour weight gain and the development of obesity, which in turn, is strongly associated with an increased risk of developing hypertension, coronary heart diseases, diabetes, stroke and some forms of cancer². Moreover, central obesity in particular, which is characterised by an increased waist circumference, is strongly associated with both the development of type 2 diabetes mellitus and cardiovascular diseases¹.

Another important lifestyle factor, namely cigarette smoking, continues to be a major health hazard, which contributes significantly to cardiovascular morbidity and mortality³ and stroke⁴. The combination of smoking along with other risk factors like diabetes and hypertension increase the frequency of diseases, disability as well as adding to an increase in mortality rate⁵. According to the WHO (2003) almost half of the total chronic disease deaths worldwide are attributable to cardiovascular diseases, while obesity and diabetes are also showing worrying trends. In South Africa, cardiovascular diseases are the leading cause of death (17%) following HIV/AIDS (30%)⁶. Furthermore, it has been projected that, by 2020, chronic

diseases will account for almost three-quarters of all deaths worldwide, and that 71% of deaths due to ischaemic heart disease (IHD), 75% of deaths due to stroke, and 70% of deaths due to diabetes will occur in developing countries¹.

The burden of chronic diseases is rapidly increasing worldwide. Contrary to widely held beliefs that the problem is limited to the developed regions of the world, developing countries are increasingly suffering from high levels of public health problems related to chronic diseases¹. In South Africa, the burden of chronic diseases of lifestyle (CDL) is high: approximately 6 million people have hypertension, 4 million have diabetes, 7 million smoke and 4 million have hyperlipidaemia according to a recent report (2003) by the Medical Research Council (MRC). Approximately 56% of the population has at least one of these risk factors and about 20% is at a high level of risk for CDL⁶.

1.2. DETERMINANTS AND ECONOMIC CONSEQUENCES OF OBESITY AND CHRONIC DISEASES OF LIFESTYLE (CDL) IN THE WORKPLACE

The above changes in lifestyle and dietary patterns are also evident in studies among employees in Bulgaria⁷, Beijing⁸, Spain⁹, United Kingdom¹⁰ and Australia¹¹. It has been shown that employees with excessive body mass have a significantly higher prevalence of hypertension, diabetes and coronary heart disease, characterised by dietary intakes high in energy, fat, protein and sodium with a pronounced fibre deficit^{7,8,11}. Moreover, as a result of automation and mechanisation, employees are becoming more sedentary in the workplace, thus increasing their risk for the development of obesity and CDL¹².

The prevalence of a sedentary lifestyle and increased risk for CDL in the workforce has been confirmed by two recent studies among employees at De Beers Consolidated Mines (DBCM), the largest diamond mining company in South Africa^{13,14}. A study among DBCM executives at Corporate Head Quarters (CHQ) in Johannesburg during 2002, has found that 15% of executives were smoking, 67% had high cholesterol, 20% had hypertension and 62% had a sedentary lifestyle¹³. Following the results of this study, a second Wellness survey was conducted by Accenture and Alliance partners during 2003 at three DBCM pilot sites (Venetia Mine situated near Musina, Kimberley Mine's Combined Treatment Plant and CHQ in Johannesburg)¹⁴. The survey concluded that 16% of employees at Venetia Mine (DB-VM) exhibited extremely unhealthy lifestyles and thus represent a high cost / opportunity lost risk to the company, whereas 55% of employees were "at significant risk" of being unhealthy. Compared to the other two pilot sites, DB-VM had the highest percentage of employees at significant risk of being unhealthy¹⁴. The lifestyle indicators used to define employees as "healthy" or "unhealthy" were self-reported perceived personal stress, smoking-, drinking- and exercise habits as well as anthropometric (body mass index and waist-to-hip ratio) and medical measures (blood pressure, fasting blood cholesterol- and glucose levels).

The economic consequences for organisations of an unhealthy workforce are seen in high absenteeism and accidents at work, loss of productivity and increasing health-related litigation, all of which pose a significant cost¹⁵. Health risks, particularly obesity, stress and general lifestyle are found to be significant predictors of health care costs in employees¹⁶. A study in the United States that investigated the relationship between modifiable health risks and health care expenditures has found that employees at high risk for poor health outcomes had significantly higher expenditures than did employees at lower risk¹⁷. Similarly, a study in the United States that investigated the relationship between physical activity and health care costs among employees in different weight groups has found that physically moderate active and very active employees had paid significantly less health care costs annually compared to sedentary employees across all weight categories. It was also shown that health care expenditures were highest in the obese subpopulation¹⁸.

The prevalence of obesity is increasing in epidemic proportions in developed countries. According to the WHO the current prevalence has not only reached unprecedented levels, but the rate at which it is annually increasing in most developing regions is substantial¹. The South African Health and Demographic survey (1998) has found that 29% of men and 57% of women were overweight or obese². At DBCM, a study among male executives (i.e. top management employees) at CHQ in 2002, has found that 30% of executives were overweight, whereas 18% were obese¹³. Similar findings were reported among Black diamond mineworkers in a South African study by Dias et al (2003) representing all mining commodities¹⁹. Table 1.1 compares the prevalence of overweight, obesity, diabetes and hypertension among different South African mines in the mining industry as was found by the Safety in Mines Research Advisory Committee (SIMRAC). Of concern is that the diamond mine sampled had the highest percentage of diabetic and hypertensive workers of all the mines investigated as well as a higher than average percentage of obese workers although the percentage of overweight workers were below average.

Table 1.1: Prevalence of overweight, obesity, diabetes and hypertension of different mining commodities in the South African mining industry¹⁹

Type of mine	Overweight	Obesity	Diabetes	Hypertension
Diamond	33%	19%	6%	25%
Platinum	45%	22%	3%	7%
Gold	48%	7%	0%	10%
Coal	39%	14%	4%	14%
Iron (open-cast) & Manganese	35%	15%	1%	19%
Mean	40%	15%	3%	15%

¹⁹ Source: Dias (et al), 2003; p. 106

The main factors favouring increased prevalence of obesity in the workforce has been attributed to a change in dietary habits, a lack of physical activity in leisure time and certain working conditions, together with the ready availability of food¹². Certain jobs also contribute significantly to this problem. Automation and the use of machinery for heavy work in industrialised countries and the phasing out of physically demanding tasks have favoured an increase in body weight due to low energy consumption⁶. Furthermore, automation of domestic tasks by energy-saving devices, the use of motorised transportation and the time devoted to certain sedentary activities such as television, video games or personal computers has lead to reduced leisure time physical activity and increased risk for CDL¹.

Figure 1 gives a diagrammatic representation of the determinants and economic consequences of obesity and chronic diseases of lifestyle (CDL) in the workplace.

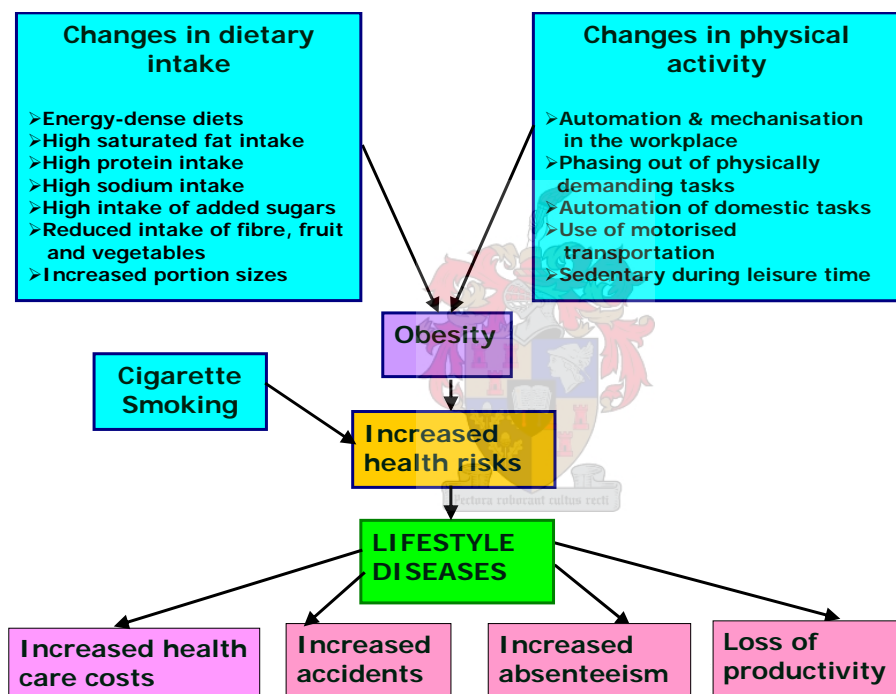


Figure 1: Diagrammatic representation of literature reported determinants and economic consequences of obesity and chronic diseases of lifestyle (CDL) in the workplace

1.3. BARRIERS TO A HEALTHY LIFESTYLE

Certain perceived or encountered barriers prevent people from eating healthier diets such as lack of money (cost), lack of availability, lack of time (too busy with work or study commitments) or taste (healthy food is uninteresting and boring)²⁰. Studies in Spain, Ukraine and European Union countries in healthy free-living subjects, has consistently found a “busy lifestyle” and “irregular working hours” to be chosen as two of the main barriers to healthy

eating, from a list of 22 possible barriers^{20, 21, 22}. Those with the highest educational level and socio-economic status as well as employed people were more likely to mention "busy lifestyle" and "irregular working hours" as the main barriers to healthier eating^{20,21,22}.

The above barriers to healthy eating have not only been found in the general population, but also in studies among employees²³ and South African mineworkers in particular¹⁹. A study conducted among ten South African mines, representing all mining commodities in the mining industry, has investigated the reasons why mineworkers did not eat at work. The main reasons for not eating were that: the participants were not in the habit of taking food to work, they did not have the time to eat, they had insufficient resources (either money or food), working conditions were not conducive to food being stored or eaten, they did not have sufficient time to prepare food to take underground, there were no food outlets or canteens available at work or the canteen was closed at night¹⁹.

It has been shown that the working environment per se can contribute to unhealthy eating. Fagier et al (2001) has conducted a study among nursing professionals at eight different health care sites in the United Kingdom, to identify the main areas of the nurse's working environment that contribute to unhealthy eating. The four main barriers identified were i) availability; ii) variety; iii) distance from catering facilities; and iv) breaks, staffing levels and workload issues. Within the fourth barrier, shift patterns and failure to take breaks were most frequently reported as barriers by nursing professionals²³.

Several investigators have found that shift-workers in particular are at increased risk for the development of obesity, coronary heart disease^{24,25} and the metabolic syndrome²⁶. Jobs that are a source of stress, such as working on three rotating shifts, have been shown to cause metabolic disorders leading to an increased prevalence of obesity. In addition, lack of recovery time between shifts, work demands and particularly stress has been associated with increased health risks¹². It has also been shown by De Assis et al (2003), Waterhouse et al (2003) as well as Sudo and Ohtsuka (2001) that the changing work schedules of shift-workers affect their eating habits, directly contributing to increased risk for CDL.^{27,28,29}

Although a study conducted among Japanese employees revealed significant differences between the nutrient intakes of day and shift workers²⁷ most studies conducted in European countries have found no significant differences between the food consumption patterns of day and shift-workers^{14,15,16,17}. There were also no significant differences in the frequency or type of meals consumed in day workers between work and off days respectively^{25,26,27}. However differences have been found between the frequency and distribution of meals of night-shift workers in particular, between work-days and off days respectively, which place these workers at increased risk for CDL^{25,26,27,28,29}. These changes in eating habits of night-shift workers is considered to be due to environmental (food availability and time pressure),

physiological (unadjusted circadian rhythms and increased fatigue), psychological (habits and appetite), or sociological (being out-of-step with family and friends) factors²⁹.

Similar to perceived or encountered barriers to healthy eating, studies have also identified certain barriers that prevent employees from engaging in physical activity. Four studies, conducted among samples from three developed countries, namely Australia, United States and Canada, have attempted to identify the prevalence of specific barriers to physical activity participation³⁰. Godin et al (1994) examined the relative importance of five barriers in a community sample of adults in Canada. The order of importance of the barriers was finding time, finding a partner to exercise with, physical health problems, the financial cost and access to appropriate facilities³⁰. Time demands, lack of motivation, perceived convenience of the exercise setting, medical problems and a lack of social support have also been reported in other studies as significant barriers to exercise^{31,32}.

Women have been shown to be less likely than men to participate in vigorous exercise and competitive sports and less likely to be physically active on a regular basis. One hypothesis to explain this problem is that personal and societal barriers or obstacles in the lives of women make it difficult for them to exercise³³. Jaffee et al (1998) examined barriers working women experience in attempting to incorporate physical activity into their lives³⁴. The barriers identified included being already active outside of work, lack of time in the work day, lack of confidence in physical skills / abilities, being self-conscious to work out in front of co-workers / younger / more fit participants and men and being concerned about their appearance³⁴. Lack of time for physical activity was an obstacle for women across all ages. Lack of time due to work commitments was reported as a barrier for more than half of the women. In addition, lack of time related to family commitments was a frequently reported barrier for most women. Hence due to the multiple roles of women in the workforce, they find their work, school, household, children, parents and social obligations to be major barriers to exercise³⁵.

Similar to barriers preventing working women from engaging in physical activity, Desmond et al (1993) investigated the factors associated with male white collar versus blue collar workers' engagement in physical activity. Working overtime, work demands, working shifts, car pooling, home responsibilities and a long commute have been identified as perceived barriers to engagement in physical activity³⁶.

Studies in Western countries have found that different levels of physical activity are strongly related to occupational class or socioeconomic status. A number of studies have reported that less-skilled workers are less physically active during leisure-time but spend more time in vigorous work and home physical activity, compared with those in skilled and professional occupations^{37,38}. On the other hand, higher-skilled workers have been found to be more physically inactive at work but more physically active during leisure time. Studies among

European Union countries and the United States have shown that workers with high education were more likely to participate in exercise than those with low education ³⁹. Desmond et al (1993) have also found that those workers with higher incomes, regardless of their occupational class, tended to engage more in physical activity ³⁶.

1.4. WORKPLACE WELLNESS PROGRAMS

Workplace wellness as a concept has been used extensively in recent years by management in business and industry, health professionals, fitness experts and others ⁴⁰. Wellness is defined as “a composite of physical, emotional, spiritual, intellectual, occupational and social health; health promotion is the means to achieve wellness” ⁴¹.

Employee wellness programs are based on the theory that it costs less to educate workers about controllable lifestyle health risks than to pay for the cost of ill health ⁴². Over the past two decades workplace wellness programs has become increasingly popular in the corporate environment as a method for preserving the health of employees in the hope of generating lower healthcare expenses and in turn, higher profits ⁴².

Healthy workplaces have been shown to help lower health risks and prevent occupational disease and injury by promoting positive lifestyle behaviours ¹⁵. In fact, the workplace is considered to have great potential for health promotion and education because workers spend more than 50% of their waking hours at work ⁴³. In addition, the workplace offers access to large numbers of people who are part of the wider social community, provides the potential for positive health messages to be enhanced by team influences found within organisations, enables activity to be reached easily in other ways, and creates the possibility of extended dissemination of a positive lifestyle culture to the family and friends of the employee outside of the targeted workplace. Wellness programs can have long-term benefits for employers above and beyond health care cost containment, such as reducing turnover, reducing absenteeism, improving employee self-image, improving job satisfaction, increasing productivity, efficiency and overall performance and enhancing the corporate image ^{15,44,45}.

Similar to other large companies, DBCM has committed itself to putting wellness on the scorecard in order to reinforce its position as “Employer of Choice”. In line with this commitment the DBCM Medical Services held a strategic planning workshop in 2003. During this workshop it was emphasised that employee health benefits have become a significant cost of doing business and an important strategic issue for DBCM. It was also concluded that the optimal strategy for reducing healthcare costs needs to include wellness and prevention as a key component in order to optimise people through whom business results are achieved.

Against this background, two Wellness surveys were conducted at three DBCM pilot sites in South Africa during 2002 and 2003 respectively^{13,14}. Wellness was measured on three levels namely wellness or resilience, stress and allostatic load. In addition, two long-term indicators of ongoing lack of health in the organisation, namely sick leave and acute and chronic medication expenditure, were measured in order to determine the medical expenses of the most healthy and least healthy profiles.

The DBCM survey has found that 16% of employees at DM-VM were functioning in an extremely unhealthy way whereas 55% of employees were “at significant risk” of being unhealthy¹³. With regards to the acute and medical expenditure year-on-year, the differences revealed that the healthier extreme decreased their medical expenditure by 14% (acute) and 24% (chronic) between 2002 and 2003, while the unhealthy extreme increased their medical expenditure by 61% (acute) and 78% (chronic). The study has also shown that there was a strong link between chronic medication spend and lifestyle¹³.

1.5. RESEARCH QUESTION

The growing epidemic of chronic diseases is largely attributed to changes in dietary intake and a sedentary lifestyle, directly promoting weight gain and obesity. These changes are evident in the workplace and increase an employee’s risk of developing CDL. Shift workers, night-shift workers in particular, are at increased risk of developing CDL. Although dietary intake patterns in general do not seem to differ between shift workers and non-shift workers, there are significant differences in the frequency of meals of night-shift workers and between dietary intake on work days and off days. Furthermore differences in physical activity patterns are seen by gender, between different occupational classes and socioeconomic levels in the workplace, which affect an employee’s risk of developing CDL. It is also evident that work-related factors such as a high workload, irregular working hours and working shifts have been identified as major barriers to healthy eating and engagement in physical activity, which increases the risk of developing obesity and CDL.

The above mentioned lifestyle changes and increased risk for CDL are also evident among DBCM employees as was confirmed by two recent Wellness surveys. In addition, these surveys found that there was a strong link between chronic medication expenditure and lifestyle. According to the DBCM medical insurance division, De Beers Benefit Society (DBBS), the chronic medication liability (including all chronic diseases, not only CDL) of DBCM for 2004 was **22 million rand** (including pensioners)⁴⁶. The chronic medication liability of DBCM employees (excluding pensioners) for 2004 was **8.4 million rand** of which DB-VM accounted for **R 287 411** (i.e. 4 % of all DBCM chronic medication claims). Since almost two thirds (62%) of the chronic medication liability are accounted for by DBCM pensioners, it

underscores the importance of optimising and maintaining the wellness of employees while still being part of the workforce.

According to the DBBS the top five categories of chronic disease claims are largely lifestyle-related ⁴⁶. In 2004 the number of known employees with CDL at DB-VM amount to **52** (i.e. 26 diabetics, 19 hypertensive and 7 hypercholesterolaemic) ⁴⁷. According to the DBBS, the expense to treat employees with CDL (excluding the treatment of additional disease complications and hospitalisation costs), depending on the type of medication/treatment used is: ⁴⁶

Employees with Diabetes mellitus	R 2400 – R 7200 per annum
Employees with Hypertension	R 490 – R 6000 per annum
Employees with Hypercholesterolaemia	R 1080 – R 4200 per annum

The above expenses imply that DB-VM is spending on average **R 204 935** per annum to treat the current number of known employees with CDL as calculated in Table 1.2.

Table 1.2: DBBS estimated cost of treating employees with CDL per annum ⁴⁶

Cost of treating CDL	Number of employees	Sub-total
Diabetes: R 2400 – R 7200	26	R 62 400 – R 187 200
Hypertension: R 490 – R 6000	19	R 9 310 – R 114 000
Hypercholesterolaemia: R 1080 – R 4200	7	R 7 560 – R 29 400
TOTAL COST		R 79 270 – R 330 600
AVERAGE TOTAL COST		R 204 935

⁴⁶ Source: Personal communication and written report, De Beers Benefit Society. Kimberley: Benefits co-ordinator Johan Barnardt, 10 May 2005.

In addition, DB-VM has lost **31 working** days during 2004, due to CDL ⁴⁶. However, the impact of these diseases on the organisation can be reduced by implementing appropriate lifestyle interventions at the workplace.

In conclusion, previous DBCM Wellness surveys, medical claims and absenteeism statistics have clearly shown CDL to have potential financial and productivity implications on the organisation. The research question was therefore to investigate the causes of increased risk for CDL and to identify potential workplace wellness interventions to decrease the risk for CDL.

1.6. SIGNIFICANCE OF THE STUDY

The global epidemic of obesity and increased risk for CDL is evident among DB-VM employees, posing a significant cost to the organisation. Rotating shift workers and night shift workers in particular have been shown to be at increased risk for CDL due to lack of recovery time between shifts, work demands and high stress levels. Furthermore certain barriers relating to the working environment and working conditions promote unhealthy eating patterns and prevent employees from engaging in physical activity, thus directly contributing to obesity and increased risk for CDL.

To date no information is available regarding the dietary intake and physical activity of employees at DB-VM. In addition, there is a lack of information on how these variables differ between day-shift workers and rotational shift workers respectively, and between different occupational categories at DB-VM. Furthermore, work-related barriers to a healthy lifestyle have not been investigated by previous Wellness surveys among DB-VM employees or by the only other reported South African study in the mining industry.

The results of this study will enable DB-VM to develop appropriate workplace strategies for the implementation of a tailored Wellness program. It will also enable other DBCM operations in South Africa to enhance their Wellness programs. The interventions that could be introduced at DB-VM, following the recommendations of this study, will have long term benefits to both the employer and employees by decreasing the risk for CDL, decreasing absenteeism and improving the future wellness and quality of life of employees, with due consideration of the constraints posed by the working environment.

CHAPTER 2

METHODOLOGY

2.1 STUDY AIM AND OBJECTIVES

In view of the literature data and the findings of previous Wellness surveys at DBCM, the aim of the study was to collect baseline information regarding the dietary- and physical activity habits and barriers to a healthy lifestyle in order to determine which workplace interventions are needed at DB-VM to improve the future wellness of employees and thus help decrease the risk for CDL.

The specific objectives for the study were:

1. To determine the usual dietary intake and meal frequency of permanent day-shift versus rotational shift workers.
2. To determine the habitual physical activity of employees in relation to occupational class and scope of physical work.
3. To determine the work-related barriers which contribute to unhealthy eating patterns and a sedentary lifestyle among employees.
4. To determine the risk for CDL among employees.

It was hypothesised that employees would exhibit unhealthy lifestyles and would be at high risk of CDL as was demonstrated by previous Wellness surveys.

2.2. STUDY DESIGN AND ETHICS

2.2.1 Study design

An analytical cross-sectional observational study design was used. Data was collected by means of structured validated questionnaires as well as objective anthropometric measurements. A quantitative approach was followed throughout the data collection process.

2.2.2 Ethics

After written approval for the study was granted by the members of the Executive Committee (EXCO) at DB-VM, a research protocol was submitted to and approved by the Committee for Human Research, Faculty of Health Sciences of the University of Stellenbosch, Tygerberg, South Africa (Reference no N05/02/020). All participants signed an informed consent form (Appendix 1) after explanation of the purpose of the study and data collection procedures to be followed. Participant confidentiality was ensured throughout the research process by omitting subject identification information from all questionnaires. Participants were assured that the investigator was the only person having access to the data. Subjects were also informed both verbally and by means of the consent form that the study results will be provided to DM-VM and published in a Masters thesis, but will not be shared for any other purposes.

2.3 SAMPLING

2.3.1 Sample selection procedure

The study population was limited to permanent employees at DB-VM. A proportional stratified random sample of employees was selected to participate in the study (Figure 2). Eighty eight participants (i.e. 90 % statistical precision) were selected from a total number of 867 total permanent employees. Participants were stratified according to shift configuration and occupational category. The sample comprised of 49% permanent day shift workers and 51% rotational shift workers from the following occupational categories: Top & middle management (11%), Supervisor / Foreman (14%), Technical staff (7%), Artisan / Technician (8%), Clerical / Admin / Security (16%), Operator (truck / dozer / shovel) (18%), Operator (other) (15%) and Operative (11%).

2.3.2 Inclusion criteria

The inclusion of permanent employees in the sample was based on three criteria: i) employed at DB-VM for at least six months prior to the starting date of the study, ii) willing to answer interviewer-administered questions and iii) willing to undergo anthropometric measurements including weight, height and waist circumference. All employees employed at DB-VM for less than six months as well as temporary employees, contractors, pregnant women and employees that participated in the pilot study were excluded from the sample. Since participation in this study was entirely voluntary, if a selected employee declined to participate, he or she was replaced by another randomly selected employee complying with the above criteria. Because the study was performed during a period of restructuring and

rightsizing at DBCM, all selected employees that had been transferred, retrenched or resigned during the study period were also replaced by randomly selected employees.

2.4 DATA COLLECTION

Prior to commencing with the study, a presentation was given to the Acting Human Resources manager, Industrial Relations manager, and eleven representatives from the NUM (National Union of Mineworkers) to explain the background, motivation, time schedule and logistics of the study. After approval by the NUM, an advertisement (Appendix 2) was placed in DB-VM's bi-monthly newsletter, the Venetia Voice, to inform all employees regarding the aim and scope of the study. In addition to the advertisement, a one-page information leaflet (Appendix 3) was distributed on the buses transporting employees to and from DB-VM in order to reach employees who might not have read the newsletter.

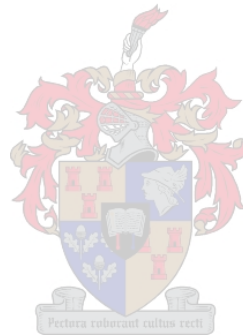
Two weeks after placing the advertisement, a pilot study was conducted on a random sample of eight participants, with similar characteristics to the sample population. One representative from each occupational category was included in the pilot study, comprising of five permanent day shift workers and three rotational shift workers. All ambiguous questions identified during the pilot study were subsequently rephrased and clarified according to the responses and suggestions received by the pilot study participants.

Following the pilot study, a second advertisement (Appendix 4) was placed in the Venetia Voice to inform employees that the study has started off well and to encourage all supervisors to release their subordinates to participate in the study. In addition, a time schedule (Appendix 5) was e-mailed to all supervisors to inform them which employees have been randomly selected in order to assist them in planning their work schedules accordingly.

Data collection took place from the beginning of April until mid June 2005. All subjects signed an informed consent form (Appendix 1) before participating in the study. A study specific adapted English version of the standard informed consent form provided by the Faculty of Health Sciences of the University of Stellenbosch was used. Three subjects were not in command of English and required the assistance of a Venda translator. The translator was familiarised with the questionnaires during the pilot study. Each question and possible answers was explained to the translator to make sure that questions are clearly understood. The translator then conducted interviews with two of the pilot study participants to ensure standardisation in the posing of questions, interpretation of answers and completion of questionnaires. The investigator was present at all times throughout the study to clarify any questions from the translator or participants.

As requested by the NUM, a space was provided on the consent form where participants could request individual feedback regarding their results. Each participant received a copy of the consent form to take home.

Participants were required to complete a total of three questionnaires. Each of the socio-demographic-, habitual physical activity-, and meal frequency- questionnaires was self-administered. The completion of these questionnaires took approximately 30 to 45 minutes. The food frequency questionnaire was administered by the investigator and took approximately 1.5 to 2 hours to complete. After completion of the questionnaires, weight, height and waist circumference measurements were performed by the investigator and recorded on the anthropometric recording sheet (Appendix 6).



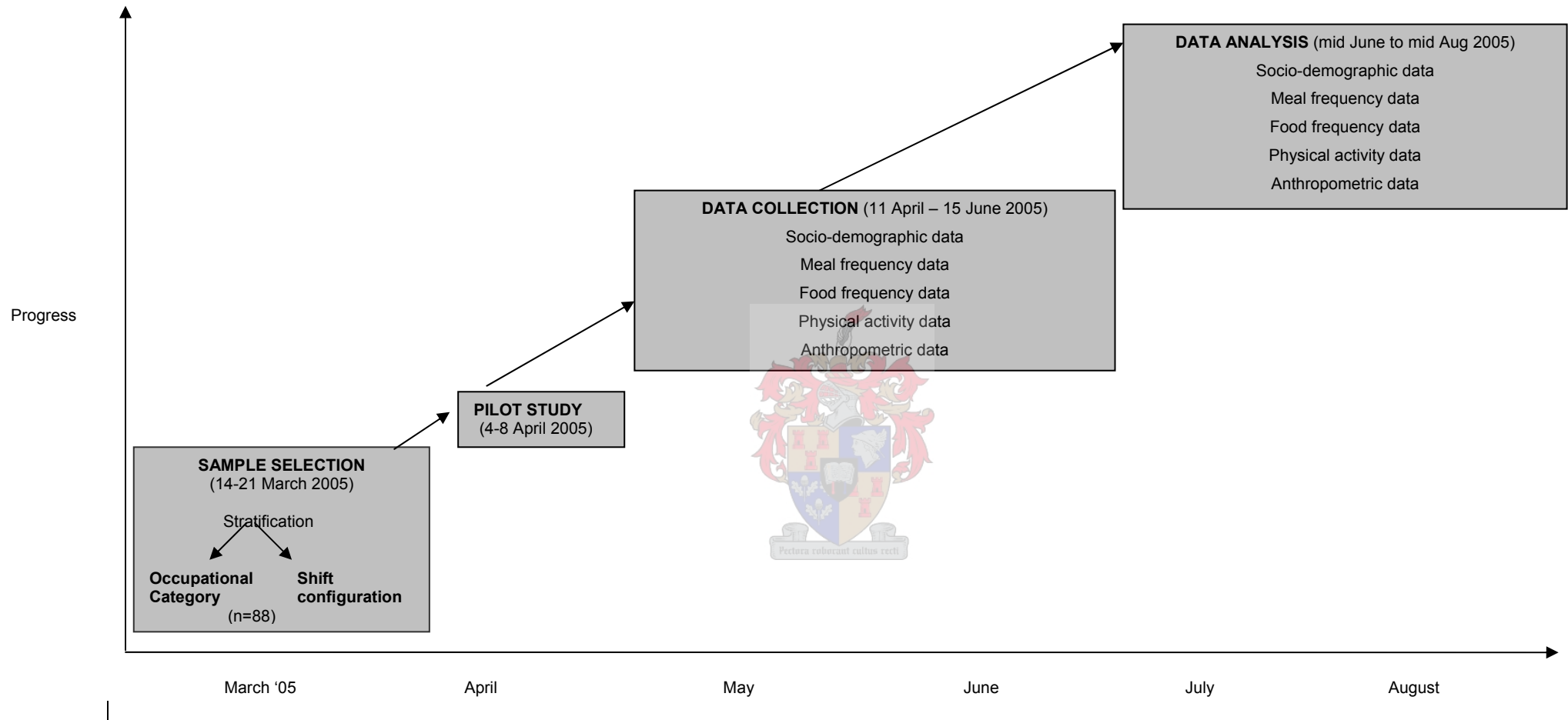


Figure 2: Flow diagram of research study

2.4.1 Socio-demographic questionnaire

The socio-demographic questionnaire (Appendix 7) collected basic socio-demographic information. Information collected include age, gender, race, marital status, highest level of education, occupational category, department, shift configuration, Patterson band (salary level), availability of electricity, running water, cooking- and food storage facilities at home, diagnosis of CDL and smoking habits.

2.4.2 Meal frequency questionnaire

Meal frequency referred to the frequency of meals (a) at home and at work, (b) on work-days and off-days and c) bought at work versus brought from home, by permanent day-shift and rotational shift workers respectively.

The meal frequency questionnaire was developed by the investigator for the specific purpose of this study. The questionnaire consists of two sections. Section A (Appendix 8) was completed by permanent day shift workers, working 8-hour shifts, either from 08h00-16h00 or from 07h00-15h00 on five days (Mondays to Fridays). Day-shift workers are usually off on weekends (Saturdays and Sundays). Section B (Appendix 9) was completed by rotational shift workers, working 12-hour shifts, starting with two day-shift days (07h00-19h00), followed by two night shift days (19h00-07h00) and are then off for the next four days, after which they repeat the same shift cycle again. Two separate questionnaires (section A and section B) were designed by the investigator taking these different working hours into consideration.

Section A collected information regarding the frequency of consuming meals, snacks and beverages on work days and weekends respectively, where meals were consumed, how food was obtained, as well as reasons for skipping meals on work days. Section B collected information regarding the frequency of consuming meals, snacks and beverages when working day shift, night shift and on off days respectively, where meals were consumed and how food was obtained when working day-shift and night-shift respectively, as well as reasons for skipping meals on work days. Section A and B differed with regard to questions concerning the frequency of meals, snacks and beverages as well as questions relating to eating dinner. Section B included questions regarding the frequency of an early morning meal or snack and beverage (questions 28-31). These questions were omitted in section A as these questions were not relevant to permanent day-shift workers (working from 08h00-16h00 or 07h00-15h00). The objective of the study was to identify interventions **at the workplace** to improve employee wellness. Permanent day-shift workers are not at the workplace during dinner time, therefore questions relating to where dinner was consumed, how food was obtained as well as reasons for skipping dinner was omitted in section A.

The meal frequency questionnaire was tested for face validity by eight subjects participating in the pilot study. For clarification purposes all meals and snacks were defined according to specific time

intervals, taking the different work-shift hours into consideration. Breakfast (question 1 section A and question 1 section B) was defined as any meal eaten from 5h00 until 9h00 in the morning. A mid-morning meal or snack (question 11 section A and question 22 section B) was defined as any meal or snack eaten after 9h00 until 11h00 in the morning. Lunch (question 11 section A and question 13 section B) was defined as any meal eaten after 11h00 until 14h00 in the afternoon. A mid-afternoon meal or snack (question 13 section A and question 15 section B) was defined as any meal or snack eaten after 14h00 until 17h00 in the evening. Dinner (question 17 section A and question 19 section B) was defined as any meal or snack eaten after 17h00 until 21h00 in the evening. A late night meal or snack (question 18 section A and question 24 section B) was defined as any meal or snack eaten after 21h00 until midnight. An early morning meal or snack (question 28 section B) was defined as any meal or snack eaten after midnight until before 5h00 in the morning. The same time interval definitions were applied to a mid-morning beverage (question 6 and 8 section A; question 7 and 9 section B), a mid-afternoon beverage (question 14 and 16 section A; question 16 and 18 section B), a late night beverage (question 19 and 21 section A; question 25 and 27 section B) and early morning beverage (question 29 and 31 section B). The word “beverage” was defined as any of the following drinks: coffee, tea, cold drinks, fruit juice, milk or milk drinks. Several questions were rephrased following the suggestions and recommendations of the pilot study participants. The original question 3 section A and question 4 section B “If you eat breakfast at work, do you bring your own food to work or do you buy food at work?” was rephrased to “If you do not eat breakfast at home on work days, where do you obtain food most of the time?”. The original question 13 section B “If you eat lunch at work, do you bring your own food to work or do you buy food at work?” was rephrased to “If you do not eat lunch at home on work days, where do you obtain food most of the time?”. Finally the original question 21 section B “If you eat dinner at work, do you bring your own food to work or do you buy food at work?” was rephrased to “If you eat dinner on work days, where do you eat dinner most of the time”

2.4.3 Food frequency questionnaire

Food frequency referred to the daily, weekly and monthly frequency of dietary intake over the past six months.

A validated quantified food frequency questionnaire (QFFQ) developed by the Medical Research Council (MRC) was used to assess dietary intake (Appendix 10)⁵³.

The QFFQ was developed and validated by means of secondary data-analysis on existing dietary databases (raw data) obtained from surveys undertaken in South Africa between 1983 and 2000. Since there has never been a national dietary survey on adults in South Africa, the data had to be extrapolated from existing isolated surveys on adults namely the Lebowa study, Dikhale study, Black Risk Factor Study (BRISK), Coronary Risk Factor Study (CORIS), Transition, Health and Urbanisation in South Africa (THUSA), Weight and Risk Factor Study (WRFS) and the First Year Female Student (FUFS) Project⁵³.

The dietary data from the above-mentioned studies were firstly coded into Global Environment Monitoring System / Food Contamination Monitoring and Assessment Programme (GEMS) / Food Commodities (main food groups); then into GEMS/ Food subgroups; then into food items having a description and a method of processing (i.e. dried / canned / fresh). The latter step involved utilising the MRC food groups and European countries classification of food items (EURO) codes. The final tables generated comprised the following data with regard to food items consumed: main food group; the subgroup where appropriate; a description of the item where appropriate; the percentage of the sample consuming that item; the portion consumed per day by those individuals who actually consumed the item and the average portion (per capita) consumed per day by all individuals in the relevant sample⁵³.

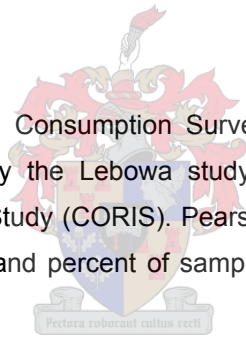
The information included in the QFFQ on food items most commonly consumed by adults was derived by following a series of statistical techniques in a logical sequence as explained below [39]:

Method 1

Calculation of data for adults using 24-hour recalls

Step 1: Correlations

Firstly data from the National Food Consumption Survey (NFCS) were correlated with data from individual surveys on adults namely the Lebowa study, Dikhale study, Black Risk Factor Study (BRISK) and Coronary Risk Factor Study (CORIS). Pearson's correlation coefficients were calculated using both per capita portion sizes and percent of sample consuming the food item, using all items and subgroups consumed.



Step 2: Factor analysis

Secondly, relationships between databases were explored by means of factor analyses. This was done to determine whether the adult databases would follow a similar trend with the NFCS as for the step on correlations. Factor analyses were done to establish the relationship between NFCS 6-9 year olds in the nine provinces, urban and rural separately, with the databases having adults, namely: BRISK, Lebowa, CORIS and Dikgale.

Step 3: Weighting of data

In order to derive equations to determine combined estimates for different population groups, the principle of "weighting" data was applied. The databases under consideration contained the following variables: the number of participants in the survey (N), the number of subjects (T) consuming a specific food item and the total quality (Q) in grams of the food item consumed per day by the whole group. From this, the following were calculated: the percentage of the group consuming a specific item

($P = T/N$); the amount consumed per day by those actually having the item ($PORT = Q/T$) and the per capita amount consumed ($POP- PORT = Q/N$). Adult intakes (average per capita portion size and percentage of adults consuming the item) in South Africa were estimated by applying weights according to the proportion of populations in each province. The weightings were adjusted for the sample sizes of the source data. Adjusted relative weightings were used to estimate adult intakes. The adjusted relative weightings were applied when calculating the weighted means of the per capita consumption of food items of those actually consuming the food items, the weighted means of the per capita consumption and the percentage of the group consuming the respective items.

Method 2

Calculation of data for adults using the food frequency method

Databases generated by means of the food frequency method included: NFCS, Transition, Health and Urbanisation in South Africa (THUSA), Weight and Risk Factor Study (WRFS) and the First Year Female Student (FUFS) Project. In order to establish relationships / associations between the NFCS and the other studies (databases) used, factor analysis were undertaken using the same methods as described above.

The above statistical methods gave a result of the most popular food items consumed by children (1-5 years, 6-9 years) and adults (> 10 years) in South Africa. The food items included in the QFFQ reflect all items that were eaten by at least 3 % of the population groups that had been surveyed ⁵³.

The QFFQ developed by the MRC and used in this study (Appendix 10) consists of 215 food items, divided into 14 food categories namely dairy; starches; fats; spreads; snacks, sweets & cold drinks; eggs; fruit; soup, legumes & nuts; fish & seafood; meat; vegetables; biscuits, cake & pudding; sauces & condiments as well as alcoholic drinks. Food frequency was described in terms of daily, weekly and monthly intake. Daily frequency of intake was described in terms of times per day, weekly frequency of intake was described in terms of days per week and monthly frequency of intake was described in terms of times per month. Portion sizes were estimated by using the Food Photo Manual (FPM) of DAEK (Dietary Assessment and Educational Kit), that was developed and launched by the MRC during August 2004 ⁵⁴. The QFFQ together with FPM has previously been used in the Birth to Ten longitudinal study in Johannesburg among adolescents (Black & White), in a study on dietary intake of children in Caledon, and in sportsmen.

The investigator followed a stepwise approach in obtaining information on dietary intake during this study:

Step 1:

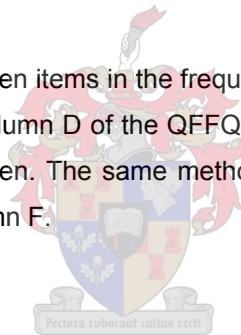
Each participant was provided with a set of food flashcards. He or she was then asked to divide the flashcards into two piles: a) items that he or she hardly ever ate or drank during the past six months and b) items that he or she did eat or drink during the past six months. The pile of items that were not eaten or drank was then removed.

Step 2:

Participants were then asked to divide the pile that was left into two piles again: a) items that he or she eat or drink nearly every day and b) items that are eaten or drank less frequently, e.g. once a fortnight or once a month.

Step 3:

Participants were then asked how often items in the frequently eaten pile was usually eaten per day or week. This data was then filled in column D of the QFFQ if eaten every day or in column E according to the number of days per week eaten. The same method was applied for the less frequently eaten pile, which involved completing column F.



Step 4:

The usual portion sizes of each item were then determined by using the FPM. The FPM consists of generic life-size sketches of food portions as well as food photo cards. The food photo cards contains photographs of specific food items or drinks, portion-size estimation guidelines in the form of specific life-sketches, generic sketches, food quantities in grams for different portion sizes derived from the MRC Food Quantities Manual (1991), as well as weights obtained from packaging and the producers of products, specifically for fast foods. Information regarding portion sizes was first determined for commonly eaten foods and then for less commonly eaten foods and was filled in column C of the QFFQ.

Reliability in obtaining information on dietary intake was ensured by the investigator being the only person responsible for completing the QFFQ, by using a standard set of photographs / sketches for estimation of portion sizes and by following a standardised stepwise data collection procedure as described above.

This study focused on nutrient intakes in relation to risk for CDL. Therefore analysis of nutrients that may have an increased or decreased risk for CDL when over- or under consumed were included in this study. Table 2.1 indicates the relationship between nutrient intakes and risk for the development of obesity, type 2 diabetes mellitus, cardiovascular diseases and cancer, based on the strength of scientific evidence as found in the literature and reported by the WHO ¹. Only nutrients that have been found by *convincing* and *probable* scientific evidence (Table 2.1) were included in the analysis. *Convincing evidence* was based on epidemiological studies showing consistent associations between exposure and disease, with little or no evidence to the contrary. The available evidence was based on a substantial number of studies including prospective observational studies and where relevant, randomised controlled trials of sufficient size, duration and quality and showing consistent effects. *Probable evidence* was based on epidemiological studies showing fairly consistent associations between exposure and disease, but where perceived shortcomings in the available evidence (e.g. insufficient duration of trials, insufficient trials available, inadequate sample sizes or incomplete follow-up) or some evidence to the contrary was described.



Table 2.1 Summary of the strength of evidence of nutrient intakes and risk for obesity, type 2 diabetes, cardiovascular disease (CVD) and cancer¹

Nutritional factor	Obesity	Type 2 diabetes	CVD	Cancer
Energy & fats				
High intake of energy-dense foods	Convincing ▲ ^a			
Saturated fatty acids		Probable ▲ ^b	Convincing ▲	
Trans fatty acids			Convincing ▲	
Dietary cholesterol			Probable ▲	
Linoleic acid			Convincing ▼ ^c	
Fish and fish oils (EPA and DHA ^d)			Convincing ▼	
Alpha- Linolenic acid			Probable ▼ ^e	
Carbohydrate				
High intake of NSP ^f (dietary fibre)	Convincing ▼	Probable ▼	Probable ▼	
Vitamins				
Folate		Probable ▼		
Minerals				
High sodium intake		Convincing ▲		
Potassium		Convincing ▼		
Fruits and vegetables				
Fruits (including berries) and vegetables	Convincing ▼ ^g	Probable ▼ ^g	Convincing ▼	Probable ▼ ^h
Non-alcoholic beverages				
Sugars-sweetened soft drink and fruit juices	Probable ▲			
Alcoholic beverages				
High alcohol intake			Convincing ▲ ⁱ	Convincing ▲ ^j
Low to moderate alcohol intake			Convincing ▼	
<p>^a Convincing ▲ refers to convincing increasing risk ^b Probable ▲ refers to probable increasing risk ^c Convincing ▼ refers to convincing decreasing risk ^d EPA, Eicosapentaenoic acid; DHA, Docosahexanoic acid ^e Probable ▼ refers to probable decreasing risk ^f NSP, Non-starch polysaccharides ^g Based on the contributions of fruits and vegetables to non-starch polysaccharides ^h For cancer of the oral cavity, oesophagus, stomach and colorectum ⁱ For cancer of the oral cavity, pharynx, larynx, oesophagus, liver and breast ^j For coronary heart disease</p>				

2.4.4 Habitual physical activity questionnaire

Habitual physical activity referred to three components of physical activity namely: occupational physical activity, sports during leisure time physical activity and leisure time physical activity excluding sports.

Data relating to physical activity was collected by the Baecke questionnaire of habitual physical activity (Appendix 1). This questionnaire has been validated in several investigations and has been shown to be an easily administered and accurate instrument⁴⁸. In validation studies the Baecke questionnaire showed the highest correlation coefficient ($r = 0.69$, $p < 0.001$) with physical activity level (PAL) as measured with doubly labelled water as the criterion^{49, 50}.

The original questionnaire included sixteen questions covering three components of physical activity namely physical activity at work, sports during leisure time, and physical activity during leisure time excluding sport⁴⁸. The investigator has adapted the questionnaire to suit the specific purpose of the study. The investigator added an additional question prior to question 1. The additional question described the degree of physical labour associated with different occupations (scope of physical work). Participants were asked to describe the degree of physical labour related to their occupations by selecting one of three possible options, as per the classification of the Centre for Disease Control³⁹. A *low* degree of physical labour was classified as “No hard physical labour” a *moderate* degree of physical labour was classified as “1-4 hours of physical labour per day” and a *hard* degree of physical labour was classified as “more than 5 hours of physical labour per day”. The investigator has adapted question 1 to include only occupations relevant to DB-VM. Another additional question (question 17) was added after question 16. The second additional question described the barriers to physical activity participation during leisure time. Participants were asked to identify three barriers to physical activity participation during leisure time from a list of fourteen possible barriers as described in the literature^{30, 31, 32, 33, 34, 35, 36, 37}.

Most questions were scored on a 5-point Likert scale, with descriptions ranging from “never” to “sometimes” to “very often”. Three questions were not scored on the Likert scale but required reporting the type of sporting activity and both the number of hours per week and the number of months per year in which the respondents participated in a particular activity. Each of the three sections, i.e. work, sport and leisure indices, were scored according to specific scoring criteria. Each section could receive a minimum score of 5 points with a maximum score of 15 points for the total activity index⁴⁸. The physical index scores that resulted from the questionnaire could be used to derive rankings of individuals by physical activity.

2.4.5 Anthropometry

The investigator obtained height, weight and waist circumference measurements in this study by using standard equipment and standardised techniques. All measurements were performed by the investigator according to the WHO methodology⁵⁵. In order to ensure privacy, all anthropometric measurements were conducted in a private room. Weight was determined to the nearest 0.1 kg by using a standardized electronic scale (Tanita body fat monitor Model 521 A). Subjects were weighed and measured without shoes and in one light layer of clothing. The scale was regularly controlled for zero reading between measurements. Height was measured in centimetres to the nearest 0.1 cm by using a portable stadiometer (Scales 2000 Model PSWHS). Height measurements were performed with the subjects standing with feet together, upright and the head placed in the Frankfort plane. Waist circumference was measured to the nearest 0.1 cm with a non-stretchable tape measure. Waist circumference was measured at the smallest area below the rib cage and above the umbilicus⁵⁵. To improve the reliability of measurements the same measuring instruments were used throughout the study, all measurements were performed twice per participant, the average recorded and the process repeated in the case of any discrepancies.

2.5 DATA ANALYSIS

2.5.1. Dietary intake

The Dietary Reference Intakes (DRI)⁵², developed by the Food and Nutrition Board of the Institute of Medicine of the United States (2000), were used to evaluate nutrient intakes in this study (Table 2.2). The Acceptable Macronutrient Distribution Range (AMDR) was used to evaluate macronutrient distribution. Total energy intake was compared to the DRI for energy by active individuals. The Estimated Average Requirement (EAR) and adequate intake (AI) levels were used for the evaluation of micronutrient intake.

Table 2.2: Nutrients and Dietary Reference Intakes used for evaluation of dietary intake

Nutrients	Dietary Reference Intakes
Total energy intake	EER ^a for active individuals
Macronutrient distribution - Protein, carbohydrate, fat	AMDR ^b
Macronutrient intake Carbohydrates - Fibre Fat - Saturated, MUFA, Omega-3 PUFA, Omega-6 PUFA	AI ^c
Micronutrient intake - Vitamin A, Vitamin C, Vitamin E Selenium, Folate	EAR ^d
Data from NICUS (Nutrition Information Centre of the University of Stellenbosch)	
^a EER = Estimated Energy Requirements	
^b AMDR = Acceptable Macronutrient Distribution Range	
^c AI = Adequate Intake	
^d EAR = Estimated Average Requirements	

2.5.2. Physical activity

In order to evaluate the sample population's physical activity levels (PAL), the physical activity scores derived from the habitual physical activity questionnaire were converted to a PAL as previously described by Saris et al ⁵¹ (Table 2.3). Four PAL categories were specified, ranging from "sedentary" to "very active" (Table 2.4) ⁵².

Table 2.3: Conversion table for physical activity levels

Non-occupational Activity Level	Occupational Activity Level					
	Light		Moderate		Heavy	
	Male	Female	Male	Female	Male	Female
Non-Active	1.4	1.4	1.6	1.5	1.7	1.5
Moderately Active	1.5	1.5	1.7	1.6	1.8	1.6
Data from Saris et al ⁵¹						

Non –occupational and occupational physical activity indices were converted to PAL between 1.4 and 1.8 using the conversion table below (Table 2.4) ⁵².

Table 2.4: Physical activity level categories

Physical activity level categories (PAL*)	
Sedentary	PAL \geq 1.0 - < 1.4
Low active	PAL \geq 1.4 - < 1.6
Active	PAL \geq 1.6 - < 1.9
Very active	PAL \geq 1.9 - < 2.5
Data from NICUS	
* PAL = Physical Activity Level	

According to the PAL conversion table (Table 2.3), occupational activity could be rated as light, moderate or heavy. The occupational activity level comprised of the work index obtained from the habitual physical activity questionnaire. A work index of 0 - 2 was classified as light, >2 - 3 as moderate and >3 - 5 as heavy (Table 2.5).

Table 2.5: Conversion of work index to occupational activity level

Work Index	Occupational Activity Level
0 – 2	Light
>2 – 3	Moderate
>3 – 5	Heavy

According to the PAL conversion table (Table 2.3), non-occupational physical activity could be rated as non-active or moderately active⁵². Non-occupational activity level comprised of the sum of sport and leisure indices obtained from the physical activity questionnaire. A sum of less than five was classified as non-active and a sum of five or more was classified as moderately active (Table 2.6).

Table 2.6: Conversion of leisure and sport indices to non-occupational activity level

Leisure & Sport Index	Non-occupational Activity Level
< 5	Non-active
5 – 10	Moderately active

2.5.3. Anthropometry

Weight and height measurements were used to calculate the body mass index (BMI) of subjects according to the formula below.

$$\text{Body mass index} = \frac{\text{weight (kg)}}{\text{height (m)} \times \text{height (m)}}$$

Subjects were then classified as having a normal weight, or being underweight, overweight or obese according to the classification of the WHO ⁵⁵:

Underweight:	BMI < 18.5 kg/m ²
Normal range:	BMI 18.5 -24.99 kg/m ²
Overweight:	BMI > 25.00 kg/m ²
<i>Pre-obesity:</i>	BMI 25 – 29.99 kg/m ²
<i>Obesity class 1</i>	BMI 30 – 34.99 kg/m ²
<i>Obesity class 2</i>	BMI 35 – 39.99 kg/m ²
<i>Obesity class 3</i>	BMI ≥ 40 kg/m ²

A waist circumference measurement equal to or above 94 cm (action level 1) and 102 cm (action level 2) for men and equal to or above 80 cm (action level 1) and 88 cm (action level 2) for women, as proposed by Lean (et al) and adopted by the WHO ⁵⁶, was used as cut-off points to determine increased risk for CDL.

The combination of both BMI and waist circumference was used to determine the risk for CDL (Table 2.7).⁵⁶

Increased risk for CDL was defined as having a BMI of 25.0 – 29.9 and a waist circumference of ≤ 102 cm in men and ≤ 88 cm in women.

High risk for CDL was defined as having a BMI of 25.0 – 29.9 and a waist circumference of > 102 cm in men and > 88 cm in women or having a BMI of 30.0 – 34.9 and a waist circumference of ≤ 102 cm in men and ≤ 88 cm in women.

Very high risk for CDL was defined as having a BMI of 30.0 – 34.9 and a waist circumference of > 102 cm in men and > 88 cm in women or having a BMI of 35.0 – 39.9 irrespective of waist circumference.

Extremely high risk for CDL was defined as having a BMI of ≥ 40.0 irrespective of waist circumference.

Table 2.7: Classification of overweight and obesity by body mass index (BMI), waist circumference and associated disease risk in adults

	BMI (kg/m ²)	Obesity class	Disease risk* relative to normal weight and waist circumference	
			Men ≤ 102 cm	Men > 102 cm
			Women ≤ 88 cm	Women > 88 cm
Underweight	< 18.5		-	
Normal #	18.5 – 24.9		-	
Overweight	25.0 – 29.9		Increased	High
Obesity	30.0 – 34.9	I	High	Very high
	35.0 – 39.9	II	Very high	Very high
Extreme obesity	≥ 40.0	III	Extremely high	Extremely high

Adapted from National Heart, Lung and Blood Institute.1998. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Washington, DC: National Institutes of Health, U.S. Department of Health and Human Services.

* Disease risk for type 2 diabetes, hypertension and cardiovascular disease

Increased waist circumference can also be a marker for increased risk even in persons of normal weight

Socio-demographic-, meal frequency-, physical activity- and anthropometric data was captured electronically with Microsoft Excel by the investigator. Food frequency data was analysed by the investigator by using the Food Finder software program (Version 3, WAMTechnology CC, South Africa) of the Medical Research Council (MRC). Means and standard deviations (SD) were calculated for all continuous variables. Normally distributed continuous variables were analysed via the F-test whereas not normally distributed continuous variables were analysed via the non-parametric Man-Whitney or Kruskal-Wallis tests. Categorical variables were analysed via the chi-square test. The difference in meal frequency data of permanent day-shift workers were analysed via the non-parametric Wilcoxon ranked pairs test. The difference in meal frequency data of rotational shift workers were analysed via the Friedman ANOVA and Kendall coefficient of concordance test. The above statistical tests were performed by the Centre of Statistical Consultation, University of Stellenbosch, by using STATISTICA analysis software (Version 6, Statsoft, Tulsa, OK, USA). The level of significance was set at $p < 0.05$ and applied to all statistical tests.

CHAPTER 3

RESULTS

3.1. SAMPLE CHARACTERISTICS

3.1.1. Socio-demographic

The sample included 77 males (88%) and 11 female (12%) subjects, representative of the gender distribution at DB-VM (Table 3.1). Fifty five (62%) of the subjects were Black, 28 (32%) of the subjects were White and 5 (6%) were Coloured. The mean age of the sample was 37 years with a standard deviation (SD) of 8.59. Sixty one (69%) subjects were married. Four (5%) of the sample had a postgraduate education, 31 (35%) had a tertiary education, 49 (55%) had a high school education, and 4 (5%) had a primary school education (Table 3.1).

3.1.2. Occupational

The sample comprised of 45 (51%) rotational shift workers and 43 (49%) permanent day-shift workers with the majority being stationed at DB-VM (Table 3.2). The occupational categories representing the sample population included mostly operators (33%) with lesser representation from the other five occupational categories. For comparison purposes to other studies the occupational categories were reclassified according to the highest level of education obtained. Three groups were distinguished namely 12 professionals (14%), 23 skilled workers (26%) and 53 less skilled workers (60%). The majority of the subjects represented the Ore Extraction (26%) and Ore Processing departments (27%) with lesser representation from the other five departments. With regards to salary level (Patterson band), where D-upper is the highest salary level and B-lower the lowest, the majority of the subjects (43%, n=38) were from the B-upper band.

Table 3.1: Socio-demographic characteristics of the sample population (N=88)

Demographic variable	Gender Male (n=77)	Female (n=11)
Race		
Black	50	5
White	23	5
Coloured	4	1
Age (Years)		
20-29	19	3
30-39	30	3
40-49	24	4
50-59	4	1
Marital status		
Unmarried	13	2
Married	54	7
Divorced	4	2
Separated	4	0
Living together	2	0
Education		
Primary school	4	0
High School	44	5
Tertiary education	25	4
Postgraduate	4	2

Table 3.2: Occupational characteristics of the sample population (n=88)

Occupational variable	Number of subjects (n)	Percentage (%)
Shift configuration		
Permanent day	43	49
Rotational	45	51
Location		
Venetia Mine	85	97
Musina	3	3
Occupational category		
Top & Middle management	10	11
Supervisor / Foreman	12	14
Technical staff	6	7
Artisan / Technician	7	8
Clerical / Admin / Security	14	16
Operator (truck / dozer / shovel)	14	16
Operator (Other)	15	17
Operative	10	11
Department		
Admin	10	11
Engineering	17	20
Human Resources	6	7
Ore Extraction	23	26
Ore Processing	24	27
Security	6	7
Capital projects	2	2
Patterson Band		
B-lower (R 5 200 – R 10 200 per month)	14	16
B-upper (R 7 200 – R 14 700 per month)	38	43
C-lower (R 11 000 – R 21 400 per month)	13	15
C-upper (R 15 200 – R 33 000 per month)	13	15
D-lower (R 27 100 - R 50 100 per month)	9	10
D-upper (R 32 250 – R 62 000 per month)	1	1

3.1.3. Running water, electricity, food preparation- and storage facilities at home

Most of the sample population had running water (93%), electricity (97%), a freezer (85%), a fridge (85%), a stove (94%) and a microwave oven (65%) at their homes where they stayed when working on the mine (Figure 3.1.).

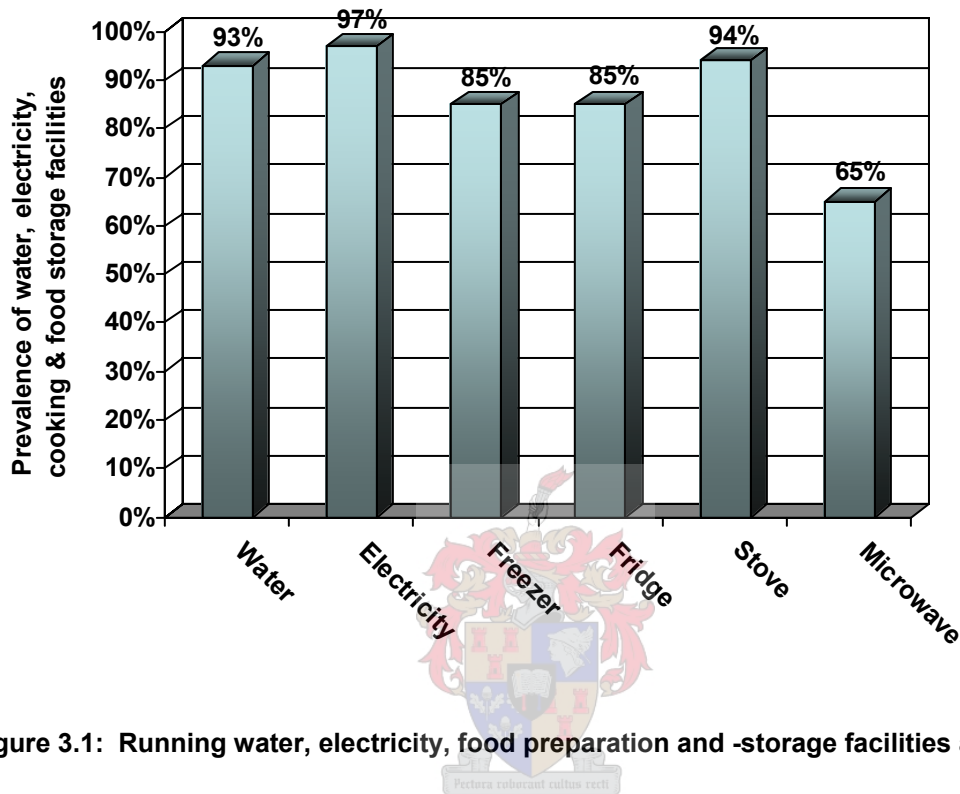


Figure 3.1: Running water, electricity, food preparation and -storage facilities at home

3.1.4. Self-reported diagnosis of CDL

Six subjects (7%) reported to have been diagnosed with diabetes, nine (10%) with hypertension, and six (7%) with hypercholesterolaemia (Figure 3.2).

Diagnosis of diabetes was reported by 20% of Operatives, 15% of Operators (other) and by 7% of Clerical /Admin / Security occupations. The diagnosis of diabetes was significantly more prevalent ($p=0.045$) among Operators (other) and Operatives compared to other occupational categories. Diagnosis of hypercholesterolemia was reported by 17% of Supervisors / Foremans, 13% of Operators (truck / dozer / shovel), 10% of Top & Middle managers and by 10% of Operatives. The diagnosis of hypercholesterolaemia was significantly more prevalent ($p=0.049$) among Supervisors / Foremans compared to other occupational categories. Diagnosis of hypertension was reported by 25% of Supervisors / Foremans, 14% of Clerical / Admin / Security occupations, 13% of Operators (truck / dozer / shovel), 10 % of Top & Middle managers and by 8% of Operators (other). No significant differences ($p=0.11$) with regard to occupational category were found in terms of diagnosis of

hypertension. Furthermore no significant differences were found between day shift and rotational shift workers for diagnosis of diabetes ($p=0.81$), hypertension ($p=0.15$) or hypercholesterolaemia ($p=0.24$).

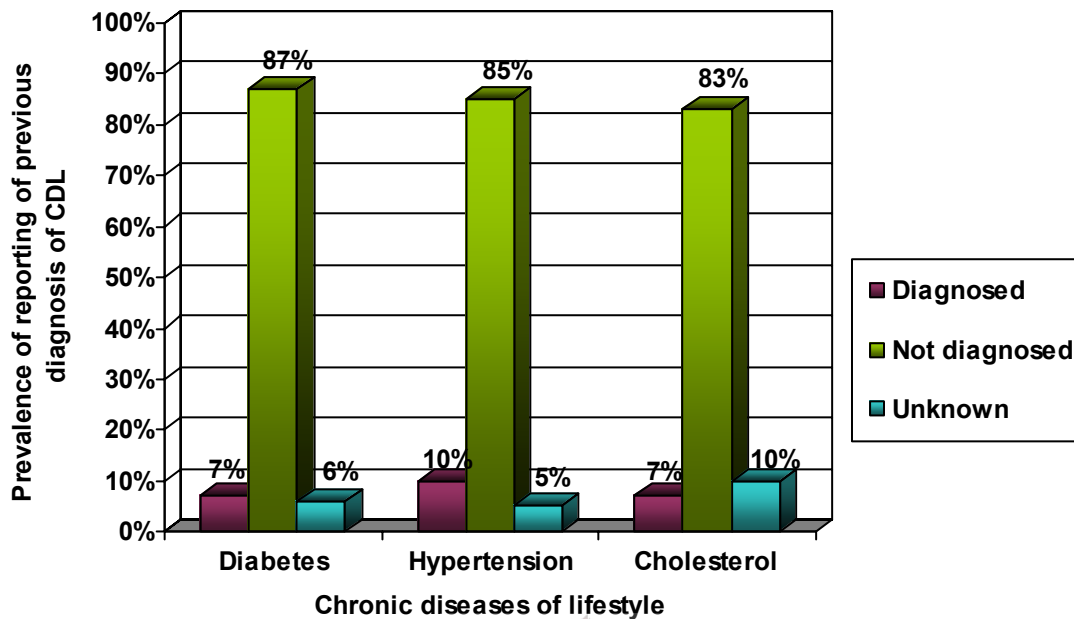


Figure 3.2: Self-reporting of diagnosis of CDL by the sample population

3.1.5. Smoking status

Smoking status was classified according to guidelines endorsed by the WHO and used in the South African Health and Demographic survey⁵⁵: Twenty (23%) of the subjects were daily smokers, 4 (5%) were regular smokers, 15 (17%) were ex- smokers and 49 (55%) were non-smokers (Figure 3.3). None of the eleven female subjects were daily smokers or ever smoked before. Of the twenty daily smokers, 15 (75%) were classified as light smokers and 5 (25%) were classified as heavy smokers (Figure 3.4). Light smokers were defined as subjects smoking 1-14 tobacco equivalents per day or ever-daily smokers smoking occasionally at the time of the interview, whereas heavy smokers were defined as subjects smoking ≥ 15 tobacco equivalents per day. One tobacco equivalent was defined as one manufactured cigarette, one pipe smoked or one cigar Two professionals were daily smokers compared to five skilled workers and 17 (32%) less skilled workers. However the difference in smoking status between occupational categories was non-significant ($p=0.64$). The prevalence of daily smokers were not significantly different ($p=0.25$) between permanent day-shift (19%) and rotational shift workers (27%).

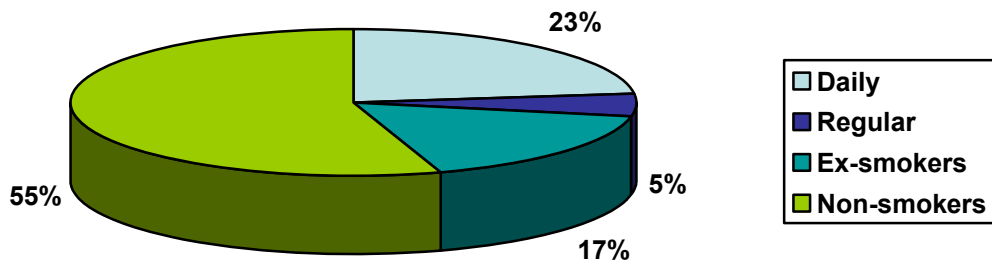


Figure 3.3: Classification of smoking status of sample population

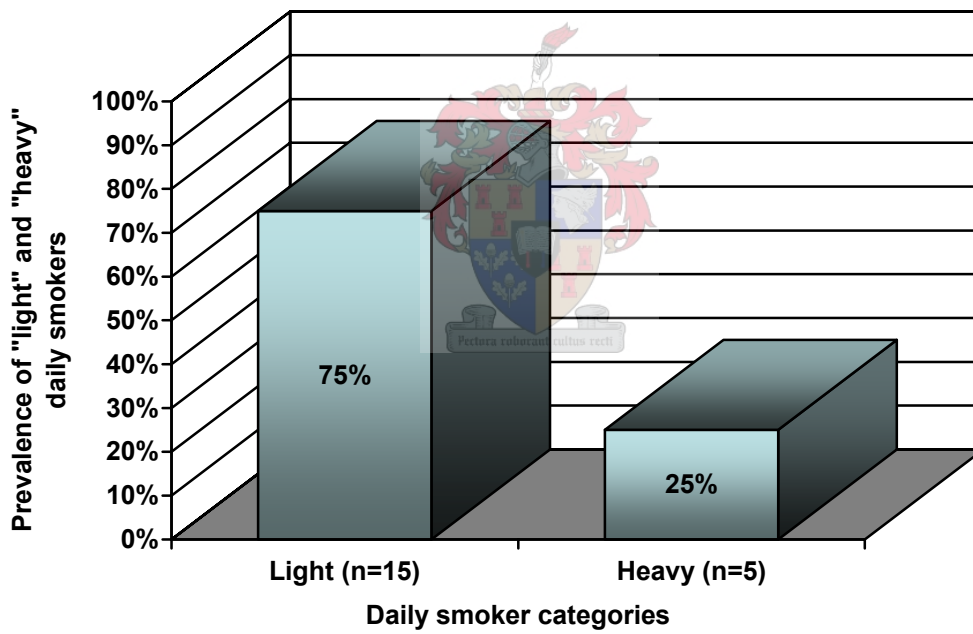


Figure 3.4: Classification of frequency of smoking in daily smokers

3.1.6. Anthropometry

3.1.6.1 BMI

Three anthropometric indicators (height, weight and waist circumference) were used to describe the sample population's anthropometry. The BMI of the sample ranged between 17.6 and 43.5 kg/m². The mean BMI of the sample was 28.1 kg/m² with a SD of 4.89. Of the total study population, twenty two subjects (25%) were classified as normal weight (BMI ≥ 18.6 – 24.9 kg/m²), thirty five (40%) as overweight (BMI ≥ 25 kg/m²), twenty eight (32%) as obese (BMI ≥ 30 kg/m²), two as morbidly obese (BMI ≥ 40 kg/m²) with only one subject having been classified as underweight (BMI ≤ 18.6 kg/m²) (Figure 3.5). Three females were classified as overweight and five as obese, compared to 31 overweight and 25 obese males (Figure 3.6). The BMI of males ranged between 17.6 and 43.5 kg/m² and of females between 19.5 and 36.8 kg/m². The mean BMI of males was 28.0 kg/m² with a SD of 4.86 while females had a mean BMI of 29.0 kg/m² with a SD of 5.29.

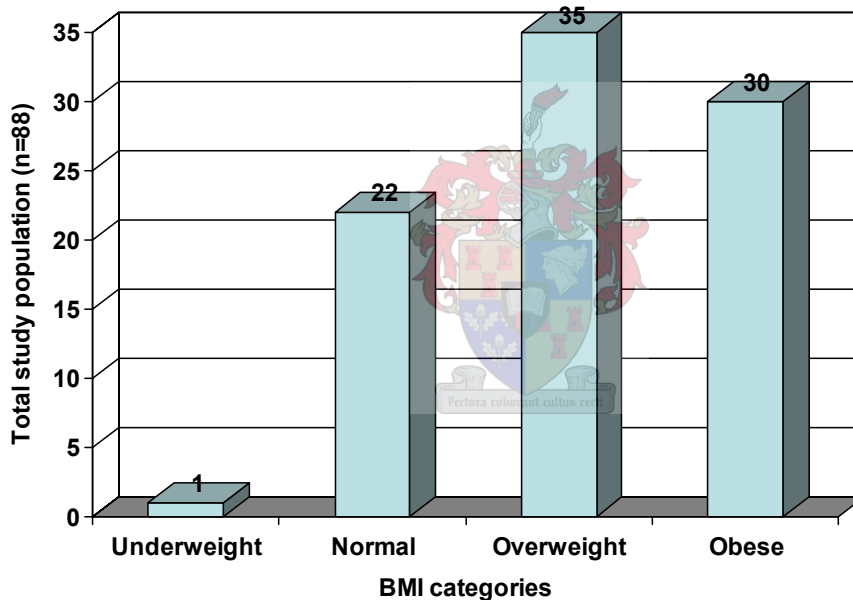


Figure 3.5: BMI classification of total study population

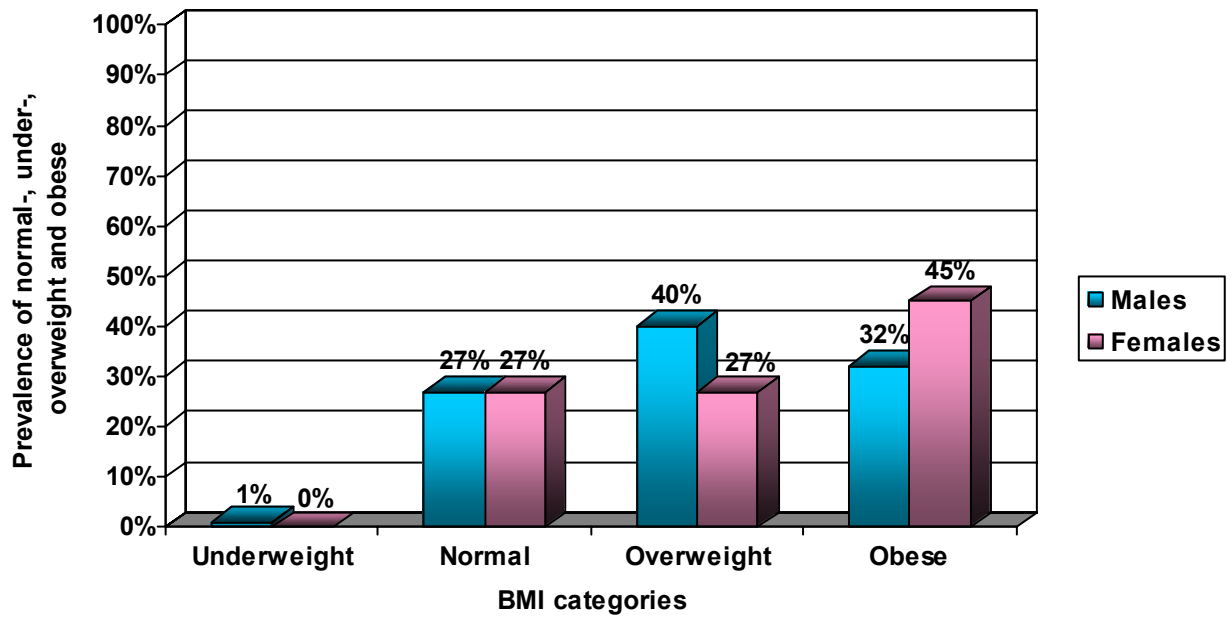


Figure 3.6: BMI classification of employees by gender

Overweight was most prevalent (60%) in the 50-59 year age category while obesity was most prevalent (50%) in the 20-29 year age category (Figure 3.7). No significant difference was found between the mean BMI of the four different age categories ($p=0.58$).

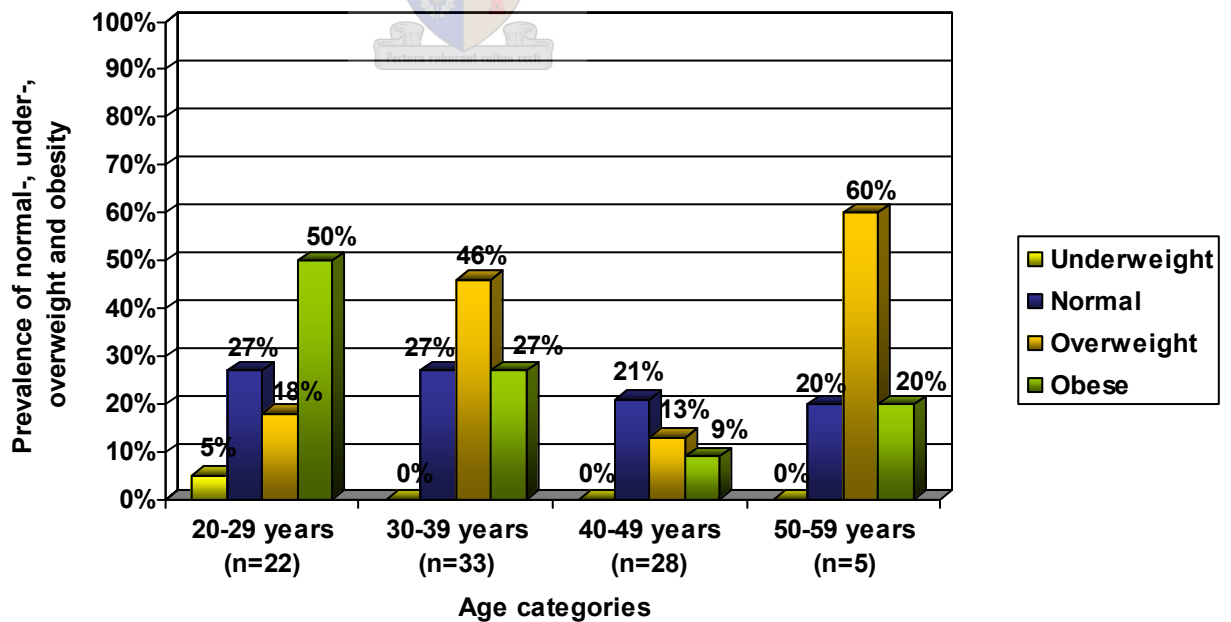


Figure 3.7: BMI classification of employees by age

3.1.6.2 Waist circumference

Waist circumference was measured to determine abdominal fat content, which has been shown to be an independent risk factor for CDL⁵⁶. The mean waist circumference for males was 95.8 cm (67 -134.5) with a SD of 13.09. Twenty-two (29%) had a waist circumference equal to or above 94 cm (action level 1) and twenty-four (31%) had a waist circumference equal or above 102 cm (action level 2). Female subjects had a mean waist circumference of 85 cm (70.5 -103) with a SD of 9.41. Six had a waist circumference equal to or above 80 cm (action level 1) and two had a waist circumference above 88 cm (action level 2) (Figure 3.8). No significant difference ($p=0.09$) was found between the mean waist circumference of males and females.

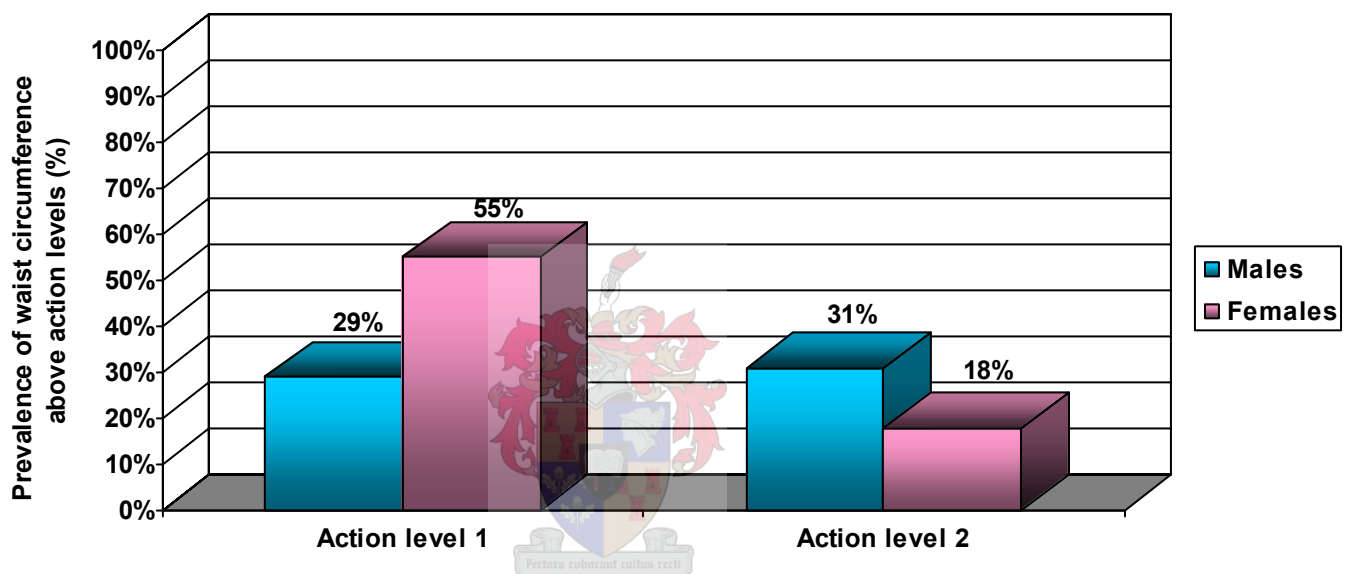


Figure 3.8: Waist circumference above recommended levels by gender

3.2. MEAL FREQUENCY

3.2.1. BREAKFAST

3.2.1.1. Frequency of eating breakfast on work days and off days

Twenty four (57%) of *permanent day-shift* workers ($n=43$) ate breakfast every day while ten (23%) never ate breakfast **on work days** (Figure 3.9 A). **On weekends**, 30 (70%) of permanent day-shift workers ate breakfast every day, 8 (12%) ate breakfast on one weekend day while 5 (18%) never ate breakfast (Figure 3.9 B). No significant difference was found between the frequency of eating breakfast on work days and weekends among permanent day-shift workers ($p=0.46$).

On **work days**, when working **day-shift**, 35 (78%) **rotational shift workers** (n=45) ate breakfast on both work days while 5 (11%) never ate breakfast. When working **night-shift**, 33 (74%) of rotational shift workers ate breakfast on both work (shift) days while 6 (13%) never ate breakfast (Figure 3.10 A). On **days off**, 35 (78%) of rotational shift workers ate breakfast on all four off days while 7 (16%) never ate breakfast (Figure 3.10 B). No significant difference was found between the frequency of eating breakfast when working day-shift, when working night-shift and on off days respectively ($p=0.49$).

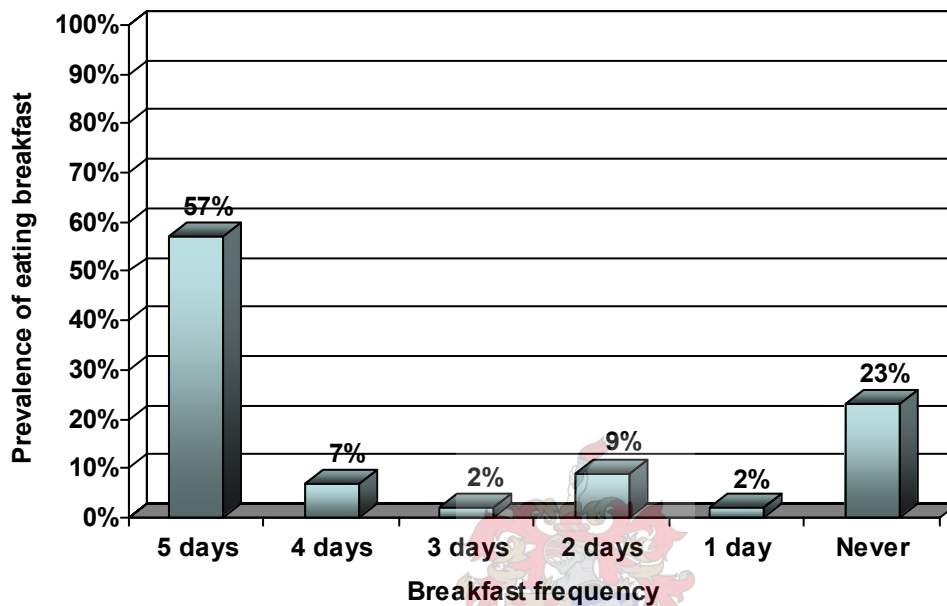


Figure 3.9 A: Frequency of eating breakfast on work days by permanent day-shift workers

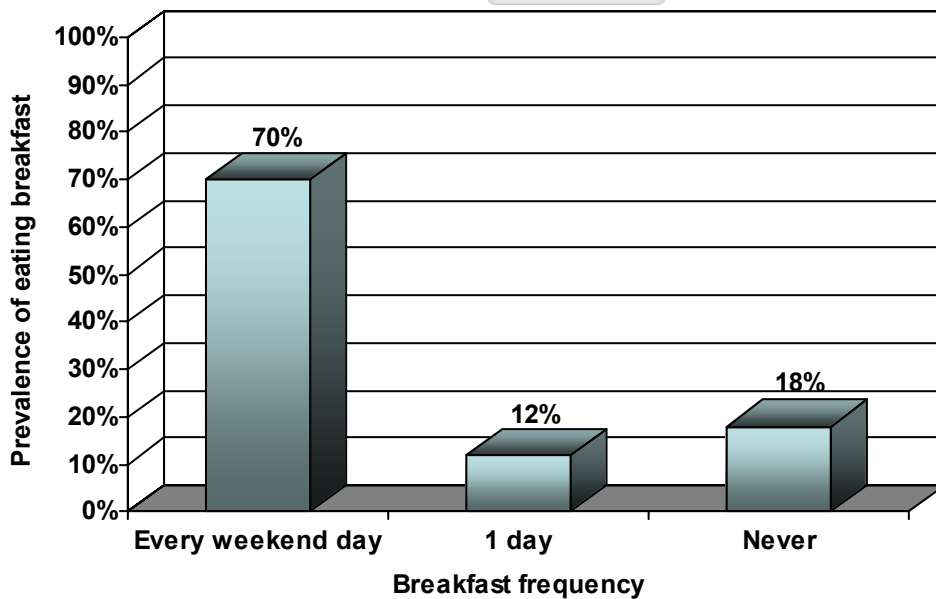


Figure 3.9 B: Frequency of eating breakfast on off days (weekends) by permanent day-shift workers

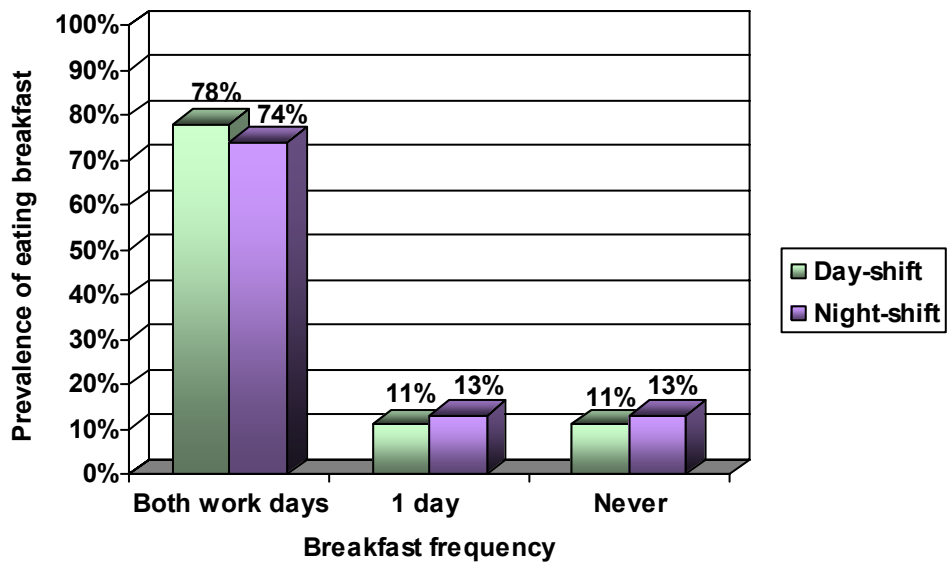


Figure 3.10 A: Frequency of eating breakfast on day-shift versus night-shift days by rotational shift workers

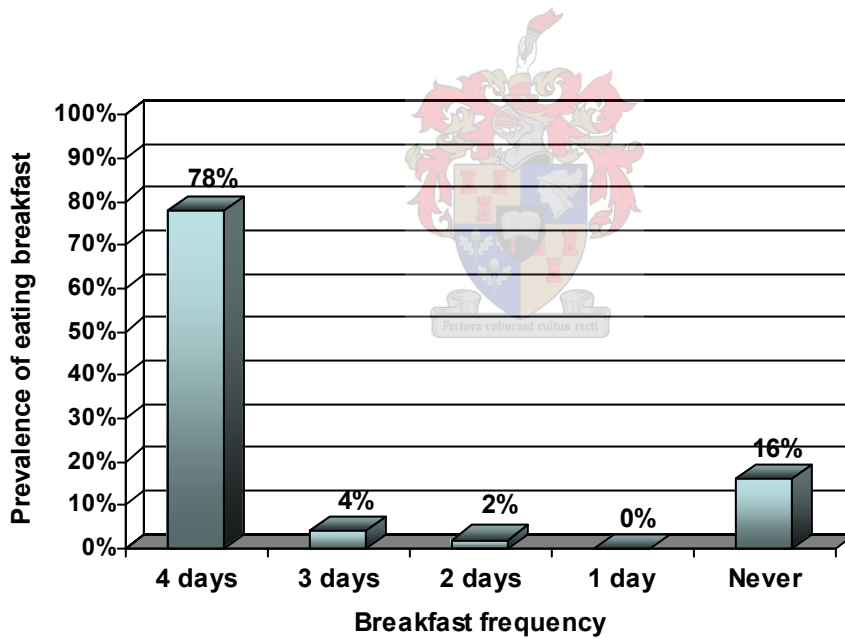


Figure 3.10 B: Frequency of eating breakfast on off days (four days) by rotational shift workers

3.2.1.2. Where breakfast was eaten on work days

On **work days**, 29 (81%) of **permanent-day shift workers** (n=43) ate breakfast at work while 7 (19%) ate breakfast at home. Breakfast was most frequently eaten at the workplace or worksite by 18 (50%) of permanent day-shift workers.

On **work days**, when working **day-shift**, 36 (88%) of **rotational shift workers** (n=45) ate breakfast at work while 5 (12%) ate breakfast at home. Breakfast was most frequently eaten at the work tea / conference room by 10 (54%) of rotational shift workers. When working **night-shift**, 23 (52%) of **rotational shift workers** ate breakfast at work while 20 (48%) ate breakfast at home. Breakfast was most frequently eaten at the work tea / conference room by 11 (26%) of rotational shift workers (Figure 3.11)

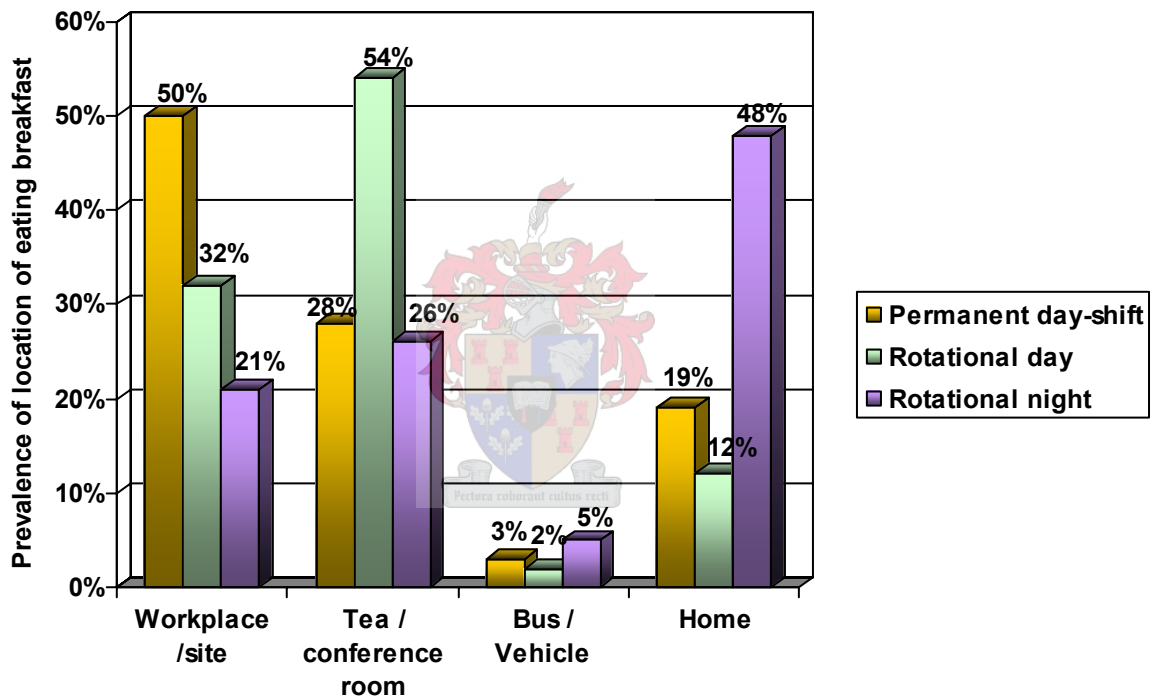


Figure 3.11: Location of eating breakfast by permanent day-shift versus rotational shift workers

3.2.1.3. How food was obtained on work days

When breakfast was eaten **at work**, food was brought to work by 33 (82%) of **permanent day-shift workers**, while 7 (18%) bought food at the mine's canteen.

When working **day-shift**, food was brought to work by 37 (95%) of **rotational shift workers** while 2 (5%) bought food at work. When working **night shift**, 32 (94%) brought food and 2 (6%) bought food at work (Figure 3.12). There was no significant difference ($p=0.29$) between day-shift- and rotational shift workers in terms of bringing food versus buying food at work.

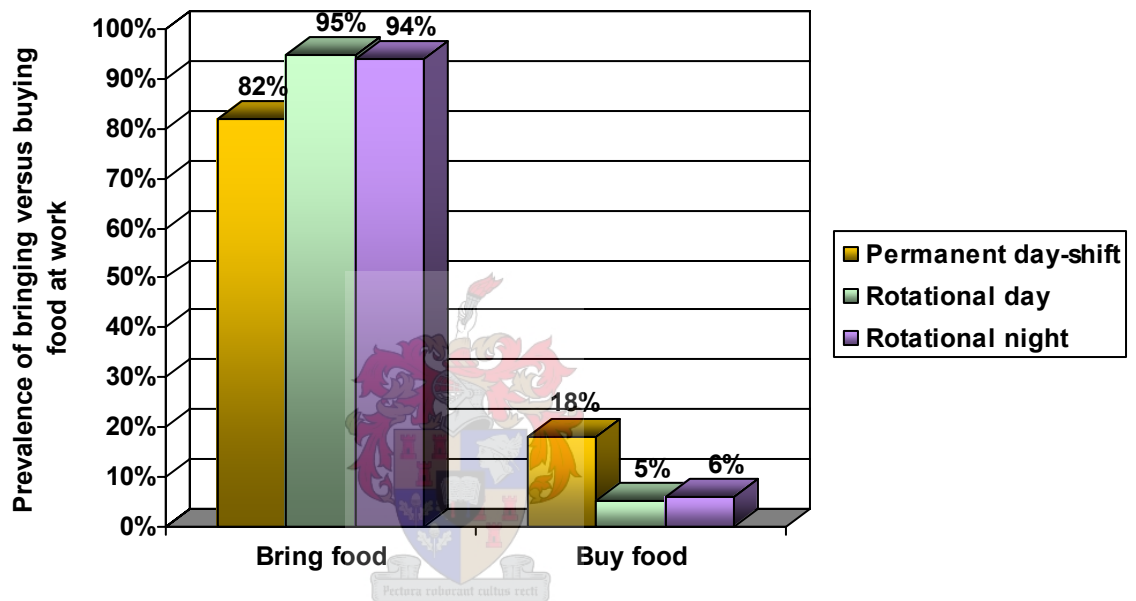


Figure 3.12: How food for breakfast was obtained on work days by permanent day-shift versus rotational shift workers

3.2.1.4. Main reasons for skipping breakfast on work days

The three most frequently mentioned reasons for skipping breakfast on work days as reported by the sample population ($n=44$) were “Too little time to prepare breakfast before work” by 25%, “ Not hungry” by 21% and “ Did not bring food from home” by 17% (Figure 3.13).

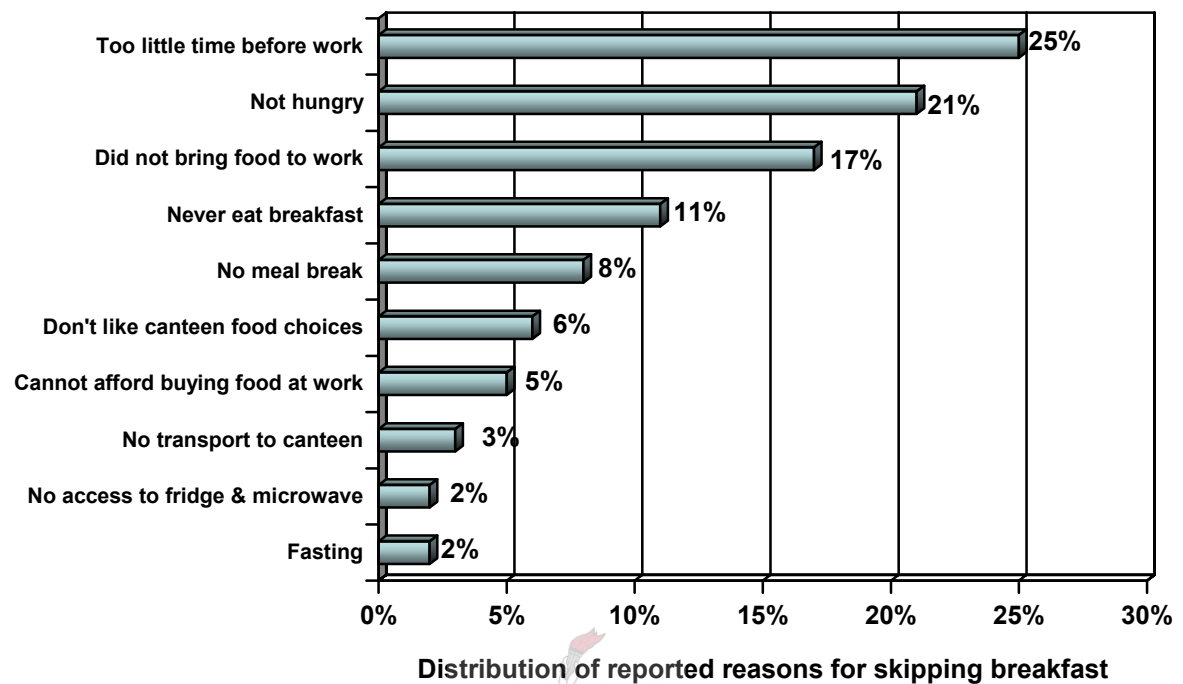


Figure 3.13: Reasons for skipping breakfast on work days by the total study population (N=88)

3.2.2. MID-MORNING MEAL/ SNACK AND BEVERAGE

3.2.2.1. Frequency of eating a mid-morning snack on work days and off days

Thirteen (30%) **permanent day-shift workers** (n=43) ate a mid-morning snack every day while 14 (33%) never ate a mid-morning snack **on work days** (Figure 3.14 A). On **weekends**, 14 (33%) permanent day-shift workers ate a mid-morning snack every day while 19 (44%) never ate a mid-morning snack (Figure 3.14 B). No significant difference was found between the frequency of eating a mid-morning snack on work days and weekends among permanent day-shift workers ($p=0.37$).

On **work days**, when working **day-shift**, 20 (44%) **rotational shift workers** (n=45) ate a mid-morning snack on both work days while 20 (44%) never ate a mid-morning snack. When working **night-shift**, 18 (40%) rotational shift workers ate a mid-morning snack on both work days while 21 (47%) never ate a mid-morning snack (Figure 3.15 A). On **days off**, 21 (47%) rotational-shift workers ate a mid-morning snack on all four off days while 9 (20%) never ate a mid-morning snack (Figure 3.15 B). A mid-morning snack was significantly more frequently eaten ($p=0.03$) on off days compared to when working day-shift and night-shift respectively.

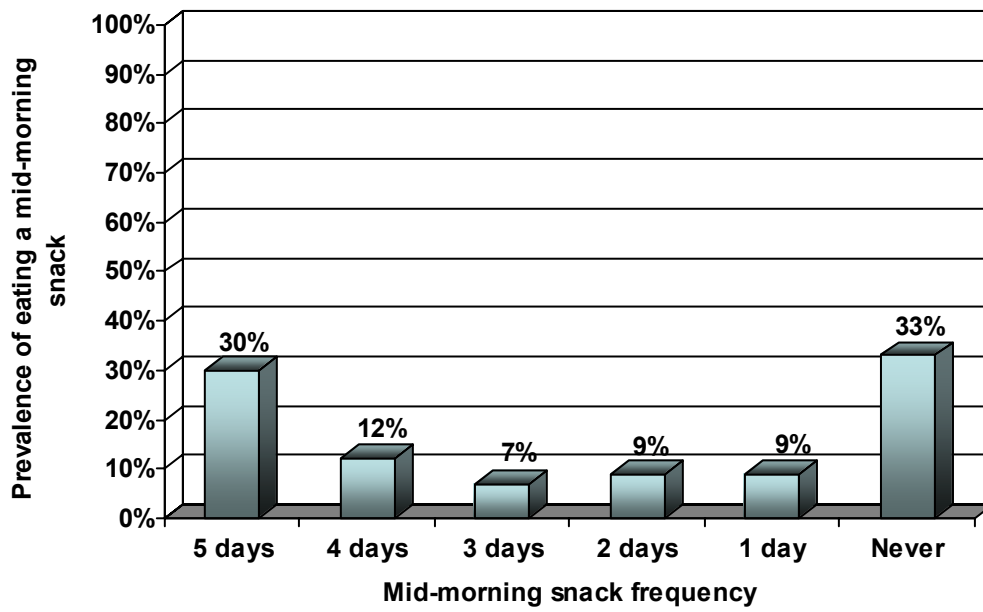


Figure 3.14A: Frequency of eating a mid-morning snack on work days by permanent day-shift workers

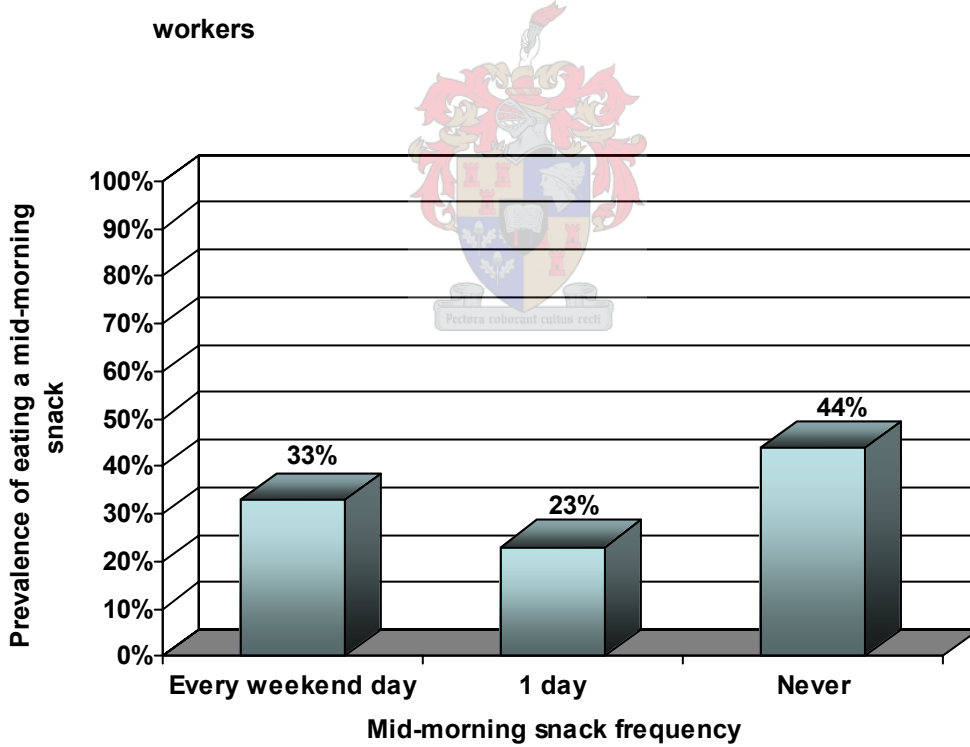


Figure 3.14 B: Frequency of eating a mid-morning snack on off days (weekends) by permanent day-shift workers

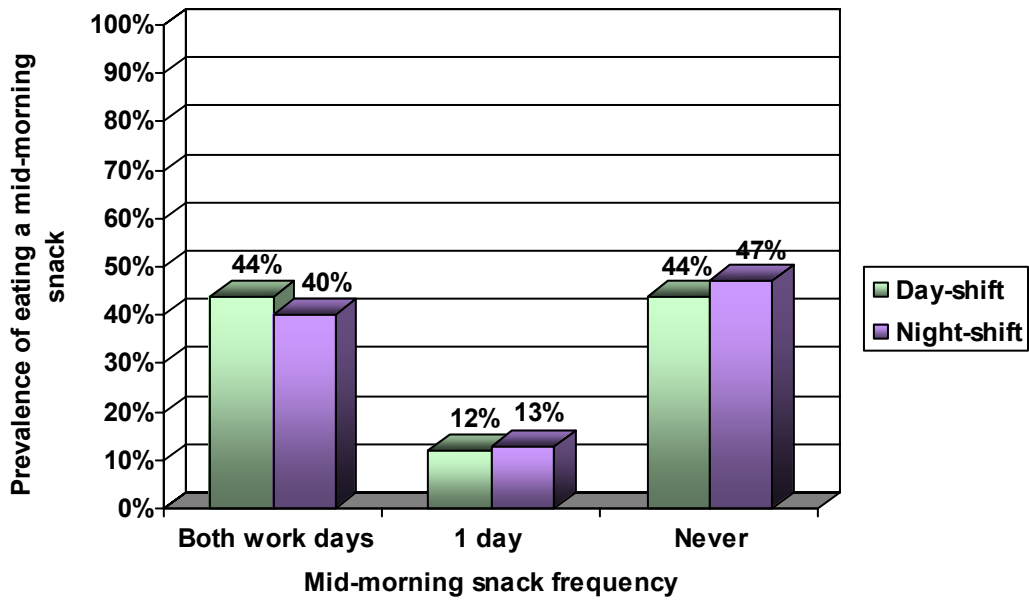


Figure 3.15 A: Frequency of eating a mid-morning snack on day-shift versus night-shift days by rotational shift workers

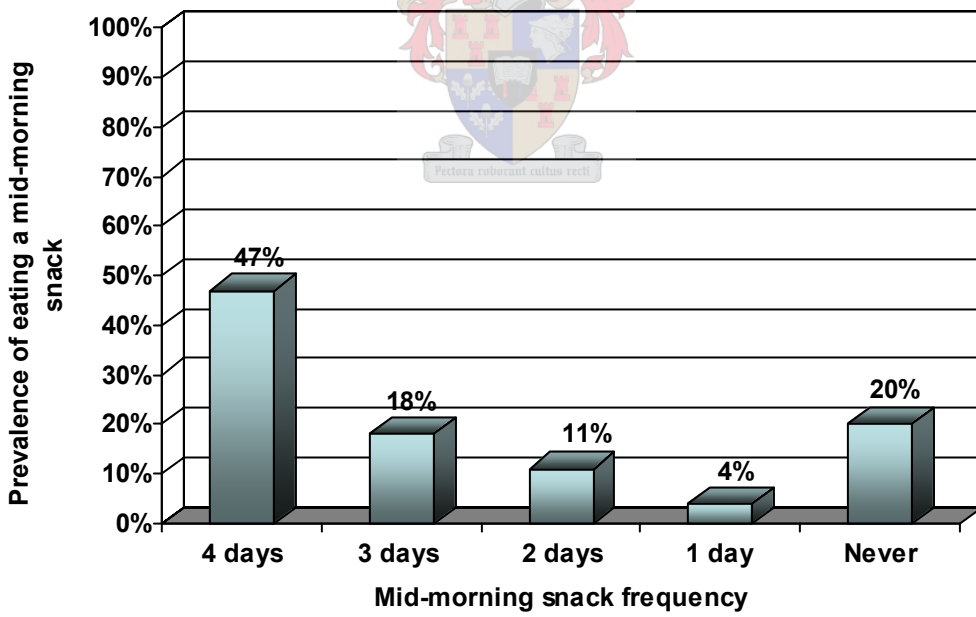


Figure 3.15 B: Frequency of eating a mid-morning snack on off days (four days) by rotational shift workers

3.2.2.2. Frequency of drinking a mid-morning beverage on work days and off days

Twenty two (51%) **permanent day-shift workers** (n=43) drank a mid-morning beverage every day while seven (17%) never drank a mid-morning beverage on **work days** (Figure 3.16 A). On **weekends**, twenty-three (53%) permanent day-shift workers drank a mid-morning beverage every day while 14 (33%) never drank a mid-morning beverage (Figure 3.16 B). No significant difference was found between the frequency of drinking a mid-morning beverage on work days and off days by permanent day-shift workers ($p=0.74$).

On **work days**, when working **day-shift**, 40 (89%) **rotational shift workers** (n=45) drank a mid-morning beverage on both work days while 2 (4%) never drank a mid-morning beverage. When working **night-shift**, 37 (82%) rotational -shift workers drank a mid-morning beverage on both work days while four (9%) never drank a mid-morning beverage (Figure 3.17 A). On **days off**, 23 (51%) of rotational-shift workers drank a mid-morning beverage on all four off days while 7 (16%) never drank a mid-morning beverage (Figure 3.17 B). A mid-morning beverage was significantly less frequently drank ($p=0.01$) on off days compared to when working day-shift and night-shift respectively.

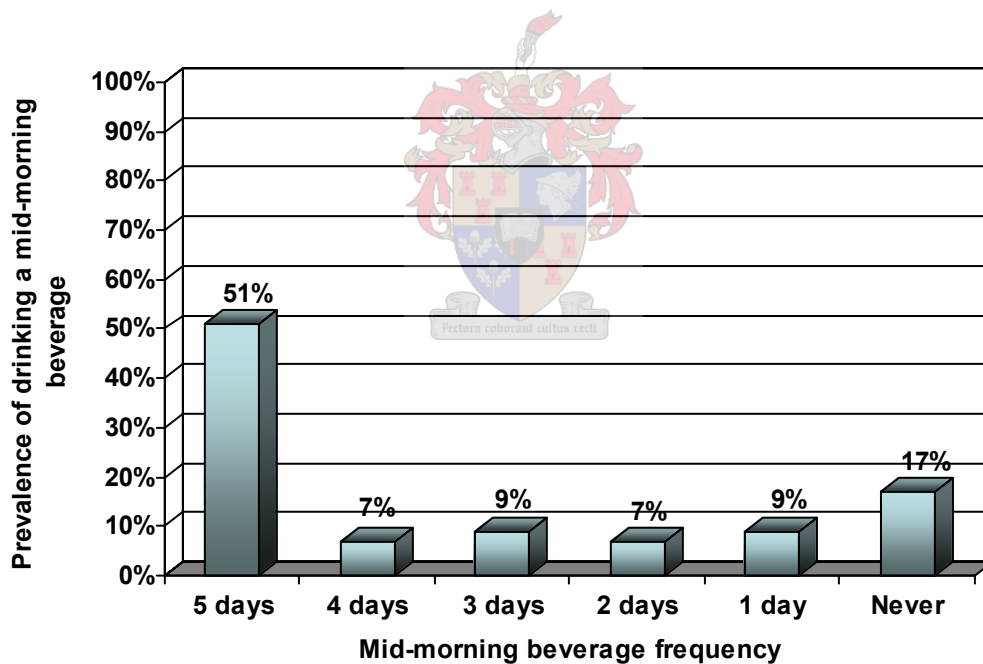


Figure 3.16 A: Frequency of drinking a mid-morning beverage on work days by permanent day-shift workers

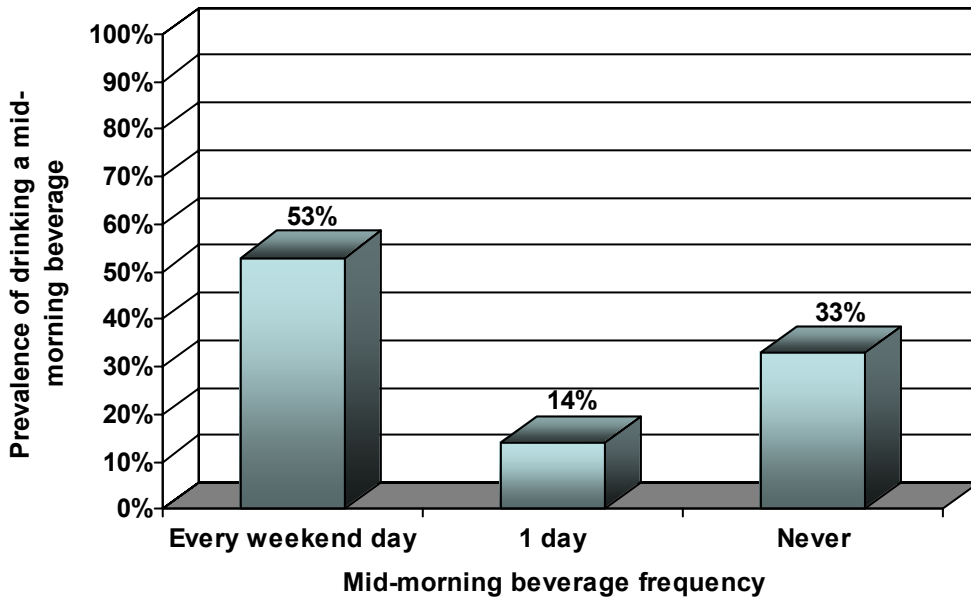


Figure 3.16 B: Frequency of drinking a mid-morning beverage on off days (weekends) by permanent day- shift workers

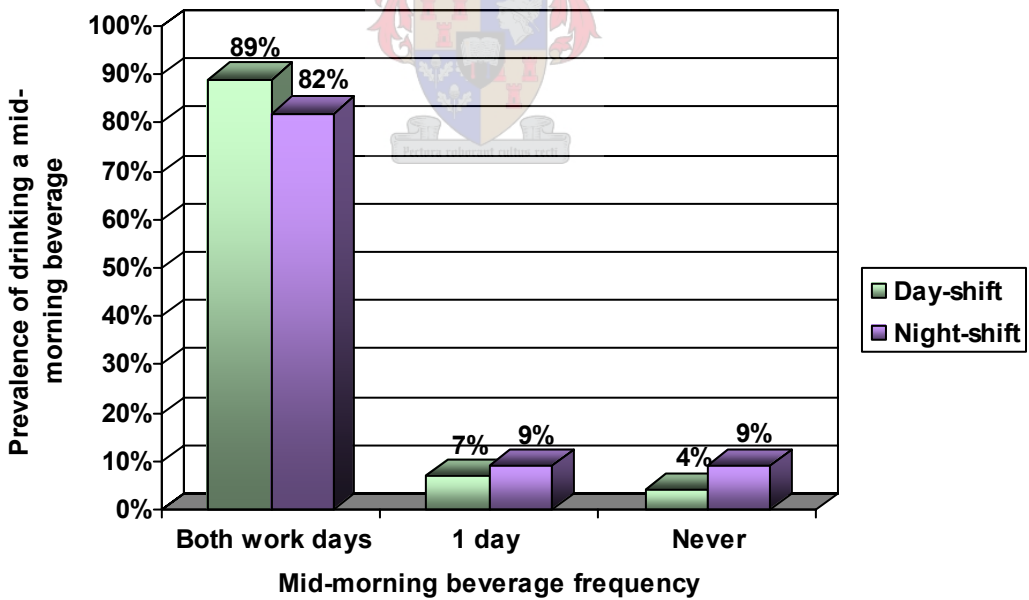


Figure 3.17 A: Frequency of drinking a mid-morning beverage on day-shift versus night-shift days by rotational shift workers

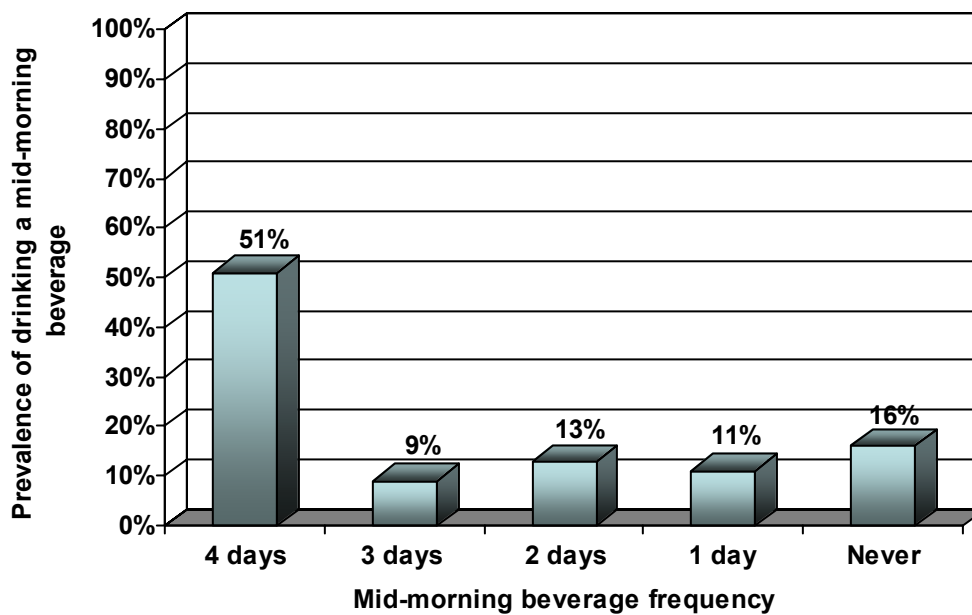


Figure 3.17 B: Frequency of drinking a mid-morning beverage on off days (four days) by rotational shift workers

3.2.3. LUNCH

3.2.3.1. Frequency of eating lunch on work days and off days

Twenty six (60%) **permanent day-shift workers** (n=43) ate lunch every day while 8 (19%) never ate lunch on **work days** (Figure 3.18 A). On **weekends**, 32 (74%) permanent day-shift workers ate lunch every day while 4 (10%) never ate lunch (Figure 3.18 B). No significant difference was found between the frequency of eating lunch on work days compared to weekends among permanent day-shift workers ($p=1.00$).

On **work days**, when working **day-shift**, 41 (91%) **rotational shift workers** (n=45) ate lunch on both work days while one (2%) never ate lunch. When working **night-shift**, 33 (73%) rotational shift workers ate lunch on both work days while 8 (18%) never ate lunch (Figure 3.19 A). On **days off**, 32 (71%) rotational shift workers ate lunch on all four off days while 4 (9%) never ate lunch (Figure 3.19 B). Lunch was significantly more frequently eaten ($p=0.007$) when working day-shift compared to when working night-shift and on off days respectively.

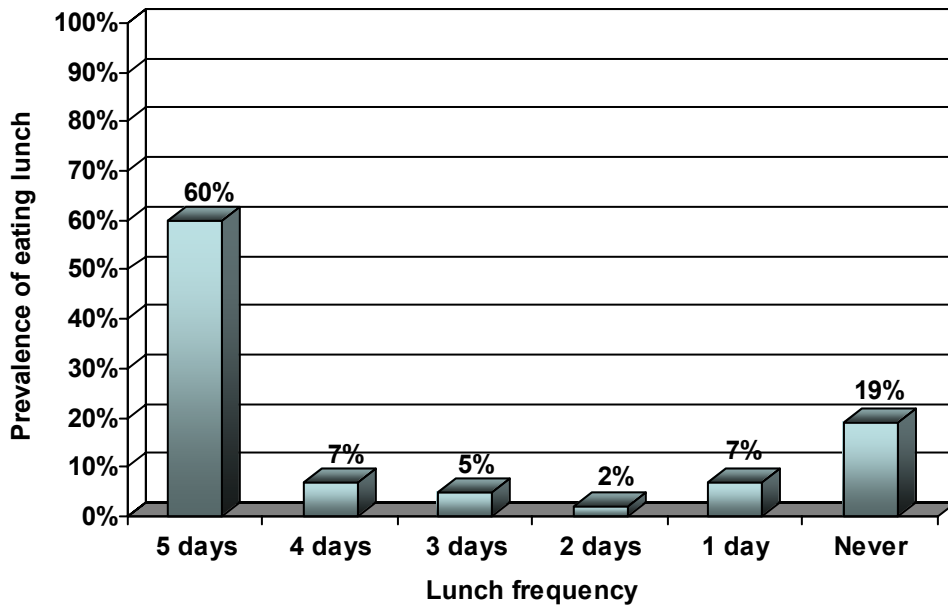


Figure 3.18 A: Frequency of eating lunch on work days by permanent day-shift workers

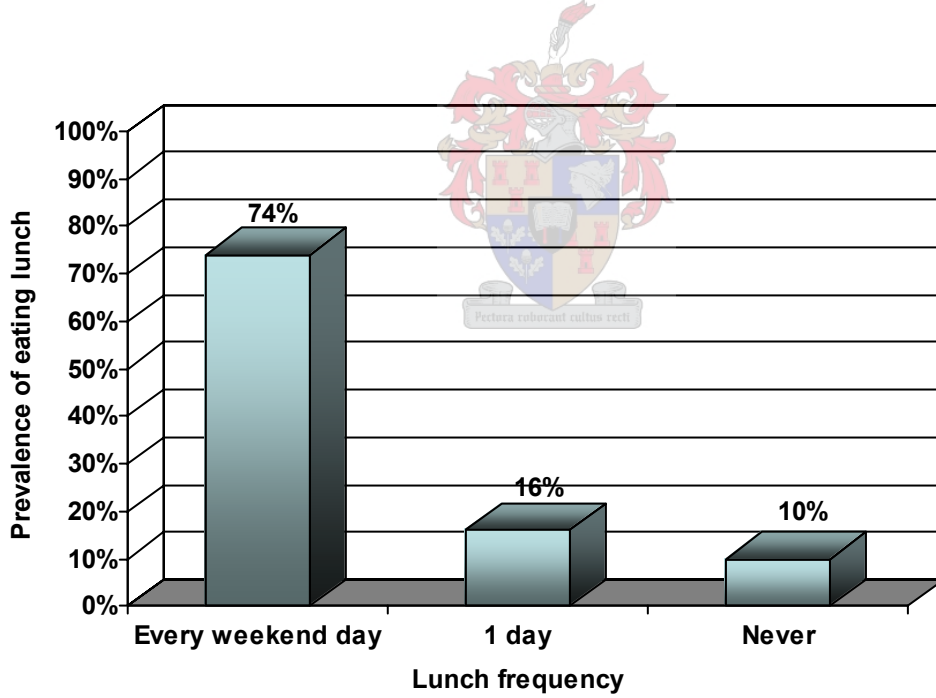


Figure 3.18 B: Frequency of eating lunch on off days (weekends) by permanent day-shift workers

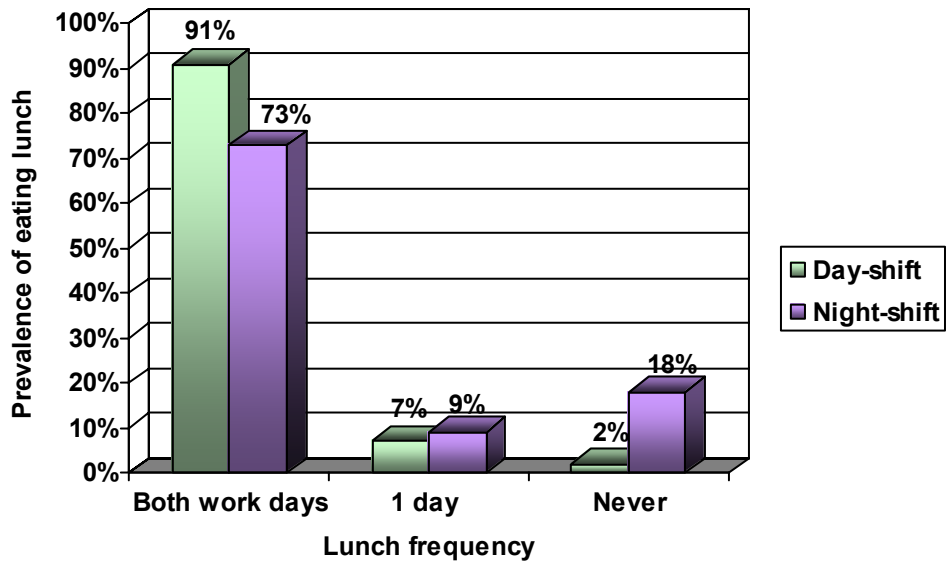


Figure 3.19 A: Frequency of eating lunch on day-shift versus night shift days by rotational shift workers

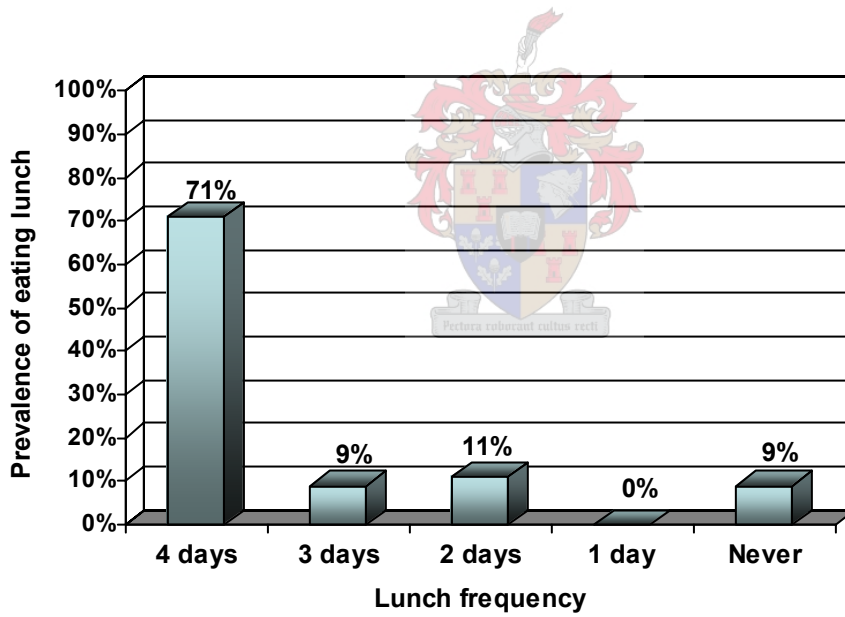


Figure 3.19 B: Frequency of eating lunch on off days (four days) by rotational shift workers

3.2.3.2. Where lunch was eaten on work days

On **work days**, 34 (97%) **permanent day-shift workers** (n=35) who ate lunch, ate lunch at work while 1 (3%) ate lunch at home. Lunch was most frequently eaten at the workplace or worksite by 26 (74%).

On **work days**, when working **day-shift**, 43 (100%) **rotational shift workers** (n=43) who ate lunch, ate lunch at work. Lunch was most frequently eaten at the work tea / conference room by 27 (63%). When working **night-shift**, 32 (75%) **rotational shift workers** ate lunch at work, while 11 (25%) ate lunch at home. Lunch was most frequently eaten at the work tea / conference room by 15 (35%) (Figure 3.20).

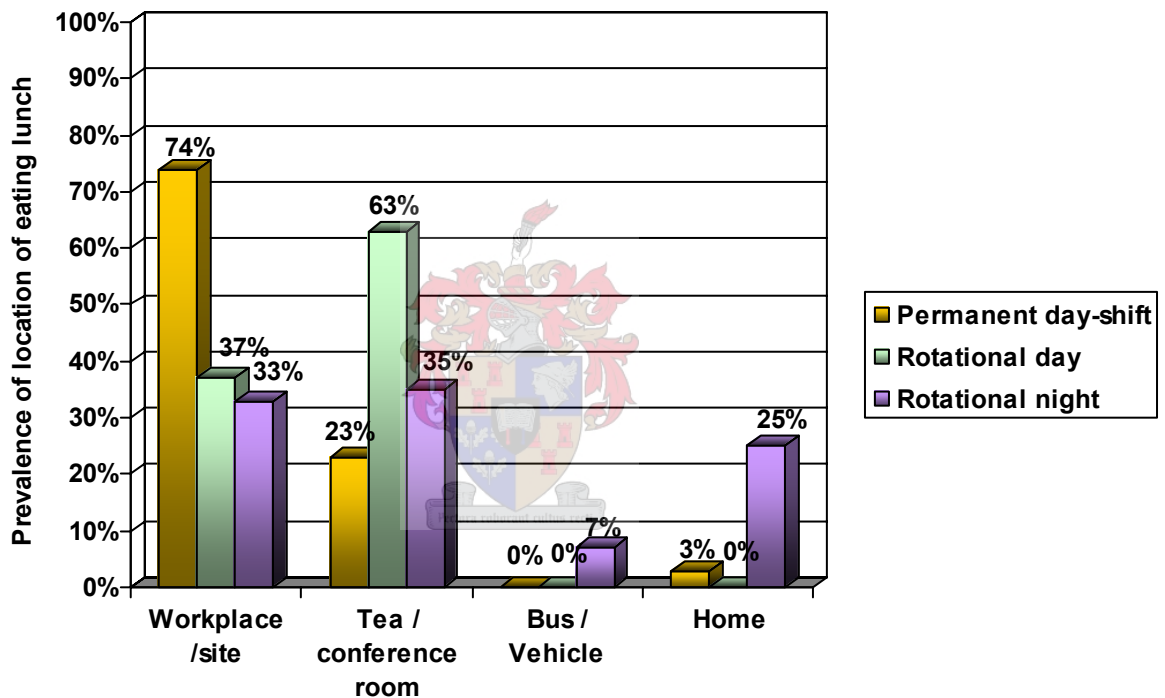


Figure 3.20: Location of eating lunch on work days by permanent day-shift versus rotational shift workers

3.2.3.3. How food was obtained on work days

When lunch was not eaten at home by **permanent day-shift workers** (n=36), food was brought to work by 31 (86%) while 5 (14%) bought food at the mine's canteen.

When lunch was not eaten at home by **rotational-shift workers** (n=44) during **day-shift**, food was brought to work by 41 (93%) while 3 (7%) bought food at work. When working **night-shift** 36 (95%) **rotational-shift workers** (n=38) brought food to work while 2 (5%) bought food at work (Figure 3.21).

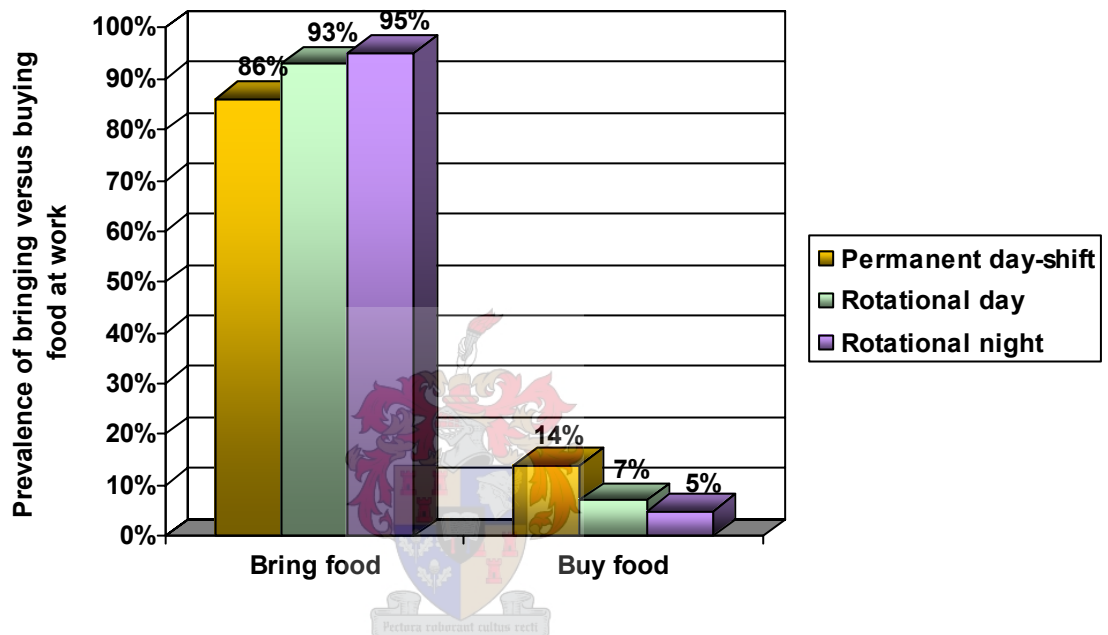


Figure 3.21: How food for lunch was obtained on work days by permanent day-shift versus rotational shift workers

3.2.3.4. Main reasons for skipping lunch on work days

The three most frequently mentioned reasons for skipping lunch on work days as reported by the sample population (n=43) were “Too busy work schedule” by 25%, “ Not hungry” by 22% and “ Did not bring food from home” by 17% (Figure 3.22).

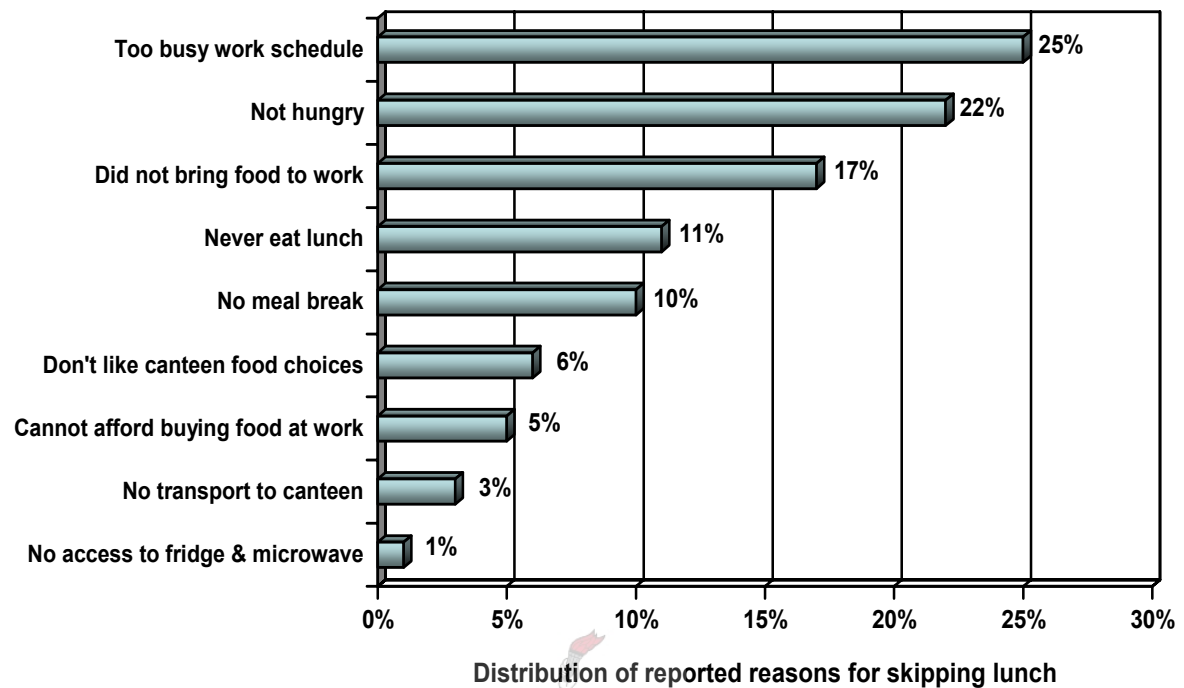


Figure 3.22: Reasons for skipping lunch on work days by the total study population (N=88)

3.2.4. MID-AFTERNOON MEAL/ SNACK AND BEVERAGE

3.2.4.1. Frequency of eating a mid-afternoon meal or snack on work days and off days

Six (14%) **permanent day-shift workers** (n=43) ate a mid-afternoon snack every day while 26 (60%) never ate a mid-afternoon snack on **work days** (Figure 3.23 A). On **weekends**, 11 (25%) permanent day-shift workers ate a mid-afternoon snack every day, while 17 (40%) never ate a mid-afternoon snack (Figure 3.23 B). No significant difference was found between the frequency of eating a mid-afternoon snack on work days and weekends among permanent day-shift workers ($p=0.14$).

On **work days**, when working **day-shift**, 17 (38%) **rotational shift workers** (n=45) ate a mid-afternoon snack on both work days, while 24 (53%) never ate a mid-afternoon snack. When working **night-shift**, 18 (40%) rotational shift workers ate a mid-afternoon snack on both work days, while 22 (49%) never ate a mid-afternoon snack (Figure 3.24 A). On **days off**, 16 (36%) rotational-shift workers ate a mid-afternoon snack on all four off days, while 3 (6%) on three days, 9 (20%) on two days, 4 (9%) on one day, and 13 (29%) never ate a mid-afternoon snack (Figure 3.24 B). No significant difference was found between the frequency of eating a mid-afternoon snack when working day-shift, when working night-shift and on off days respectively ($p=0.87$).

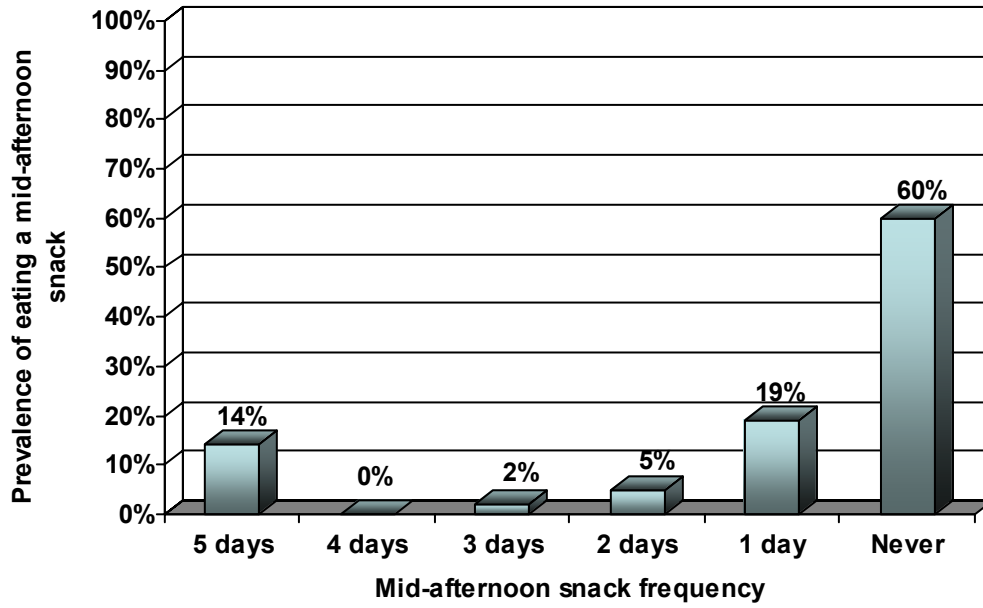


Figure 3.23 A: Frequency of eating a mid-afternoon snack on work days by permanent day-shift workers

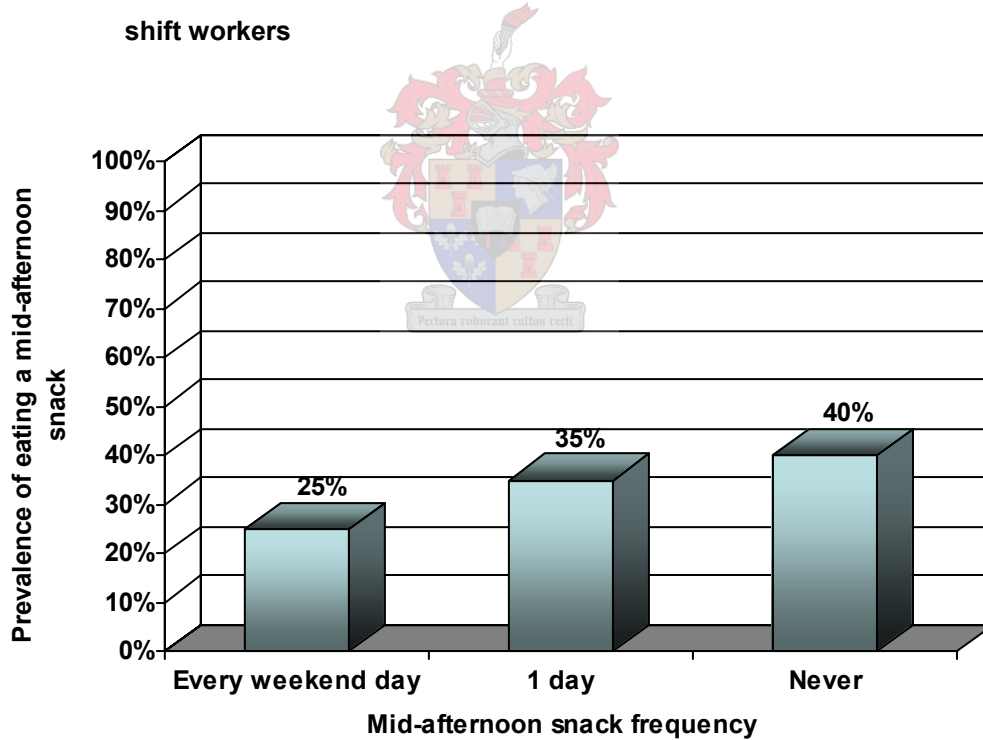


Figure 3.23 B: Frequency of eating a mid-afternoon snack on off days (weekends) by permanent day-shift workers

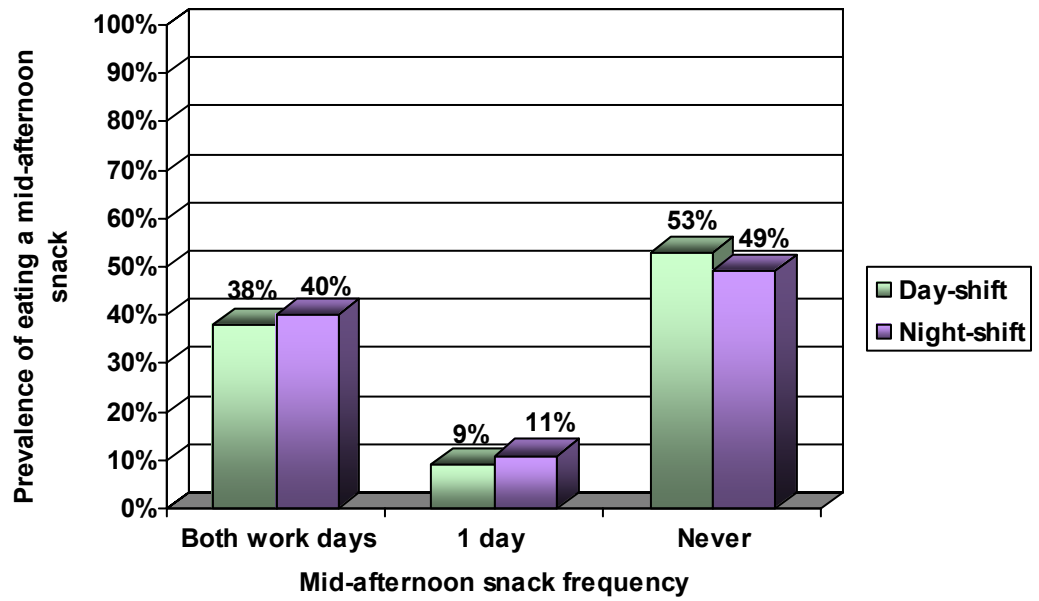


Figure 3.24 A: Frequency of eating a mid-afternoon snack on day-shift versus night-shift days by rotational shift workers

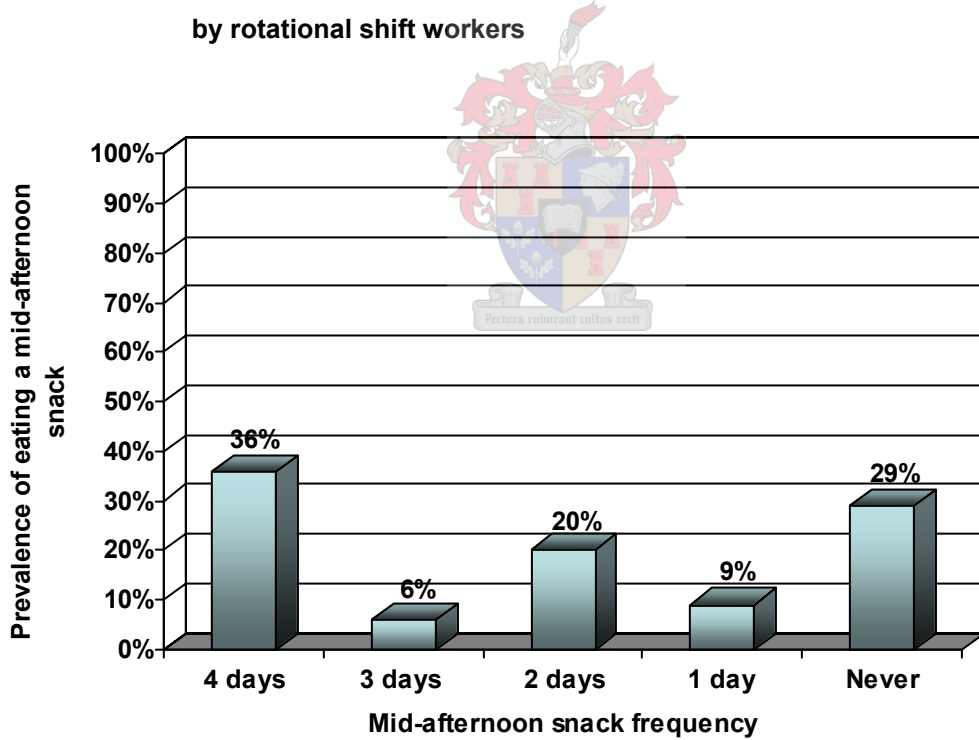


Figure 3.24 B: Frequency of eating a mid-afternoon snack on off days (four days) by rotational shift workers

3.2.4.2. Frequency of drinking a mid-afternoon beverage on work days and off days

Nineteen (44%) **permanent day-shift workers** (n=43) drank a mid-afternoon beverage every day, while 14 (33%) never drank a mid-afternoon beverage on **work days** (Figure 3.25 A). On **weekends**, 23 (53%) permanent day-shift workers drank a mid-afternoon beverage every day, 9 (21%) on one weekend day while 11 (26%) never drank a mid-afternoon beverage (Figure 3.25 B). No significant difference was found between the frequency of drinking a mid-afternoon beverage on work days and weekends among permanent day-shift workers ($p=0.69$).

On **work days**, when working **day-shift**, 33 (73%) **rotational shift workers** (n=45) drank a mid-afternoon beverage on both work days while 10 (23%) never drank a mid-afternoon beverage. When working **night-shift**, 34 (76%) rotational -shift workers drank a mid-afternoon beverage on both work days, while 10 (22%) never drank a mid-afternoon beverage (Figure 3.26 A). On **days off**, 26 (58%) rotational-shift workers drank a mid-afternoon beverage on all four off days while 5 (11%) never drank a mid-afternoon beverage (Figure 3.26 B). No significant difference was found between the frequency of drinking a mid-afternoon beverage when working day-shift, when working night-shift and on off days respectively ($p=0.69$).

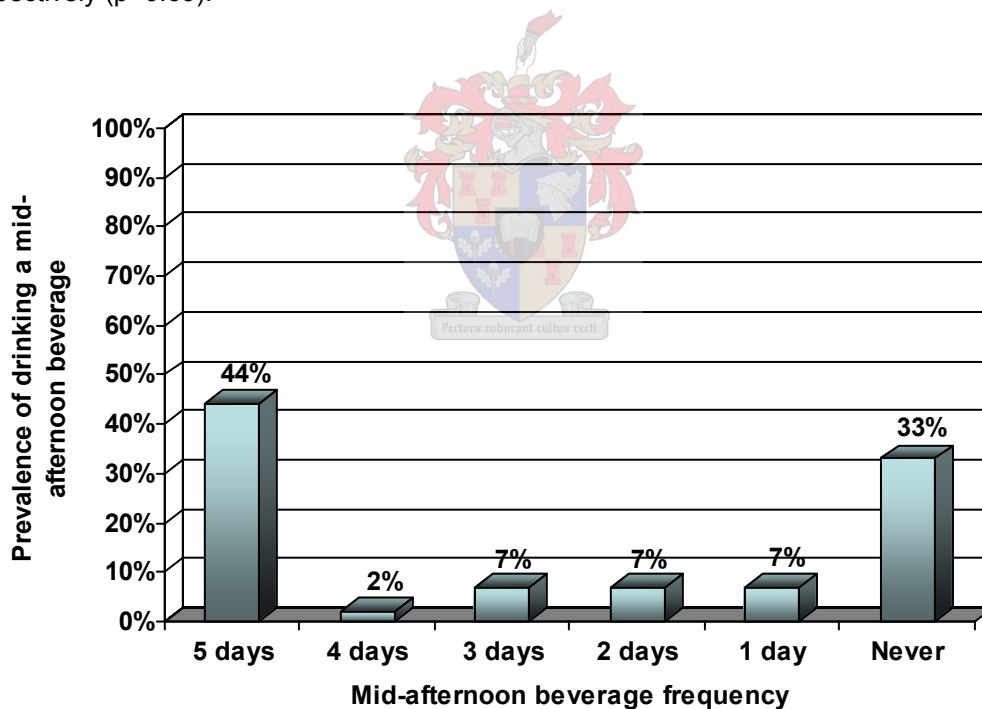


Figure 3.25 A: Frequency of drinking a mid-afternoon beverage on work days by permanent day-shift workers

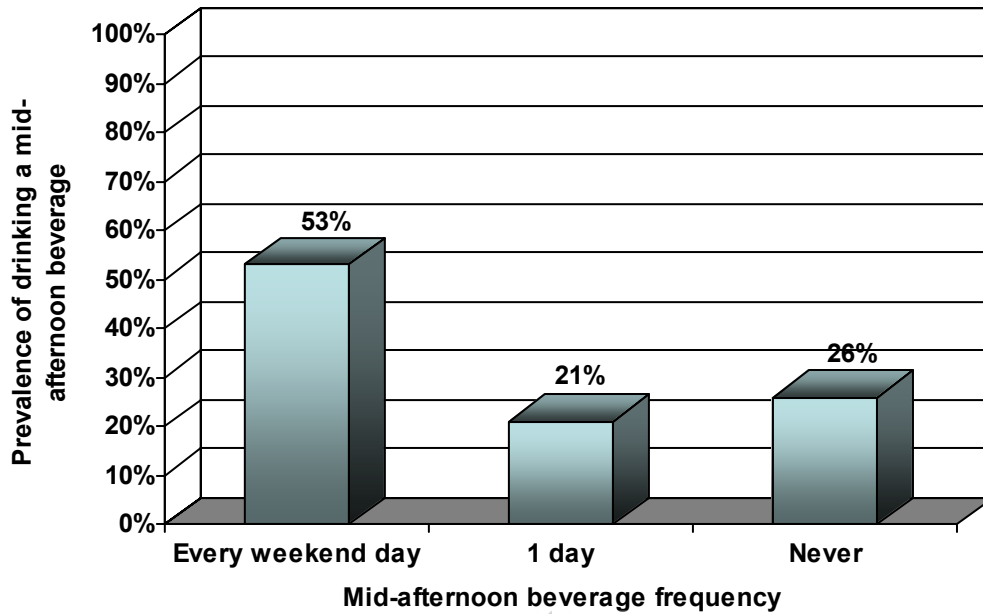


Figure 3.25 B: Frequency of drinking a mid-afternoon beverage on off days (weekends) by permanent day-shift workers

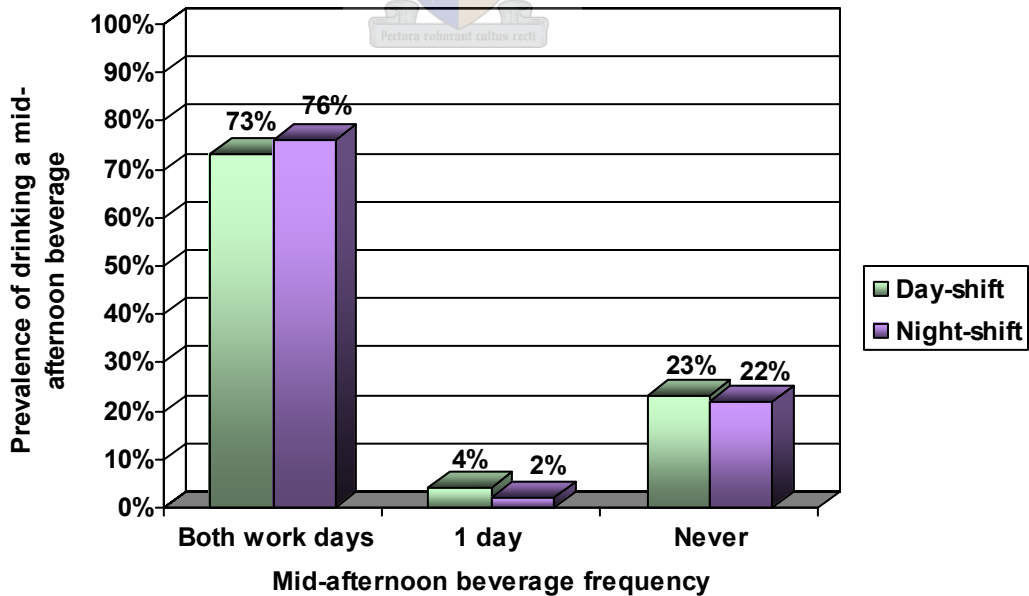


Figure 3.26 A: Frequency of drinking a mid-afternoon beverage on day-shift versus night shift days by rotational shift workers

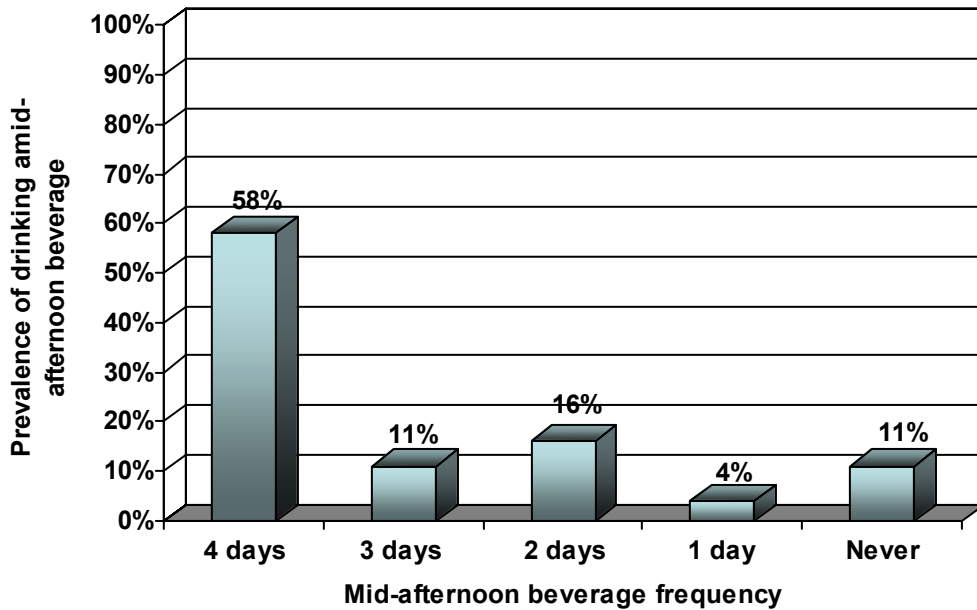


Figure 3.26 B: Frequency of drinking a mid-afternoon beverage on off days (four days) by rotational shift workers

3.2.5. DINNER

3.2.5.1. Frequency of eating dinner on work days and off days

Thirty five (82%) **permanent day-shift workers** (n=43) ate dinner every day while 4 (9%) never ate dinner on **work days** (Figure 3.27 A). On **weekends**, 38 (88%) of permanent day-shift workers ate dinner every day, while 2 (5%) never ate dinner (Figure 3.27.B). No significant difference was found between the frequency of eating dinner on work days and weekends among permanent day-shift workers (p=0.59).

On **work days**, when working **day-shift**, 33 (73%) **rotational shift workers** (n=45) ate dinner on both work days while 8 (18%) never ate dinner. When working **night-shift**, 35 (78%) rotational shift workers ate dinner on both work days, while 5 (11%) never ate dinner (Figure 3.28 A). On **days off**, 40 (89%) rotational shift workers ate dinner on all four off days, while 2 (4%) never ate dinner (Figure 3.28 B). Dinner was significantly more frequently eaten (p=0.04) on off days compared to when working day-shift and when working night shift respectively.

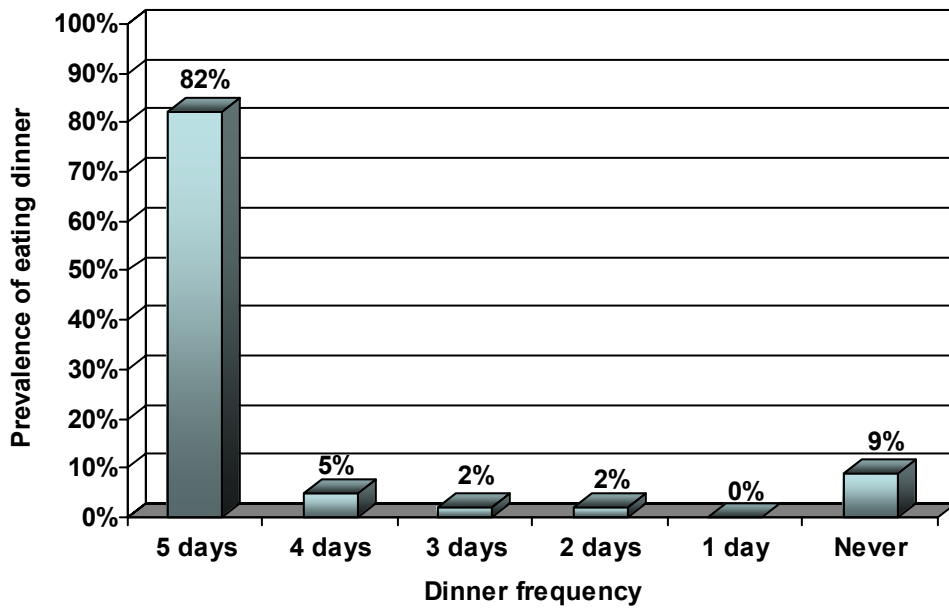


Figure 3.27 A: Frequency of eating dinner on work days by permanent day-shift workers

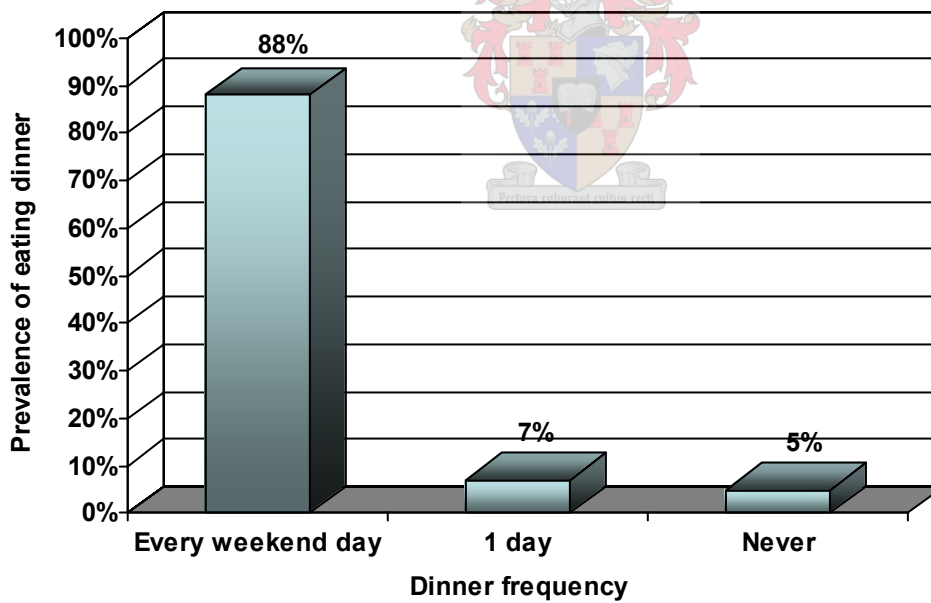


Figure 3.27 B: Frequency of eating dinner on off days (weekends) by permanent day-shift workers

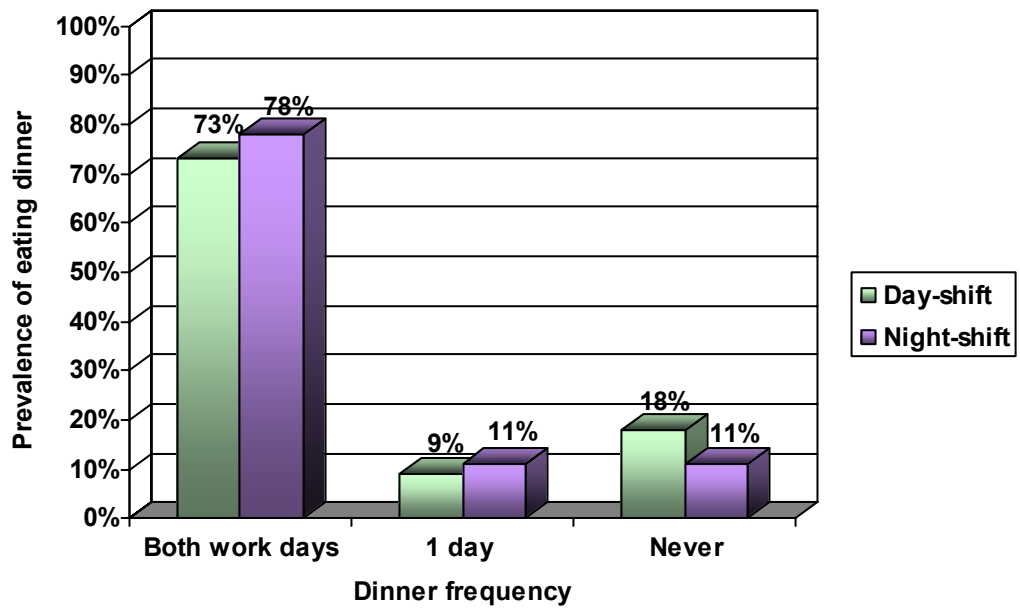


Figure 3.28 A: Frequency of eating dinner on day-shift versus night shift days by rotational shift workers

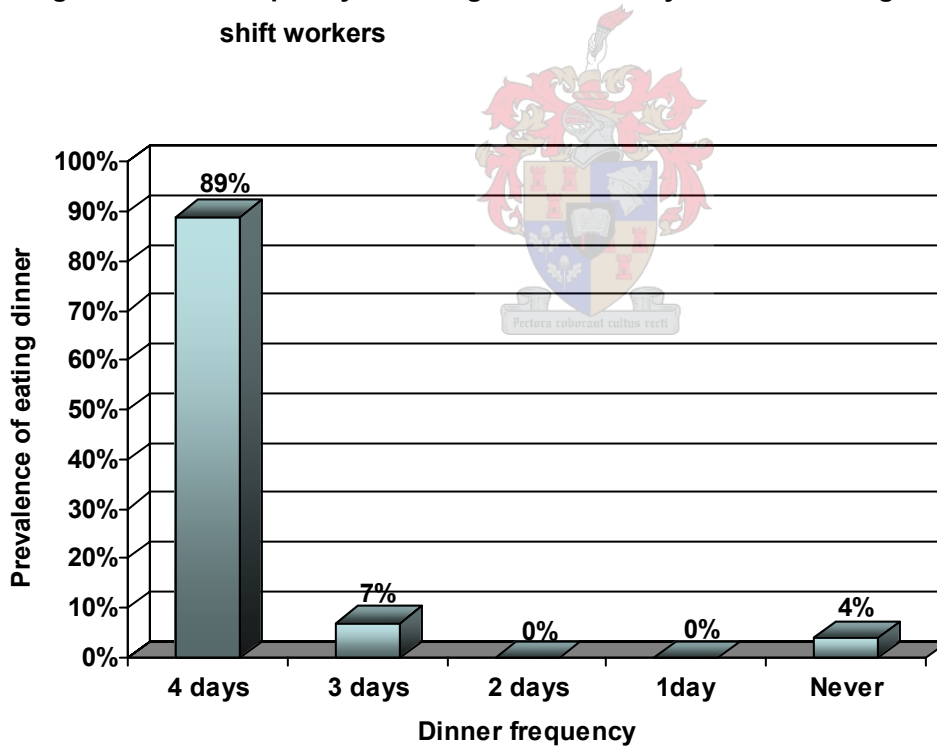


Figure 3.28 B: Frequency of eating dinner on off days (four days) by rotational shift workers

3.2.5.2. Where dinner was eaten on work days

On **work days**, when working **day-shift**, 24 (56%) **rotational shift workers** (n=43) who ate dinner, ate dinner at work while 19 (44%) ate dinner at home. Dinner was most frequently eaten at the work tea / conference room by 14 (33%). When working **night-shift**, 29 (69%) **rotational shift workers** (n=42) who ate dinner, ate dinner at work, while 13 (31%) ate dinner at home. Dinner was most frequently eaten at the workplace or worksite by 16 (38%) (Figure 3.29).

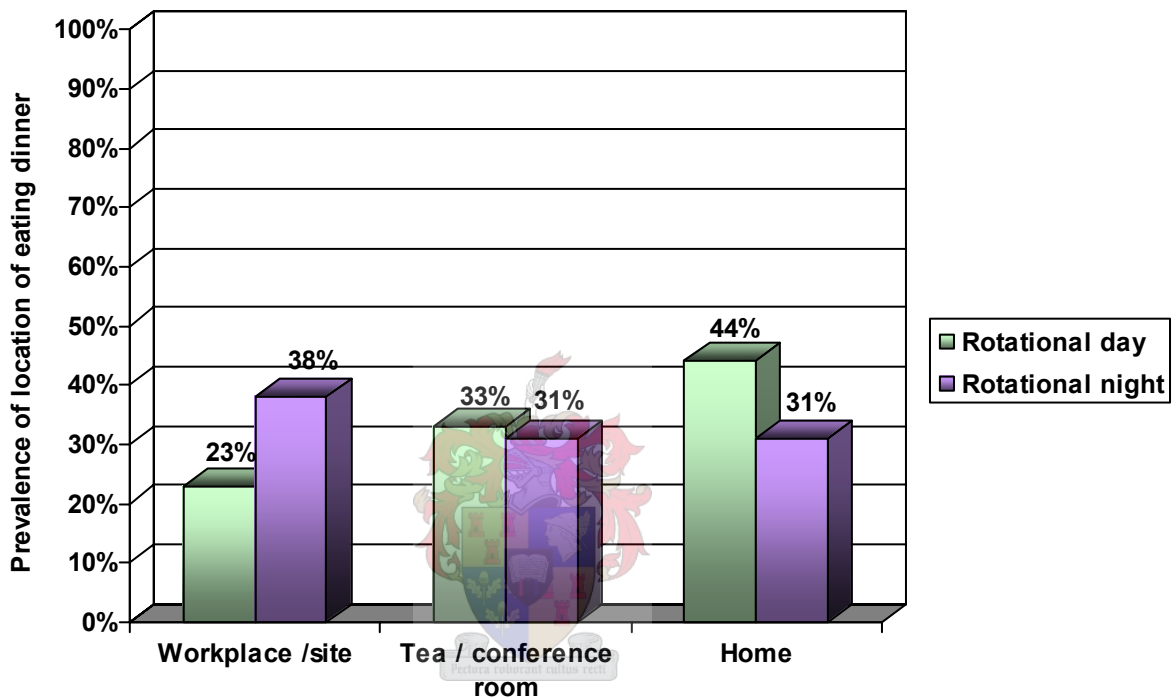


Figure 3.29: Location of eating dinner by rotational shift workers when working day-shift and night shift

3.2.5.3. How food was obtained on work days

When dinner was not eaten at home by **rotational-shift workers** (n=30) during **day-shift**, food was brought to work by 28 (93%) while two (7%) bought food at work. When working **night-shift**, 34 (97%) **rotational-shift workers** (n=36) brought food to work while two (3%) bought food at work (Figure 3.30).

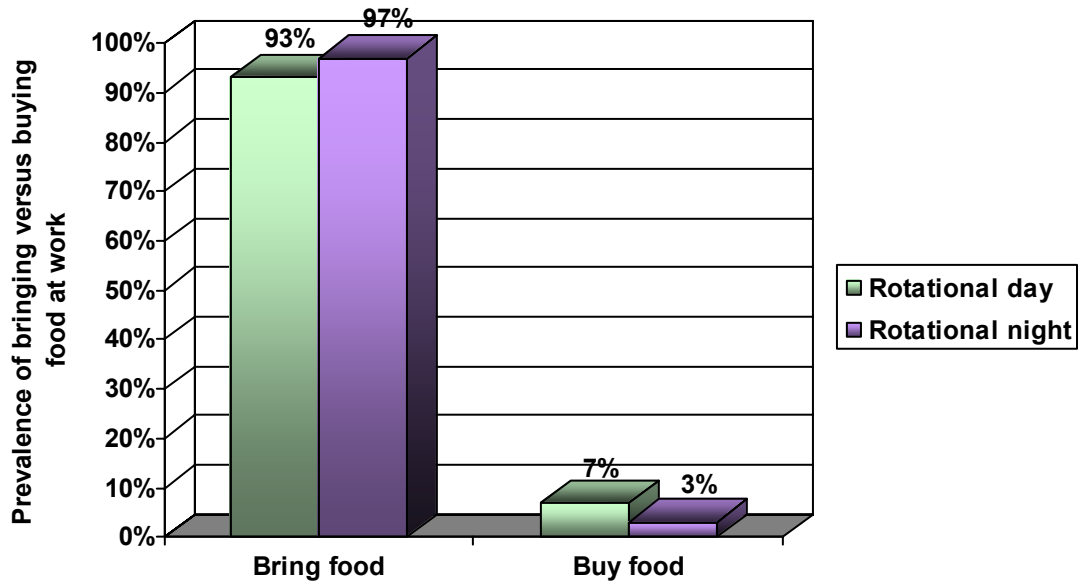
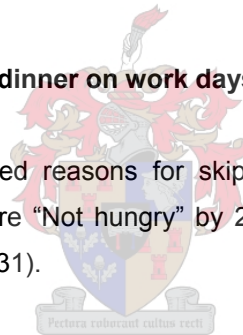


Figure 3.30: How food for dinner was obtained on work days by rotational shift workers

3.2.5.4. Main reasons for skipping dinner on work days

The three most frequently mentioned reasons for skipping dinner on work days as reported by **rotational shift workers** (n=19) were “Not hungry” by 24% “Too busy work schedule” by 19% and “Never eat dinner” by 18% (Figure 3.31).



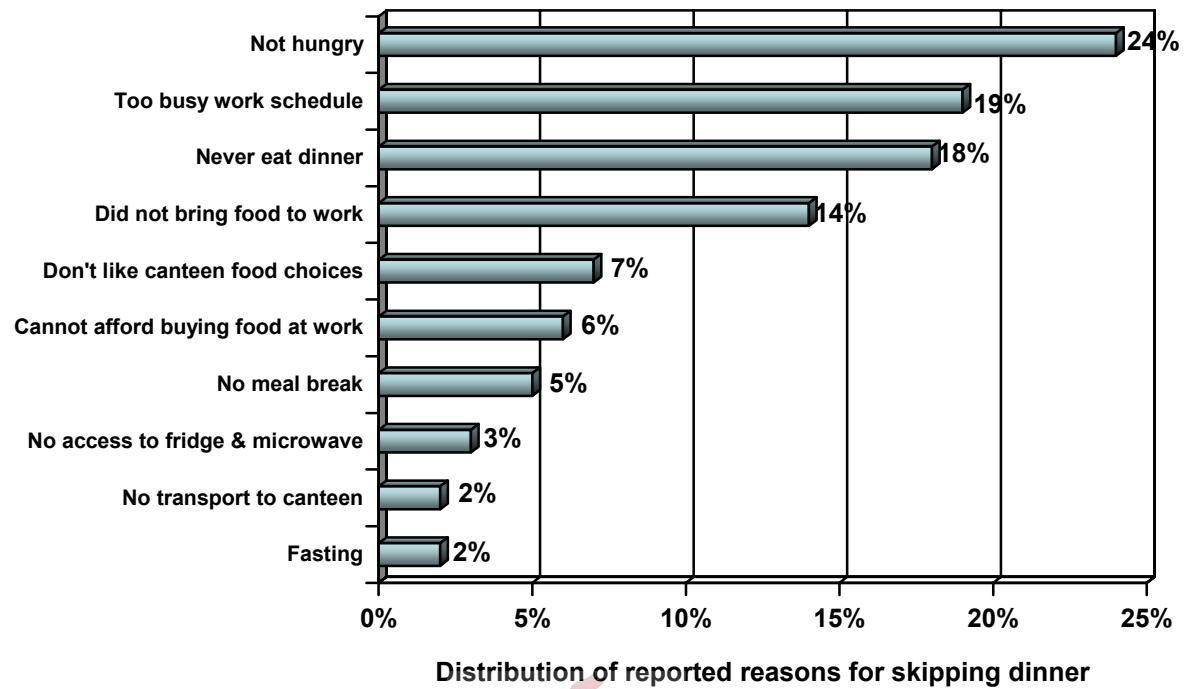


Figure 3.31: Reasons for skipping dinner on work days by the total study population (N=88)

3.2.6. LATE NIGHT MEAL / SNACK AND BEVERAGE

3.2.6.1. Frequency of eating a late night snack on work days and off days

Five (12%) **permanent day-shift workers** (n=43) ate a late night snack every day, while 26 (60%) never ate a late night snack **on work days** (Figure 3.32 A). On **weekends**, 5 (12%) permanent day-shift workers ate a late night snack every day, while 23 (53%) never ate a late night snack (Figure 3.32 B). No significant difference was found between the frequency of eating a late night snack on work days and weekends among permanent day-shift workers ($p=1.00$).

On **work days**, when working **day-shift**, 13 (29%) **rotational shift workers** (n=45) ate a late night snack on both work days, while 31 (69%) never ate a late night snack. When working **night-shift**, 21 (47%) rotational shift workers ate a late night snack on both work days, while 19 (42%) never ate a late night snack (Figure 3.33 A) On **days off**, 13 (30%) rotational-shift workers ate a late night snack on all four off days, while 22 (49%) never ate a late night snack (Figure 3.33 B). No significant difference was found between the frequency of eating a late night snack when working day-shift, when working night shift and on off days respectively ($p=0.08$).

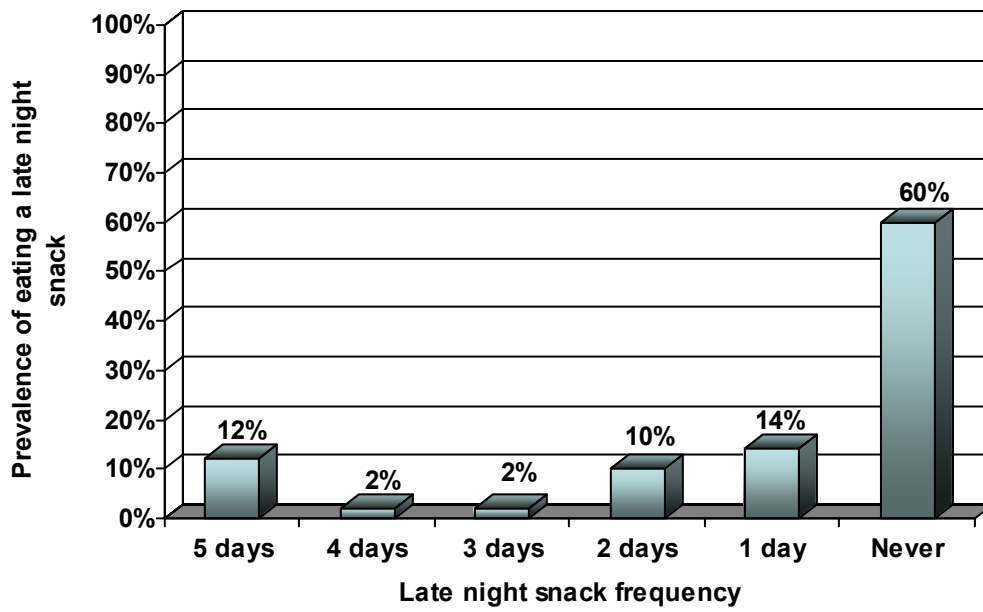


Figure 3.32 A: Frequency of eating a late night snack on work days by permanent day-shift workers

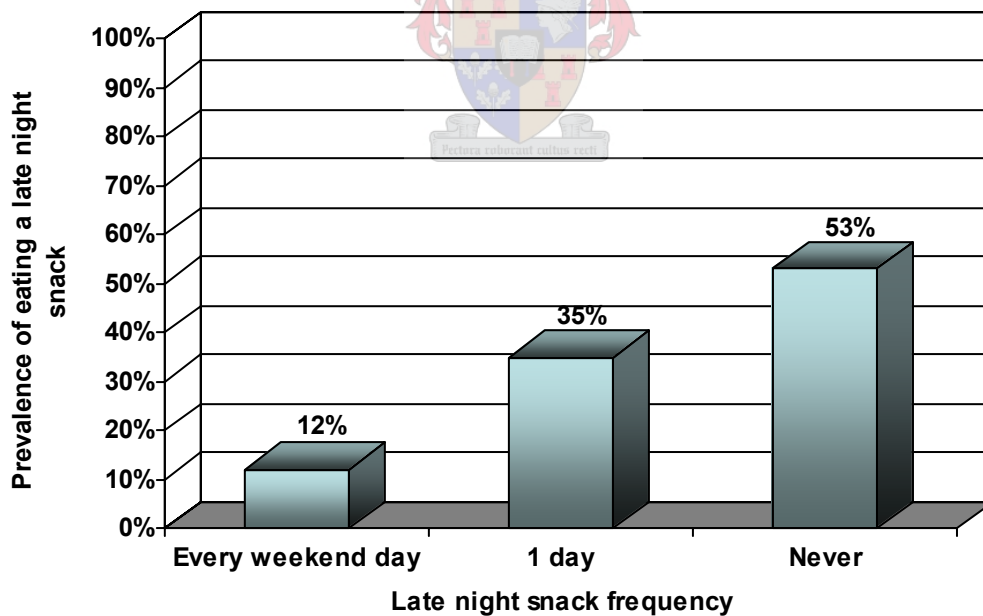


Figure 3.32 B: Frequency of eating a late night snack on off days (weekends) by permanent day-shift workers

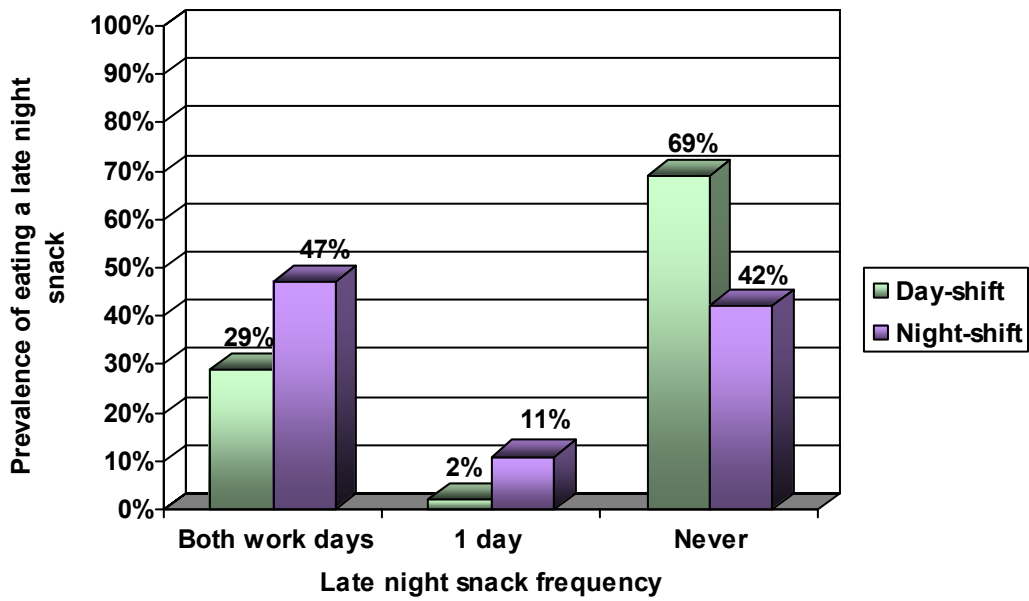


Figure 3.33 A: Frequency of eating a late night snack on day-shift versus night-shift days by rotational shift workers

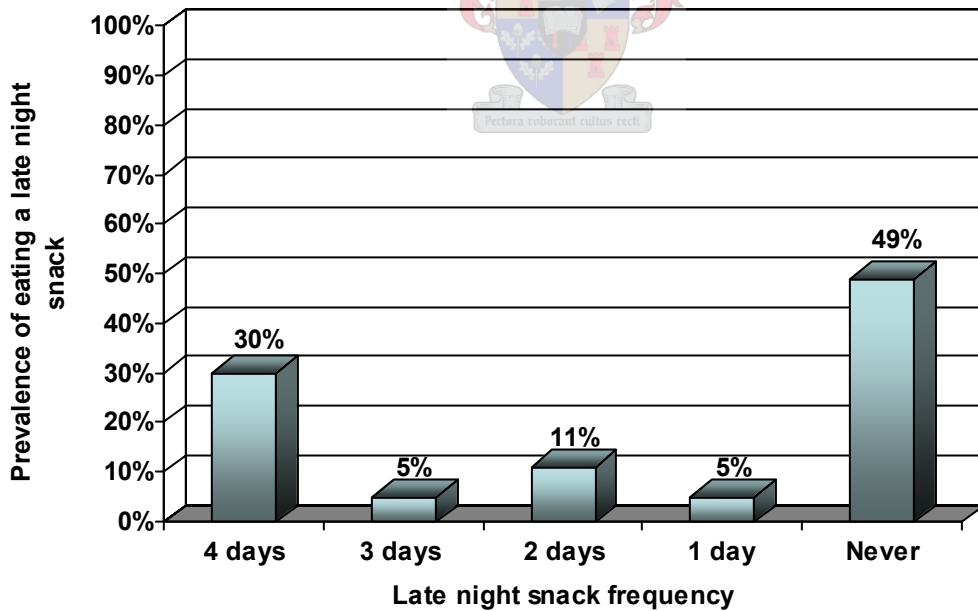


Figure 3.33 B: Frequency of eating a late night snack on off days (four days) by rotational shift workers

3.2.6.2. Frequency of drinking a late night beverage on work days and off days

Twelve (28%) **permanent day-shift workers** (n=43) drank a late night beverage every day while 14 (33%) never drank a late night beverage on **work days** (Figure 3.34 A). On **weekends**, 14 (33%) permanent day-shift workers drank a late night beverage every day, 15 (34%) on one weekend day, while 14 (33%) never drank a late night beverage (Figure 3.34 B). No significant difference was found between the frequency of drinking a late night beverage on work days and weekends among permanent day-shift workers ($p=1.00$).

On **work days**, when working **day-shift**, 34 (76%) **rotational shift workers** (n=45) drank a late night beverage on both work days while 11 (24%) never drank a late night beverage. When working **night-shift**, 38 (85%) rotational -shift workers drank a late night beverage on both work days, while 5 (11%) never drank a late night beverage (Figure 3.35 A). On **days off**, 19 (42%) rotational-shift workers drank a late night beverage on all four off days, while 17 (38%) never drank a late night beverage (Figure 3.35 B). A late night beverage was significantly more frequently drank ($p=0.0003$) when working night shift compared to when working day-shift and on off days respectively.

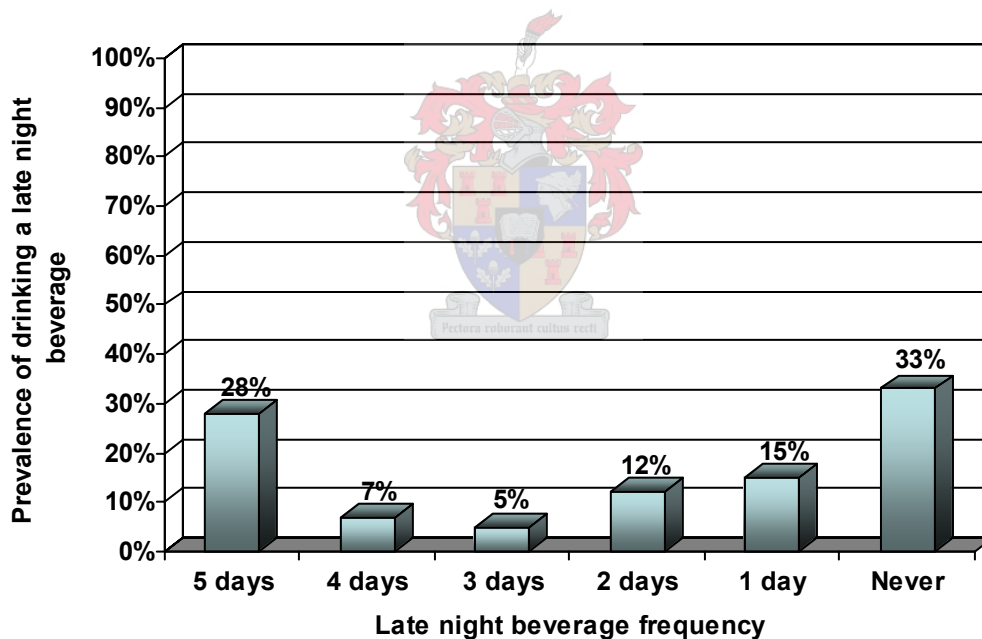


Figure 3.34 A: Frequency of drinking a late night beverage on work days by permanent day-shift workers

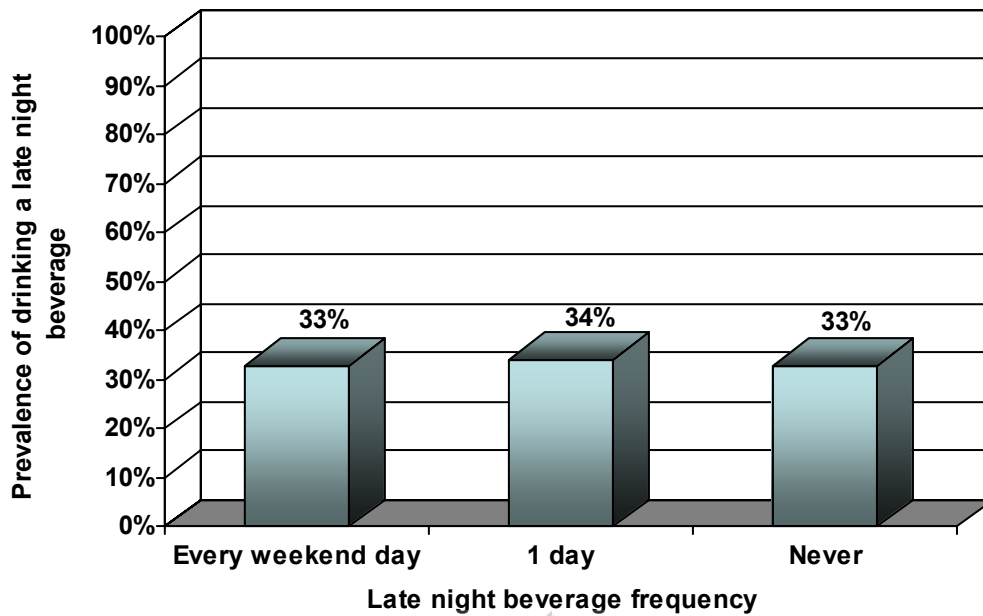


Figure 3.34 B: Frequency of drinking a late night beverage on off days (weekends) by permanent day-shift workers

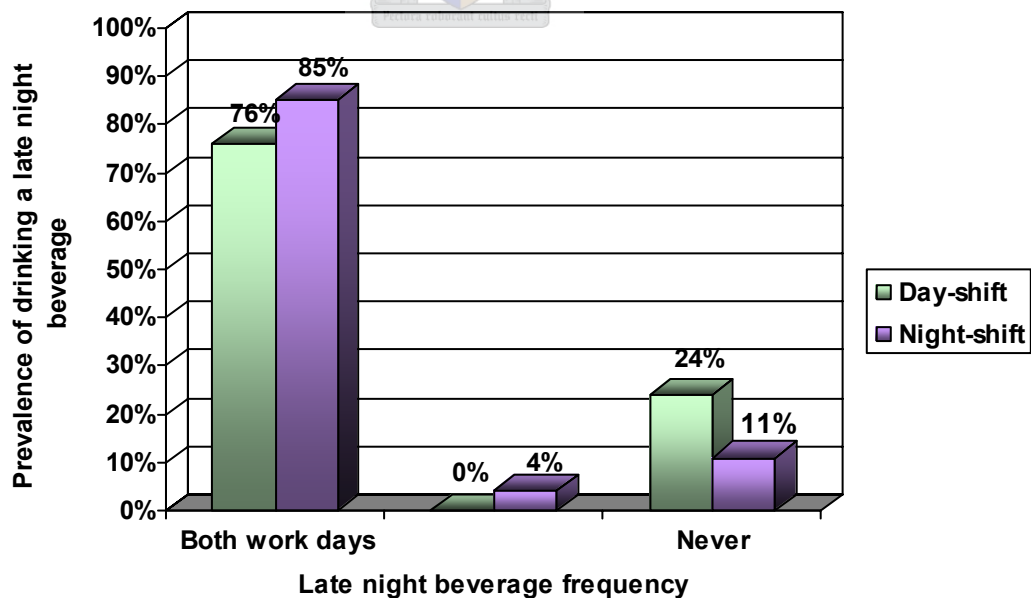


Figure 3.35 A: Frequency of drinking a late night beverage on day-shift versus night shift days by rotational shift workers

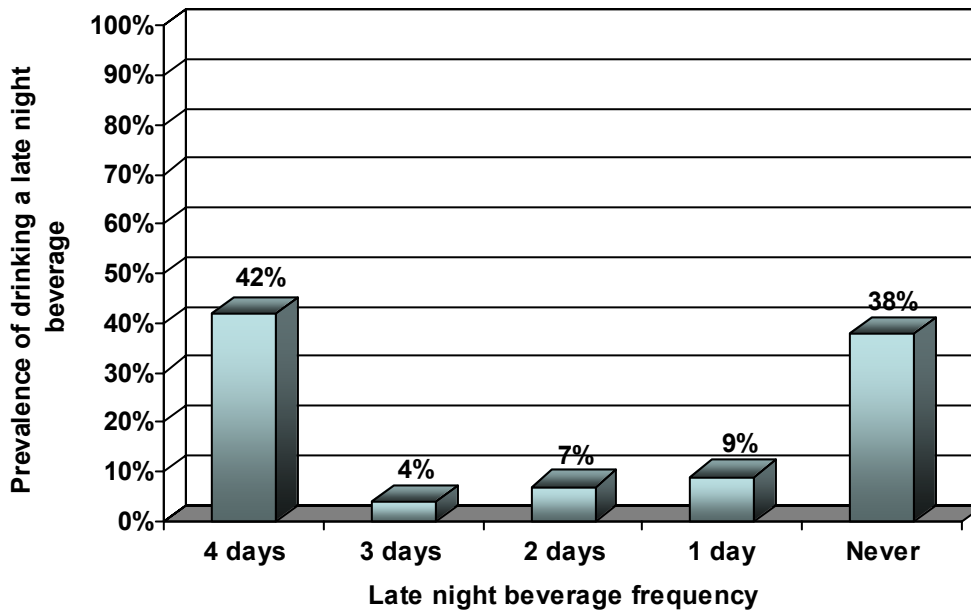
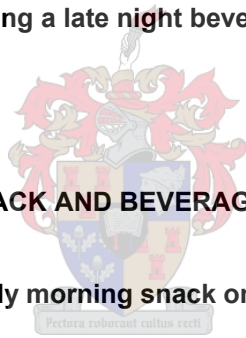


Figure 3.35 B: Frequency of drinking a late night beverage on off days (four days) by rotational shift workers



3.2.7. EARLY MORNING MEAL/SNACK AND BEVERAGE

3.2.7.1. Frequency of eating an early morning snack on work days and off days

On **work days**, when working **day-shift**, 10 (22%) rotational shift workers (n=45) ate an early morning snack on both work days, while 34 (76%) never ate an early morning snack. When working **night-shift**, 20 (44%) rotational shift workers ate an early morning snack on both work days, while 23 (52%) never ate an early morning snack (Figure 3.36 A). On **days off**, 11 (24%) rotational-shift workers ate an early morning snack on all four off days, while 30 (67%) never ate an early morning snack (Figure 3.36 B). An early morning snack was significantly more frequently eaten ($p=0.005$) when working night shift compared to when working day-shift and on off days respectively.

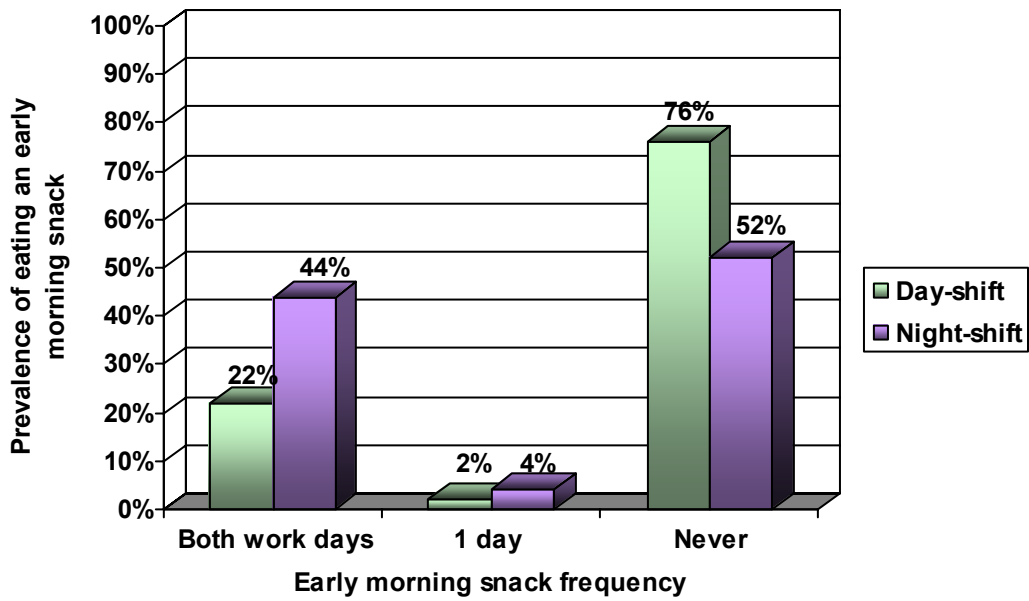


Figure 3.36 A: Frequency of eating an early morning snack on day-shift versus night-shift days by rotational shift workers

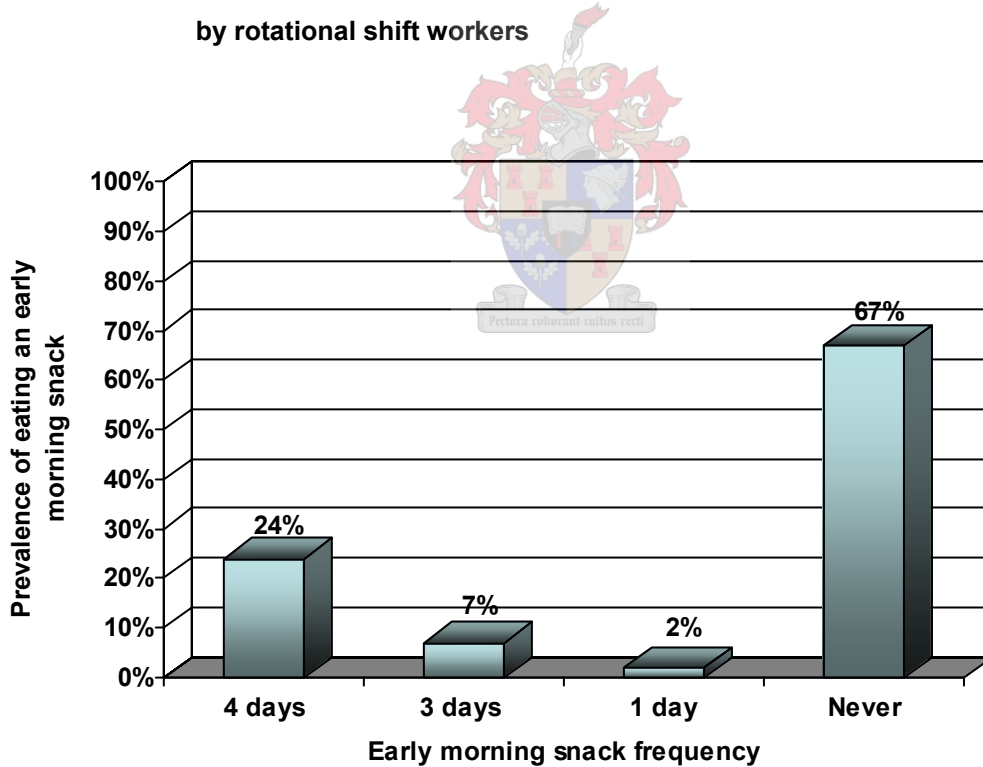


Figure 3.36 B: Frequency of eating an early morning snack on off days (four days) by rotational shift workers

3.2.7.2. Frequency of drinking an early morning beverage on work days and off days

On **work days**, when working **day-shift**, 31 (69%) **rotational shift workers** (n=45) drank an early morning beverage on both work days, while 13 (29%) never drank an early morning beverage. When working **night-shift**, 30 (66%) rotational -shift workers drank an early morning beverage on both work days, while 12 (27%) never drank an early morning beverage (Figure 3.37 A). On **days off**, 18 (40%) rotational-shift workers drank an early morning beverage on all four off days, while 23 (52%) never drank an early morning beverage (Figure 3.37 B). An early morning beverage was significantly less frequently drank ($p=0.001$) on off days compared to when working day-shift and when working night-shift respectively.

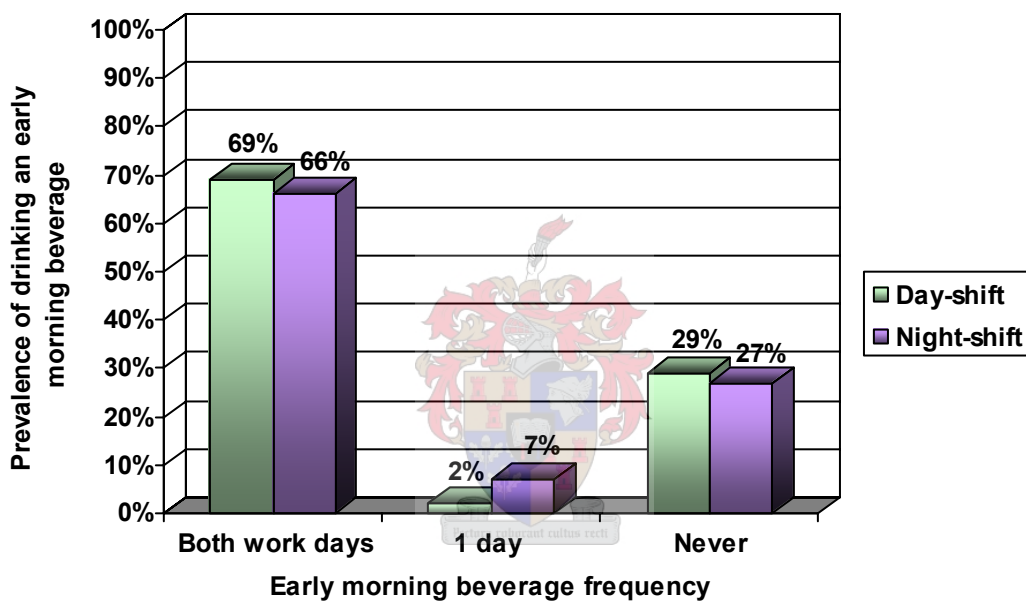


Figure 3.37 A: Frequency of drinking an early morning beverage on day-shift versus night shift days by rotational shift workers

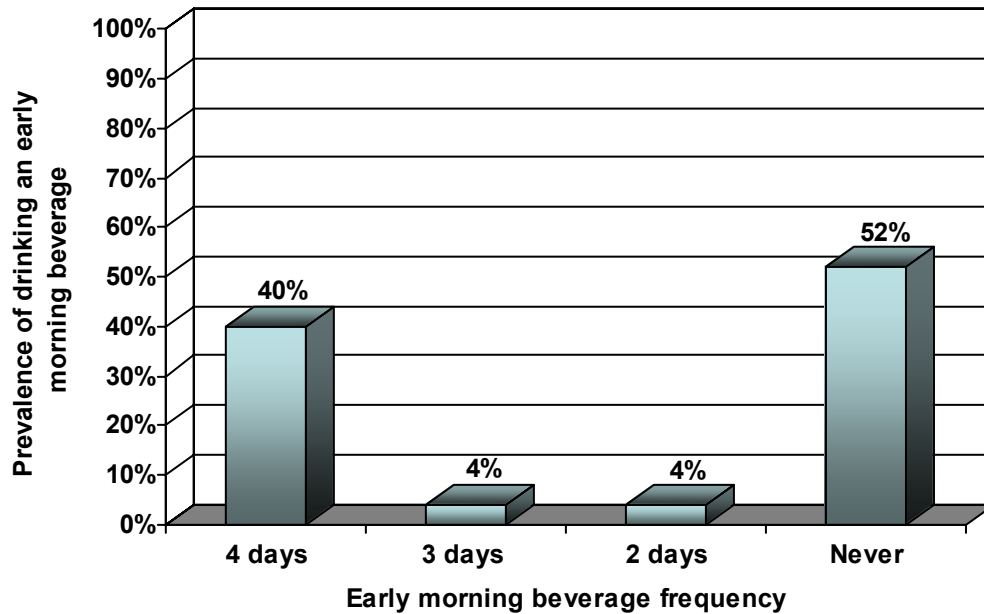


Figure 3.37 B: Frequency of drinking an early morning beverage on off days (four days) by rotational shift workers

3.3 DIETARY INTAKE

3.3.1. Macronutrient intake

The mean energy intake for male subjects (n=77) was 12 014 kJ (6 873 – 16 864) with a SD of 2308.86. The mean energy intake for female subjects (n=11) was 10 231 kJ (6 556 – 13 398) with a SD of 2 016.17 (Table 3.3). Twenty-nine (38%) male subjects and 7 female subjects had an energy intake above the EER for active individuals. The mean fibre intake of 67 (87%) male subjects and 6 female subjects was inadequate (below AI) Figure 3.38.

No significant difference ($p=0.16$) was found between the mean energy intake of permanent day-shift (11 433 kJ) and rotational shift workers (12 133 kJ). Rotational shift workers had a significantly higher ($p=0.04$) carbohydrate intake (329 g) compared to permanent day-shift workers (300 g) (Table 3.4).

Underweight subjects (n=1) had the highest mean energy intake (14 529 kJ). Reported mean energy intake for normal weight (12044 kJ) and overweight (11 629 kJ) subjects was higher than for subjects classified as obese (11 530 kJ) (Table 3.5). The difference in reported energy intake for BMI categories was not significant ($p=0.72$). Subjects aged 18-29 years (n=22) had the highest mean energy intake of 12 649 kJ and subjects aged 50- 59 years (n=5) had the lowest mean intake of 10 610 kJ (Table 3.6). The mean energy intake between the different age categories were non-significant ($p=0.09$)

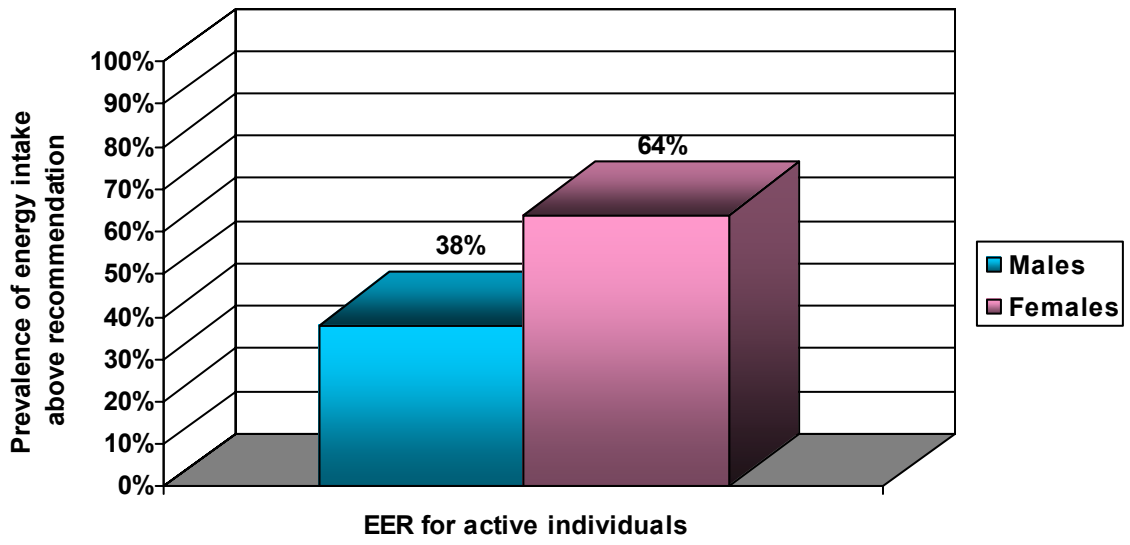
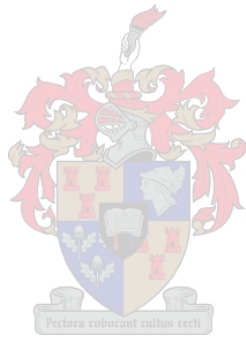


Figure 3.38: Prevalence of energy intake above the EER for active individuals



Macronutrients	Recommended EER / AI	Total population (n=88) Mean (SD)	Male (n=77) Mean (SD)	Female (n=11) Mean (SD)	p-value
Total Energy Intake (kJ) ^a	12 881 (M) 10 093 (F)	11791 (2327)	12014 (2309)	10231 (2016)	0.59
Protein (g)	-	102 (26)	103 (27)	92 (16)	0.18
Carbohydrate(g)	-	315 (66)	321 (65)	271 (56)	0.11
Added sugar (g)	-	71 (40)	72 (42)	62 (22)	0.45
Fibre (g) ^b	38g/day (M) 25g/day (F)	25 (7)	26 (7)	24 (6)	0.55

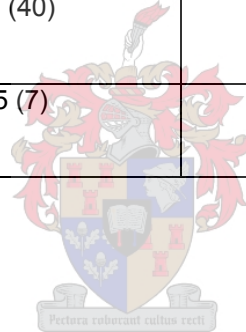


Table 3.3 (cont'd)					
Macronutrient intake for total study population (N=88) and by gender					
Macronutrients	Recommended DRI / AI	Total population (n=88) Mean (SD)	Male (n=77) Mean (SD)	Female (n=11) Mean (SD)	p-value
Total Fat (g)	-	110 (30)	112 (31)	96 (25)	0.11
Saturated fat (g)	-	32 (11)	33 (11)	30 (9)	0.39
Mono unsaturated fat (g)	-	37 (11)	38 (11)	32 (9)	0.07
Poly unsaturated fat (g)	-	30 (10)	30 (10)	26 (8)	0.12
Omega -6 PUFA (g) ^b	17 g / day (M) 12 g /day (F)	28 (9)	29 (9)	24 (7.73)	-
Omega- 3 PUFA (g) ^b	1.6 g/day (M) 1.1 g /day (F)	0.67 (0.22)	0.68 (0.23)	0.59 (0.15)	-
^a EER for active individuals ⁵² ^b Adequate intake among Dietary Reference intakes for fibre, omega-6 and omega-3 PUFA was used ⁵²					

Table 3.4**Macronutrient intake for total study population (N=88) and by shift configuration**

Macronutrients	Recommended EER / AI	Total population (n=88) Mean (SD)	Day-shift (n=43) Mean (SD)	Rotational (n=45) Mean (SD)	P-value
Total Energy Intake (kJ) ^a	12 881 (M) 10 093 (F)	11791 (2327)	11433 (2366)	12133 (2289)	0.16
Protein (g)	-	102 (26)	100 (25)	103 (28)	0.53
Carbohydrate(g)	-	315 (66)	300 (69)	329 (60)	0.04 ^a
Added sugar (g)	-	71 (40)	74 (44)	67 (37)	0.42
Fibre (g)	38g/day (M) 25g/day (F)	25 (7)	25 (7)	26 (6)	0.33

^a The total carbohydrate intake was significantly higher ($p=0.04$) in rotational shift workers compared to permanent day-shift workers.

Macronutrients	Recommended EER / AI	Total population (n=88) Mean (SD)	Day-shift (n=43) Mean (SD)	Rotational (n=45) Mean (SD)	p-value
Total Fat (g)	-	110 (30)	108 (32)	112 (29)	0.50
Saturated fat (g)	-	32 (11)	33 (12)	32 (10)	0.51
Mono-unsaturated fat (g)	-	37 (11)	37 (12)	38 (11)	0.65
Poly-unsaturated fat (g)	-	30 (10)	28 (10)	31 (9)	0.10
Omega-6 PUFA (g) ^b	17 g/day (M) 12 g/day (F)	28 (9)	26 (9)	30 (9)	
Omega-3 PUFA (g) ^b	1.g g/day (M) 1.1 g/day (F)	0.67 (0.22)	0.68 (0.22)	0.65 (0.23)	

^a EER for active individuals⁵²

^b Adequate intake among Dietary Reference intakes for fibre, omega-6 and omega-3 PUFA was used⁵²

Table 3.5. Mean energy intake of employees by BMI category	
BMI classification	Energy intake (kJ) Mean (SD)
Underweight (n=1)	14 529
Normal weight (n=22)	12044 (2016)
Overweight (n=35)	11629 (2314)
Obese (n=30)	11530 (2595)

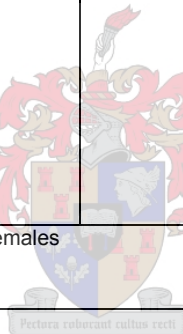
Table 3.6. Mean energy intake of employees by age category	
Age category	Energy intake (kJ) Mean (SD)
20 – 29 (n=22)	12649 (2051)
30-39 (n=33)	11385 (1636)
40-49 (n=28)	11144 (1808)
50-59 (n=5)	10610 (2531)

3.3.2. Macronutrient distribution

The sample population's carbohydrate, protein and added sugar intake was within the AMDR. The population's mean fat intake contributed 34% to total energy intake. This is still within the acceptable range, but close to the upper limit of 35%. The average distribution for mono-unsaturated fatty acids (MUFA) was 12% and within the recommended range of 10-15%. The population's n-6 PUFA and n-3 PUFA intake contributed 9% and 0.2% respectively to total energy intake. The population's n-6PUFA: n-3PUFA intake ratio was 46:1. Total SFA intake contributed 10% to total energy intake, which exceeded the AMDR of less than 10% (Table 3.7). Forty five percent of males and four female subjects exceeded the AMDR of 35% for total fat intake, while 48% male subjects and seven female subjects exceeded the AMDR for SFA (Figure 3.39). Omega-6 PUFA intake below AI was recorded in 10% male and in one female subject, while inadequate intake of omega-3 PUFA was recorded in 95% of male and all female subjects (Figure 3.40). Permanent day-shift workers had a significantly higher ($p=0.04$) saturated fat intake compared to rotational shift workers (Table 3.8).

Macronutrient distribution	AMDR	Total population (n=88)	Male (n=77)	Female (n=11)	p-value *
Protein (%)	10 -35 %	15%	15%	15%	0.36
Carbohydrates (%)	45-65 %	49%	49%	49%	0.87
Added sugar	< 25 %	10%	10%	11%	0.91
Total fat (%)	20 – 35 %	34 %	34%	34%	0.80
Saturated fat	< 10 %	10%	10%	11%	0.30
MUFA	10 – 15 %	12%	12%	11%	0.64
Omega-6 PUFA	5 -10 %	9%	9%	9%	-
Omega-3 PUFA	0.6-1.2%	0.2%	0.2%	0.2%	-

*The p-value refers to the difference in macronutrient distribution between males and females



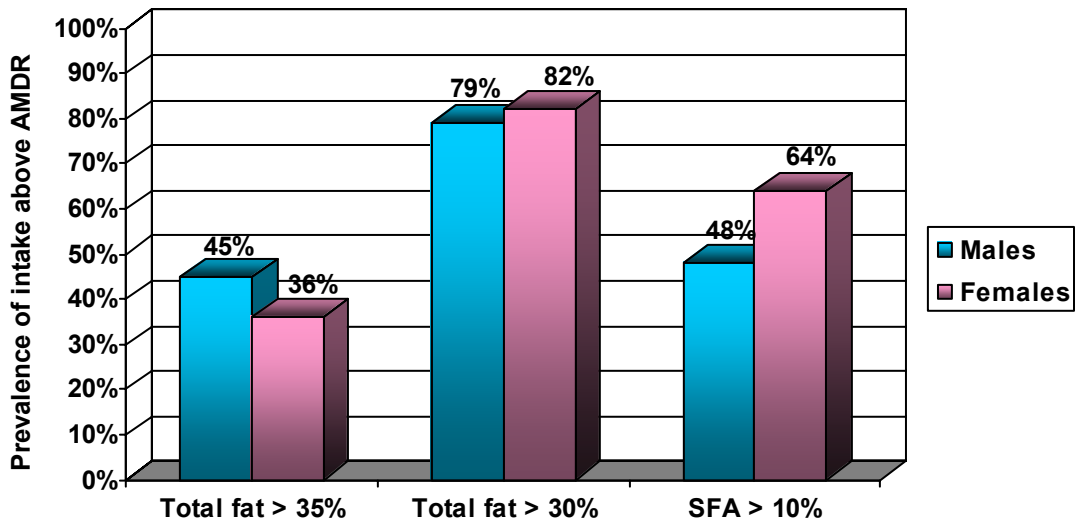


Figure 3.39: Prevalence of total fat intake and SFA > 10% of the total study population (N=88)

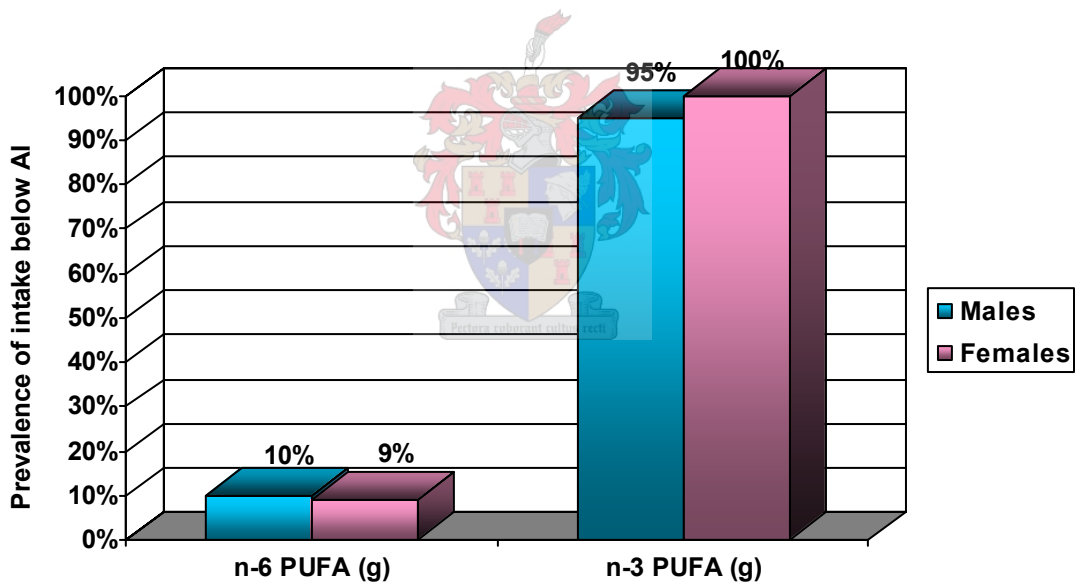


Figure 3.40: Prevalence of n-6 and n-3 PUFA intake below the recommended intake (AI) for the total study population (N=88)

Macronutrient distribution	AMDR	Total population (n=88)	Day-shift (n=43)	Rotational shift (n=45)	p-value
Protein (%)	10 -35 %	15%	15%	15%	0.40
Carbohydrates (%)	45-65 %	49%	49%	50%	0.20
Added sugar	< 25 %	10%	10%	10%	0.42
Total fat (%)	20 – 35 %	34 %	34%	34%	0.68
Saturated fat	< 10 %	10%	10%	9%	0.04 ^a
MUFA	10 – 15 %	12%	12%	12%	0.59
Omega -6 PUFA	5 -10 %	9%	9%	9%	0.27
Omega-3 PUFA	0.6 -1.2%	0.2%	0.2%	0.2%	0.34

^a The saturated fat percentage was significantly higher in permanent day-shift (p=0.04) compared to rotational shift workers.

3.3.3. Micronutrient intake

Micronutrient intake in this study was derived from food sources only, thus excluding supplement usage. The EAR was used to evaluate micronutrient intakes⁵². Only micronutrients that have been shown by convincing or probable scientific evidence to increase or decrease the risk for CDL when over- or under consumed were included in the analysis (Table 2.1) The micronutrient intake of both genders (Table 3.9) and shift configurations (Table 3.10) was adequate except for folate. Intakes above the Upper Limit (UL) were only recorded for vitamin A (18% male and one female subject) (Fig 3.41 A). Intakes below the EAR /AI were recorded for vitamin A (23% of males and 0% of females), vitamin C (16% male and one female subjects), vitamin E (13% male and one female subject), folate (62% male and 9 female subjects), and selenium (40% male and one female subject) (Fig 3.41 B).

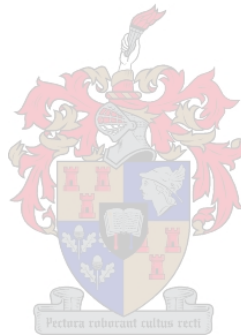


Table 3.9					
Micronutrient intake for total study population (N=88) and by gender					
Micronutrients	EAR	Total population (n=88) Mean (SD)	Male (n=77) Mean (SD)	Female (n=11) Mean (SD)	p-value
Vitamin A (ug)	625 ug/day (M) 500 ug /day (F) UL* = 3000 ug /day	1454 (1350)	1431 (1393)	1621 (1121)	0.67
Vitamin E (mg)	12 mg /day UL = 1000 mg /day	19 (7)	20 (7)	18 (3)	0.46
Vitamin C (mg)	75 mg / day (M) 60 mg / day (F) UL = 2000 mg / day	164 (126)	165 (132)	164 (96)	0.99
Folate (ug)	320 ug / day UL= 1000 mg / day	300 (102)	303 (106)	280 (74)	0.47
Selenium (mcg)	45 ug / day UL = 400 ug / day	56 (29)	56 (31)	53 (7)	0.70

Micronutrients	EAR	Total population (n=88) Mean (SD)	Day-shift (n=43) Mean (SD)	Rotational (n=45) Mean (SD)	p-value
Vitamin A (ug)	625 ug/day (M) 500 ug /day (F) UL* = 3000 ug /day	1454 (1350)	1407 (1189)	1499 (1514)	0.75
Vitamin E (mg)	12 mg /day UL = 1000 mg /day	19 (7)	19 (8)	19 (6)	0.91
Vitamin C (mg)	75 mg / day (M) 60 mg / day (F) UL = 2000 mg / day	164 (126)	177 (163)	152 (78)	0.36
Folate (ug)	320 ug / day UL= 1000 mg / day	300 (102)	288 (91)	313 (116)	0.25
Selenium (mcg)	45 ug / day UL = 400 ug / day	56 (29)	60 (34)	52 (24)	0.26

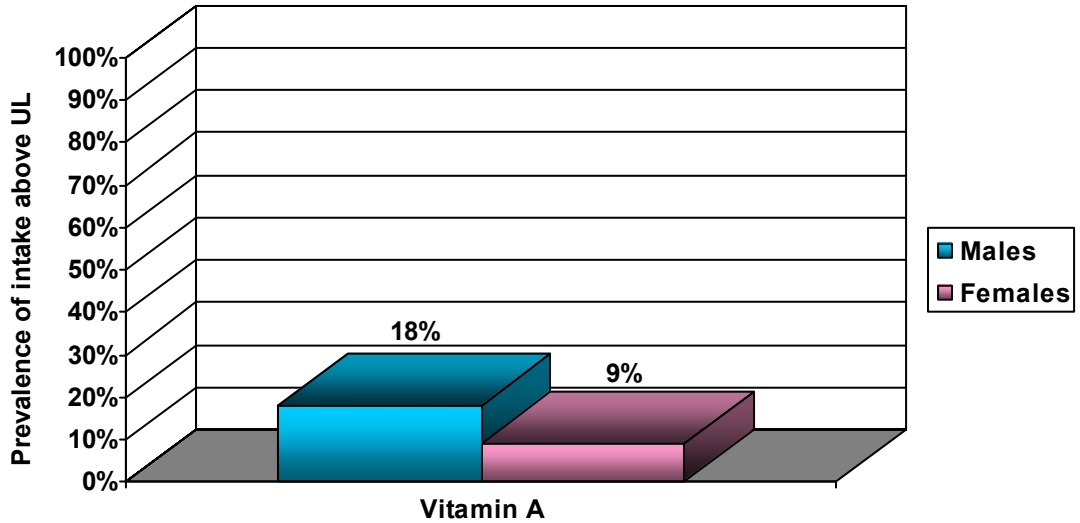


Figure 3.41 A: Prevalence of micronutrient intakes above the UL by gender

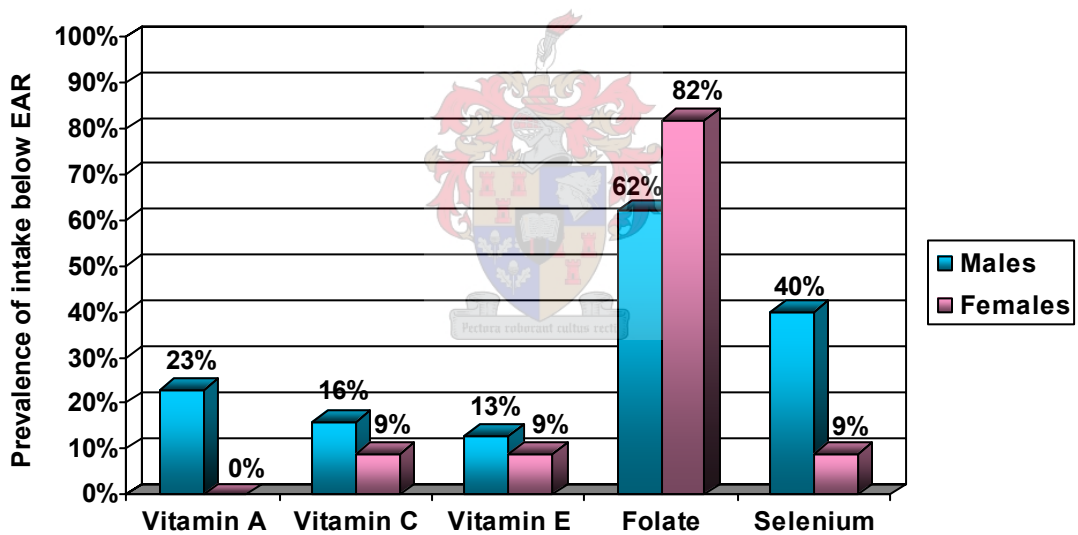


Figure 3.41 B: Prevalence of micronutrient intakes below the EAR by gender

3.4. PHYSICAL ACTIVITY

3.4.1. Scope of physical work

Fifty one subjects (58%) had a *low* degree of physical labour, twenty (23%) had a *medium* degree of physical labour, whereas seventeen (19%) had a *high* degree of physical labour (Figure 3.42).

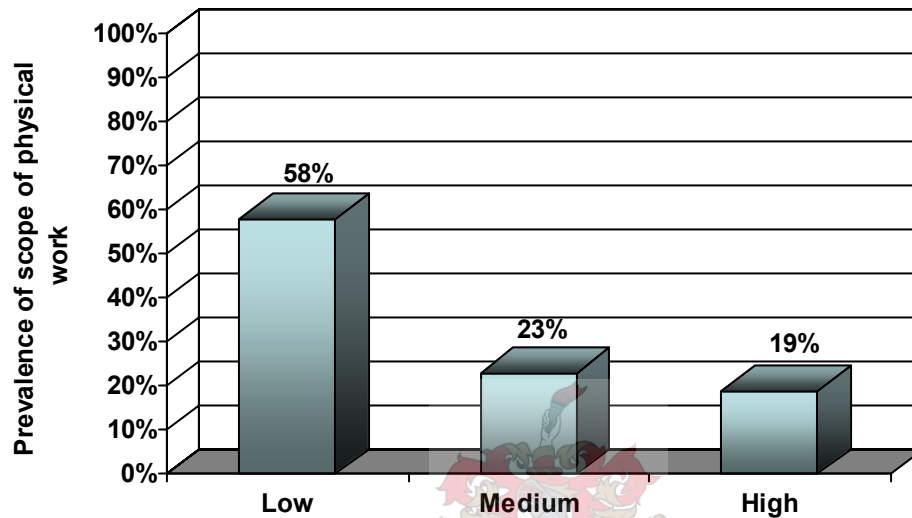


Figure 3.42: Scope of physical work of the total study population (N=88)

3.4.2. Baecke habitual physical activity indices

There was a significant difference ($p=0.008$) between the total physical activity score for male subjects (7.35) and female subjects (6.03). The work index was significantly higher ($p=0.01$) for males than for females (Table 3.11).

Subjects classified as obese reported a work index (2.62) higher than normal weight (2.51) and overweight (2.61) subjects. The difference was not significant ($p=0.80$). Normal weight subjects reported a higher sport index (2.27) than overweight (1.71) and obese (2.17) subjects. Normal weight subjects scored higher on leisure time physical activity (2.81) than overweight (2.51) and obese (2.53) subjects. The total activity score was the highest (7.61) for normal weight subjects (Table 3.12).

Subjects aged 18-29 years had the highest total physical activity score (7.68) and subjects aged 30 -39 years had the lowest total physical activity score (6.92) (Table 3.13).

Physical activity category	Total population (n=88) Mean (SD)	Male (n=77) Mean (SD)	Female (n=11) Mean (SD)	p-value
Work index (1-5) ^a	2.58 (0.65)	2.64 (0.65)	2.19 (0.33)	0.01 ^c
Sport index (1-5) ^a	2.01 (1.10)	2.09 (1.11)	1.45 (0.82)	0.07
Leisure index (1-5) ^a	2.59 (0.69)	2.61 (2.45)	2.39 (2.06)	0.31
Total score (3-15) ^b	7.19 (1.65)	7.35 (1.64)	6.03 (1.21)	0.008 ^d

^a A score of 1-5 for work, sport and leisure indices could be obtained, where 1= the lowest activity and 5 = the highest activity.

^b A score of 3-15 could be obtained, where 3 = the lowest activity and 15 = the highest activity.

^c Work index for males was significantly higher than for females (p=0.01)

^d Total score was significantly higher for males than for females (p=0.008)

Physical activity category	Normal weight (n=22) Mean (SD)	Overweight (n=35) Mean (SD)	Obese (n=30) Mean (SD)	p-value
Work index (1-5) ^a	2.51 (0.14)	2.61(0.11)	2.62 (0.12)	0.80
Sport index (1-5) ^a	2.27 (1.24)	1.71 (0.29)	2.17 (0.36)	0.11
Leisure index (1-5) ^a	2.81 (0.77)	2.51 (0.77)	2.53 (0.73)	0.20
Total score (3-15) ^b	7.61 (0.35)	6.84 (0.27)	7.33 (0.30)	0.23

^a A score of 1-5 for work, sport and leisure indices could be obtained, where 1= the lowest activity and 5 = the highest activity.

^b A score of 3-15 could be obtained, where 3 = the lowest activity and 15 = the highest activity.

Physical activity category	18-29 (n=22) Mean (SD)	30-39 (n= 33) Mean (SD)	40-49 (n=28) Mean (SD)	50-59 (n= 5) Mean (SD)	p-value
Work index (1-5) ^a	2.61 (0.56)	2.37 (0.57)	2.77 (0.74)	2.56 (0.74)	0.16
Sport index (1-5) ^a	2.45 (1.06)	2.06 (0.97)	1.71 (1.05)	1.4 (0.89)	0.55
Leisure index (1-5) ^a	2.61 (0.15)	2.43 (0.12)	2.66 (0.13)	3.05 (0.31)	0.24
Total score (3-15) ^b	7.68 (1.69)	6.92 (1.68)	7.15 (1.61)	7.03 (1.44)	0.31

^a A score of 1-5 for work, sport and leisure indices could be obtained, where 1= the lowest activity and 5 = the highest activity.

^b A score of 3-15 could for total score could be obtained, where 3= the lowest activity and 15 = the highest activity.

Professionals had the lowest work index (2.08) but the highest sport index (2.17) in contrast to less skilled workers who had the highest work index (2.67) but the lowest sport index (1.96) (Table 3.14). No significant differences were found between the work ($p=0.09$), sport (0.83), leisure ($p=0.49$) and total indices ($p=0.16$) between the different occupational categories.

Physical activity category	Professionals (n= 33) Mean (SD)	Skilled workers (n=28) Mean (SD)	Less skilled workers (n= 5) Mean (SD)	p-value
Work index (1-5) ^a	2.08 (0.77)	2.60 (0.68)	2.67 (0.57)	0.09
Sport index (1-5) ^a	2.17 (1.11)	2.04 (1.15)	1.96 (1.09)	0.83
Leisure index (1-5) ^a	2.17 (0.64)	2.54 (0.94)	2.70 (0.92)	0.49
Total score (3-15) ^b	6.42 (1.67)	7.21 (1.82)	7.36 (1.54)	0.16

^a A score of 1-5 for work, sport and leisure indices could be obtained, where 1= the lowest activity and 5 = the highest activity.

^b A score of 3-15 could for total score could be obtained, where 3= the lowest activity and 15 = the highest activity.

3.4.3. Physical activity conversion

Physical activity scores derived from the Baecke habitual physical activity questionnaire were converted to a physical activity level (PAL). The conversion of work, sport and leisure indices to a PAL is described in detail in Chapter 2. Occupational physical activity was classified into three categories namely *low*, *moderate* and *heavy*. Nineteen subjects (22%) had a *light*, forty-nine (55%) had a *moderate* and twenty (23%) had a *heavy* occupational physical activity (Figure 3.43). Non-occupational activity was classified into two categories namely *non-active* and *moderately active*. Fifty-five (63%) of subjects had a low active and thirty-three (37%) had a moderate active non-occupational physical activity (Figure 3.44).

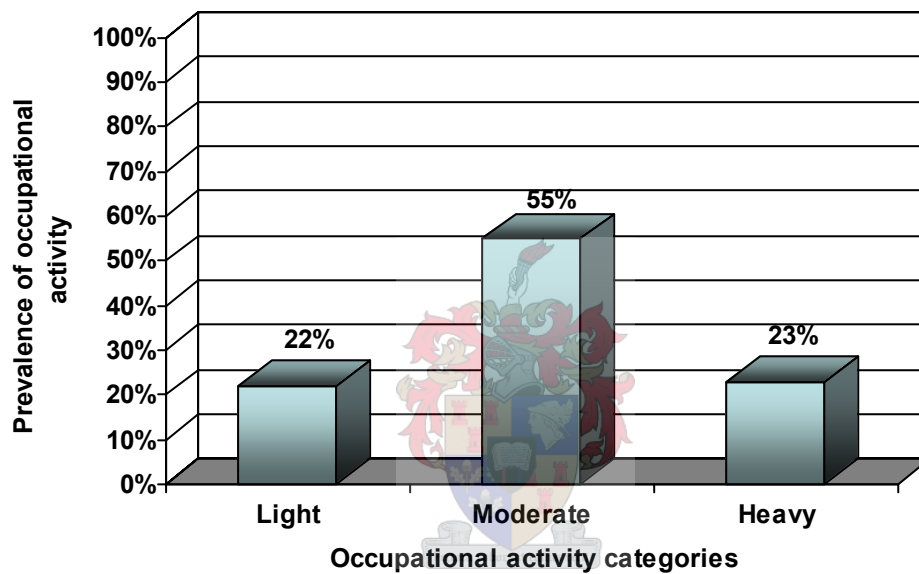


Figure 3.43: Occupational physical activity of total study population (N=88)

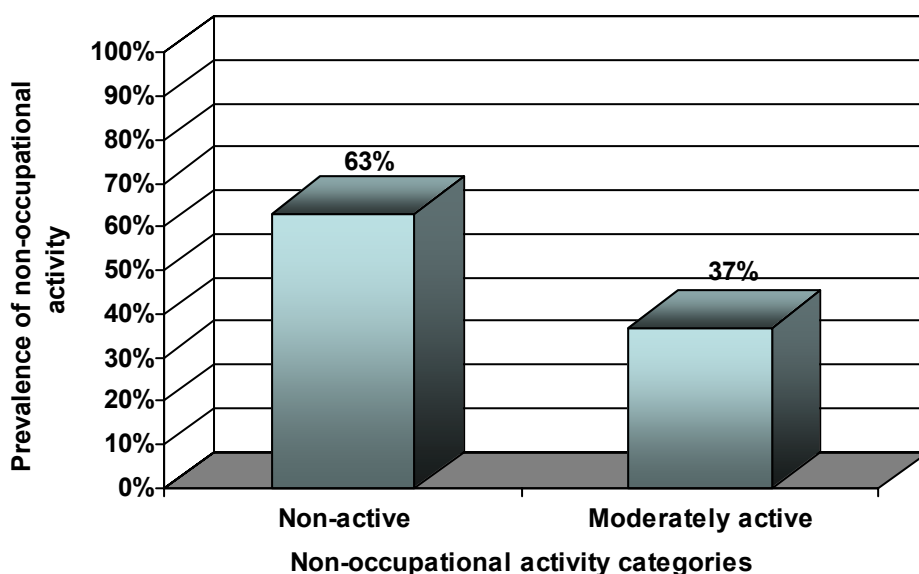


Figure 3.44: Non- occupational physical activity of total study population (N=88)

The values of occupational and non-occupational activity indices were converted to two PAL categories: *low active* ($PAL \geq 1.4 < 1.6$) or *active* ($PAL \geq 1.6 < 1.9$)⁵⁰. Twenty-six (30%) of the total population were classified in the “low active” PAL category and 62 (70%) were classified in the “active” PAL category. Ten females were classified as “low active” compared to 16 (21%) males (Figure 3.45A). Significantly more ($p=0.01$) females were classified as “low active” compared to males. The prevalence of a “low active” PAL among 8 normal weight and 10 overweight (29%) subjects was higher as the prevalence reported by 7 obese subjects (23%) (Figure 3.45 B). The prevalence of “low active” PAL was the highest for subjects aged 50-59 years (40%). The prevalence of a “low active PAL” was higher for subjects aged 30-39 years (39%) than for subjects aged 20-29 years (27%) and 40-49 years (18%) (Figure 3.45 C). The prevalence of a “low active” PAL was higher among professionals (67%) than skilled workers (26%) and less skilled workers (23%) (Figure 3.45 D). Significantly more ($p=0.00005$) professionals had a “low active” PAL compared to skilled workers and less skilled workers. The prevalence of a “low active PAL” was higher among permanent day-shift workers (40%) than rotational shift workers (20%) (Figure 3.45 E). The difference in PAL between permanent day-shift workers and rotational shift workers was non-significant ($p=0.19$).

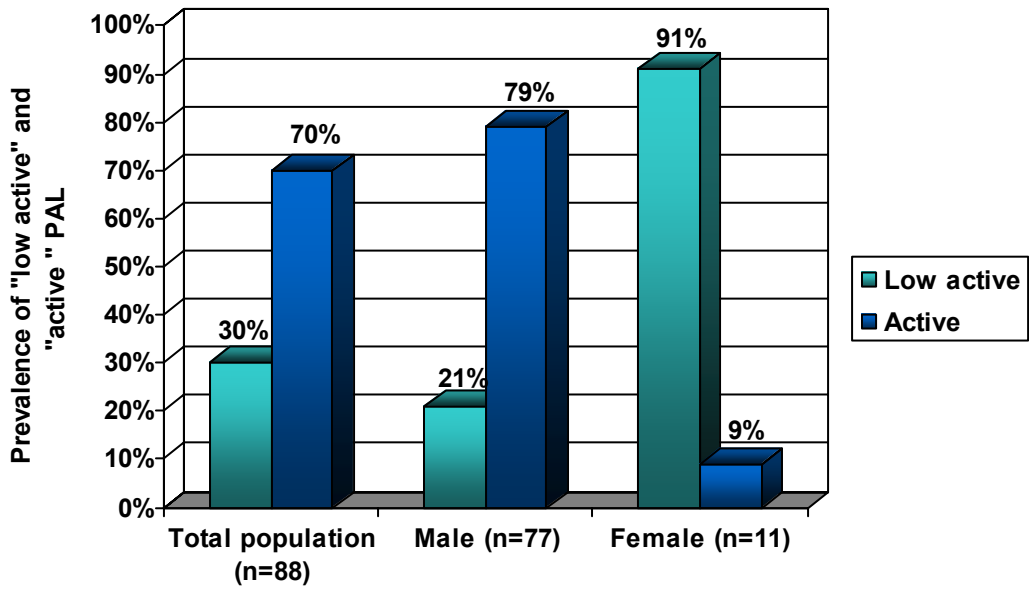


Figure 3.45 A: Prevalence of “low active” and “active” PAL for total study population (N=88) and by gender

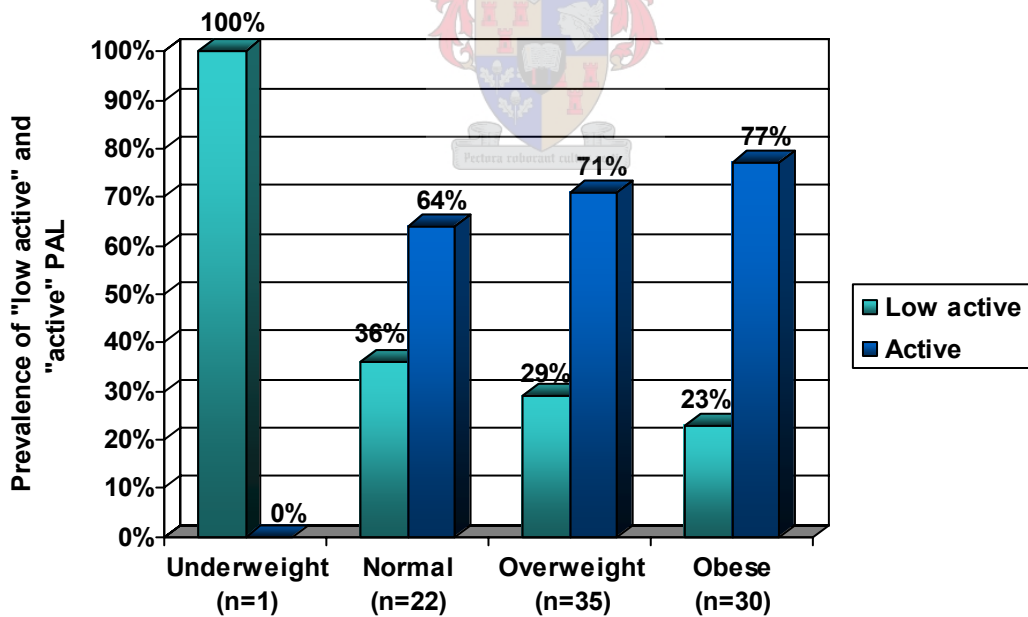


Figure 3.45 B: Prevalence of “low active” and “active” PAL of employees by BMI category

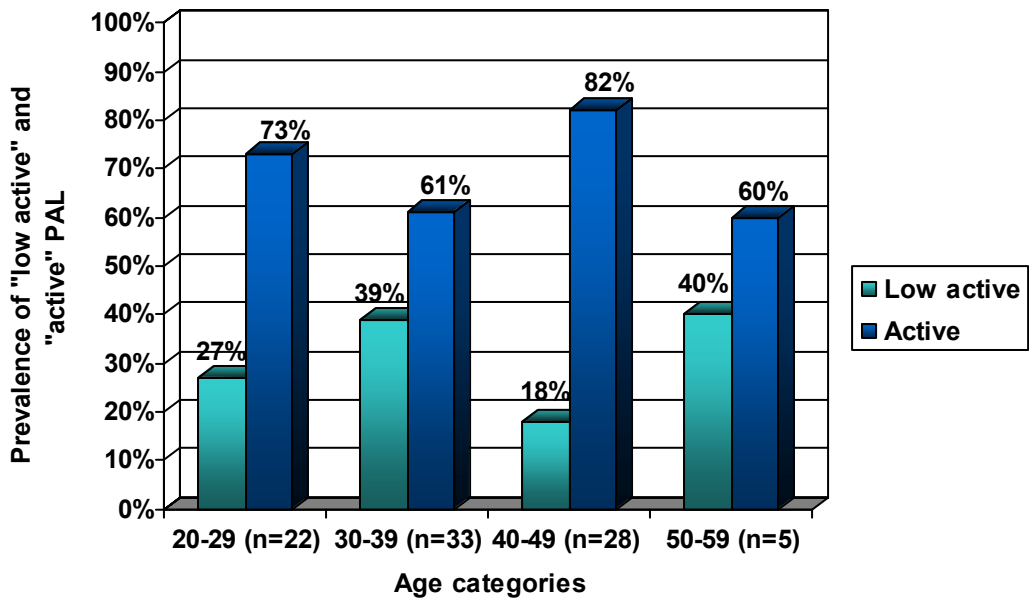


Figure 3.45 C: Prevalence of “low active” and “active “PAL of employees by age

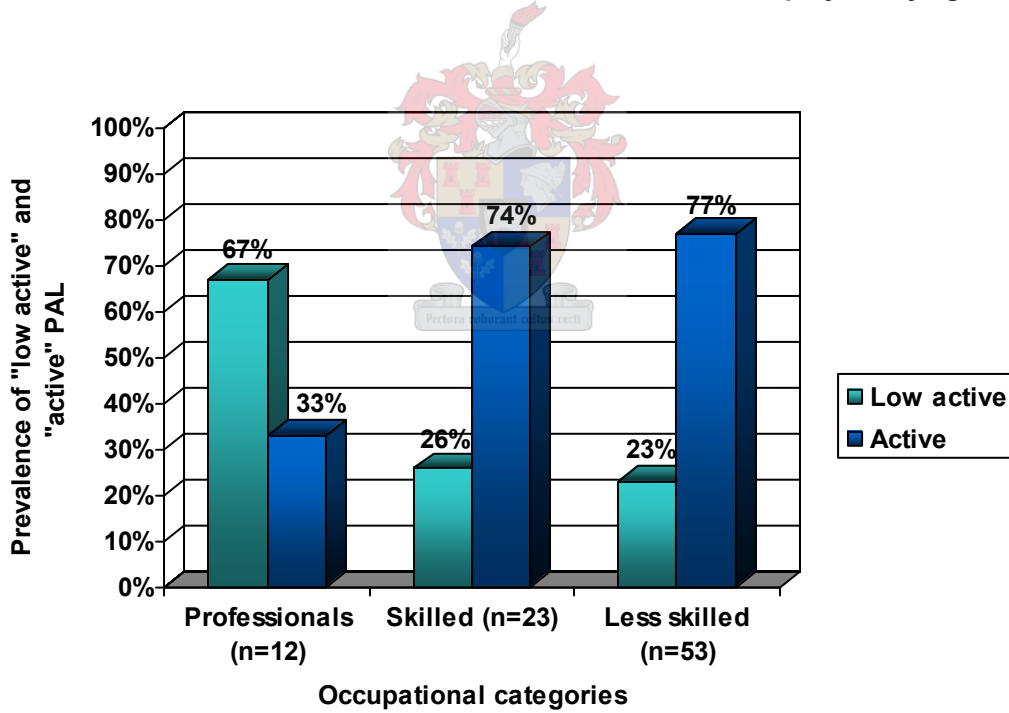


Figure 3.45 D: Prevalence of “low active” and “active “PAL of employees by occupational category

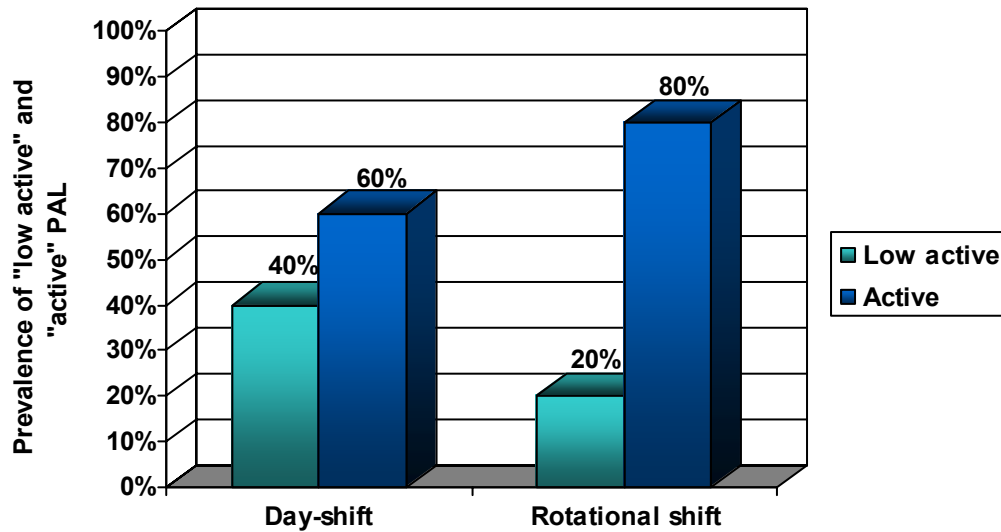


Figure 3.45 E: Prevalence of “low active” and “active” PAL of employees by shift configuration

3.4.4. Barriers to physical activity participation

The three most frequently reported barriers to physical activity by the sample population was “leave too early for work /get home too late” by 21%, “lack of time due to family commitments” by 15%, and “too tired to exercise after work / haven’t got the energy” by 13% (Figure 3.46). “Working shifts” was reported as a barrier to physical activity participation by 21 (55%) rotational shift workers. “Lack of time due to work demands” was reported by 2 women and 17 (20%) men. “Lack of time due to family commitments” was reported by 5 women and 27 (42%) men. “Too tired to exercise after work / haven’t got the energy” was reported by 5 women and 22 (29%) men.

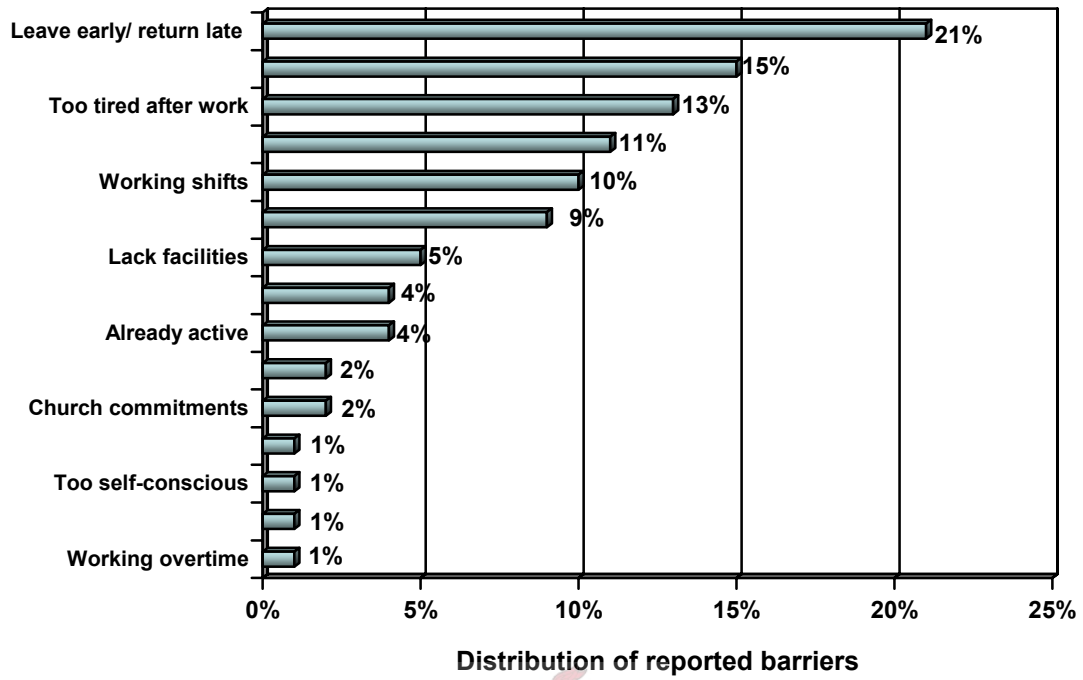


Figure 3.46: Barriers to physical activity participation as reported by the total study population (N=88)



CHAPTER 4

DISCUSSION

This study is the first cross sectional, analytical, observational study to investigate the dietary intake, physical activity and risk for lifestyle diseases among employees at a South African open cast diamond mine.

This study has demonstrated a high prevalence of overweight (40%) and obesity (34%) among employees. The prevalence of overweight in the present study was higher than the prevalence reported by Dias et al (2003)¹⁹ and Accenture (2003)¹³ among South African mineworkers (i.e. 33% and 30% respectively), as was the prevalence of obesity (19% and 18% respectively). The higher prevalence of obesity and overweight may be ascribed to the predominantly male population in the present study, of which 32% being white males, who have been shown to have a higher BMI than black males. The South African Health and Demographic survey² has found that 36% of white males were overweight compared to 19% of black males whereas 18% and 6% were obese. Although BMI has been shown to be a reliable indicator of obesity, it does not distinguish between overweight resulting from obesity and that resulting from muscular development.⁵⁶ The present study has not investigated if the high prevalence of overweight and obesity was due to a high muscle mass (low body fat percentage) or if male subjects were truly overweight (high body fat percentage). If the body fat percentage of subjects was determined in the present study it could have distinguished males with a high muscle mass from males with a high body fat mass which could have confirmed a true high prevalence of overweight and obesity.

Three females in the present study were classified as overweight and five as obese compared to 40% overweight and 32% obese males. The higher prevalence of obesity in females is in agreement with the South African Health and Demographic survey² that reported more women (30%) to be obese compared to men (8%). Although a relatively small number 11 (12%) of females were included in the sample population, the small number was representative of the distribution of females at DB-VM.

Although the prevalence of overweight and obesity in the present study was high, 31% of males and 18% of females had an increased waist circumference, indicating a low prevalence of central obesity. Thus although women were found to be more obese than men, they were at lower risk for chronic diseases due to a lower prevalence of central (android) obesity.

The prevalence of daily smokers in the present study was higher than the prevalence reported in the study by Accenture (2003)¹³. The higher prevalence of daily smokers in the present study may be ascribed to the inclusion of all occupational categories compared to Top & Middle managers only in the study by Accenture (2003)¹³. In the present study 17% of Top & Middle managers were daily smokers, similar to the prevalence (15%) reported by Accenture (2003)¹³. The high prevalence of smoking among Top & middle Managers may contribute significantly to cardiovascular morbidity and mortality³ and stroke⁴. Furthermore the combination of smoking along with other risk factors like obesity, increased waist circumference and a sedentary lifestyle may increase the risk and severity of CDL.

Seven percent of subjects in the present study reported to have been diagnosed with diabetes, 10% with hypertension and 7% with hypercholesterolaemia. Eight out of ten subjects that have been diagnosed with diabetes were overweight (BMI > 25 kg/ m²), seven out of ten subjects with hypertension were overweight and nine out of ten of subjects with hypercholesterolaemia were overweight, clearly indicating the relationship between overweight and increased prevalence of CDL. The prevalence of diabetes in the present study was similar to and the prevalence of hypertension was lower than the prevalence of 6% and 25% respectively reported by Dias et al (2003)¹⁹. The prevalence of hypercholesterolaemia and hypertension was much lower than the prevalence of 67% and 20% respectively reported by Accenture (2003)¹³. The lower prevalence of CDL in the present study could be explained by self-reported diagnosis which should have been confirmed with a fasting blood sample as was done in the other two documented studies. The extremely high prevalence of hypercholesterolaemia in the study by Accenture (2003)¹³ could be ascribed to a conveniently selected sample of predominantly white Top & Middle Managers, compared to a randomly selected representative sample including all occupational categories and race groups in the present study. Another limitation is that 6%, 5% and 10% of subjects in the present study was not sure if they had been previously diagnosed with diabetes, hypertension or hypercholesterolaemia respectively. Previous diagnosis of CDL could thus not be determined in these subjects, which again underscores the importance of confirming self-reported diagnosis with a fasting blood sample.

The meal frequency of day-shift workers in the present study was not significantly different on work days and off days with regard to all meals and snacks reported. This finding is in agreement with the findings of De Assis (2003)²⁷ among Brazilian day and night shift workers and Waterhouse (2003)²⁹ among day and night shift workers in the United Kingdom. However, in the present study the meal frequency of a mid-morning snack, mid-morning beverage, lunch, dinner, late night beverage, early morning snack and an early morning beverage differed significantly when working day-shift, when working night-shift and on off days among rotational shift workers. A mid-morning snack was significantly more (p=0.03) frequently eaten on off days and a mid-morning beverage was significantly less (p=0.01)

frequently drank on off days by rotational shift workers compared to when working day-shift and night-shift. The lower prevalence of eating a mid-morning snack on work days may be due to a lack of time in the work schedule, therefore rotational shift workers preferred drinking beverages in-between meals rather than eating snacks. On the other hand, on off days rotational shift workers have more time to eat a mid-morning snack compared to shift days. Lunch was significantly more ($p=0.007$) frequently eaten when working day-shift compared to working night shift and on off days respectively. This could be explained by the tendency of rotational shift workers to sleep between 11h00 and 14h00 in the afternoon after getting home from working night-shift. Dinner was significantly more ($p=0.04$) frequently eaten on off days compared to when working day-shift and night-shift respectively. The lower prevalence of eating dinner could be explained by the tendency of rotational shift workers to snack rather than to eat large meals when working night-shift. This is evident by significantly more ($p=0.005$) rotational shift workers eating an early morning snack when working night shift. A late night beverage is significantly more ($p=0.0003$) frequently drank when working night-shift compared to when working day-shift and on off days respectively. This could be explained by the tendency of night-shift workers to drink caffeinated beverages during the night in an effort to keep them awake. An early morning beverage was significantly less ($p=0.005$) frequently drank on off days compared to when working day-shift and when working night-respectively. This could be explained by the fact that rotational workers slept between midnight and 05h00 on off days.

All meals were eaten at the workplace rather than at home and the majority of employees brought their own food to work as opposed to buying food at work. The three most frequently reported reasons for skipping breakfast on work days were “Too little time to prepare breakfast before work”, “Not hungry” and “Did not bring food from home”. Lack of time to prepare breakfast before work in the present study could be ascribed to the bus leaving for DB-VM at 05h35 and 06h50 for rotational- and permanent day-shift workers respectively. DB-VM is situated 80 km north of Musina. Ninety seven percent of employees (Table 1) are stationed at DB-VM and therefore make use of the mine’s daily bus transport: the implication being that employees leave Musina an hour to an hour and a half before work and get home an hour to an hour and a half after work (i.e. at 17h30 for permanent day-shift workers and at 08h30 and 20h30 when working day-shift and night-shift respectively). The three most frequently reported reasons for skipping lunch on work days were “Too busy work schedule”, “Not hungry”, and “Did not bring food from home”. The three most frequently reported reasons for skipping dinner were “Not hungry” “Too busy work schedule” and “Never eat dinner”. Similarly Dias et al (2003)¹⁹ reported “Did not have sufficient time to prepare food”, “No time to eat”, and “Not in the habit of taking food to work” as reasons why mineworkers did not eat at work.

A total energy intake above the EER was found in 38% of males and seven females. In addition, ten females had a “low active” PAL compared to 21% of males. These findings support the higher prevalence of obesity found among female subjects. Obese subjects reported a lower, although not significantly lower ($p=0.72$) energy intake than overweight and normal weight subjects. This could be explained by the tendency of obese people to underreport energy intakes and over report physical activity. Several studies demonstrated a positive association between underreporting of nutrient intake and obesity^{56, 57, 58, 59, 60}. Underreporting of energy intake is more prevalent in obese than overweight and normal weight subjects⁵⁹. Similarly, over reporting of physical activity is more prevalent in obese than normal weight subjects⁶¹.

The present study demonstrated a high prevalence of subjects exceeding the AMDR for total fat (48% male and 64% female subjects) while the mean SFA of the population was above the recommendation of less than 10%. In addition, an inadequate n-3 PUFA intake was found in 95% of male and 100% of female subjects. The population’s relative high total fat intake increases their risks of various cancers, particularly breast, colon and prostate cancer¹. High SFA and low n-3 PUFA put them at increased risk for coronary heart disease¹. A high prevalence of inadequate fibre intake was observed for both male (87%) and six female subjects. Increasing evidence suggest that inadequate fibre intake is associated with increased risk for colon cancer¹. Prevalence of micronutrient intakes below the EAR was low for all vitamins except for folate (62% male and 82% female subjects). The high prevalence of low folate intakes further increases the population’s risk for coronary heart disease¹ due to high homocysteine plasma concentrations. High homocysteine levels are related to low folate levels which confer an increased risk of arteriosclerosis⁶².

The dietary intake of permanent day-shift workers and rotational shift workers did not differ significantly with the exception of total carbohydrate intake and SFA intake. Rotational shift workers had a significantly higher ($p=0.04$) total carbohydrate intake than permanent day-shift workers. This could be explained by the majority of rotational shift workers being black whose staple food is maize porridge eaten twice to trice daily. The higher SFA intake of permanent day-shift workers could be ascribed to dinner (main meal) being eaten at home, whereas rotational shift-workers eat most meals at work when working day-shift and night shift and prefer taking porridge and bread to work rather than meat. Although permanent-day shift workers had a significantly higher ($p=0.04$) SFA percentage than rotational shift workers, the total SFA intake did not differ significantly between the two groups, probably due to a higher meat intake of rotational shift-workers during off days.

Seven out of ten subjects had an “active” PAL. Nine out of ten females were classified in the “low” PAL category compared to two out of ten males. The higher PAL among males could be ascribed to over reporting of physical activity particularly among obese males. Furthermore

males, particularly skilled and less skilled workers, had a higher occupational physical activity compared with females. The prevalence of “low active” PAL was highest for subjects aged 50-59 years. This could be explained by a decrease in energy expenditure as one gets older. With regard to physical activity indices, females had a significantly lower total physical activity than males. The work index was significantly higher ($p=0.01$) for males than for females. This could be explained by the majority of females at DB-VM being employed in sedentary occupations e.g. Clerical/ Admin/ Security (64% females, $n=7$) compared to 9% of males. Normal weight subjects reported a higher sport index and total index than overweight and obese subjects. The lower sport index in overweight and obese subjects could explain the higher BMI due to lower energy expenditure. Professionals had the highest sport index and the lowest work index, while less skilled workers had the highest work index, but the lowest sport index. These findings are in agreement with a number of studies that reported professionals to be less active at work and more active during leisure time compared to less skilled workers who are more physically active at work but less physically active during leisure time.^{37, 38} Results from the present study also support the findings that workers with high education and higher incomes were more likely to participate in exercise than those with low education. As was mentioned above the study has found that professionals (with a tertiary education and D-band salary level) were more likely to engage in physical activity during leisure time than less skilled workers (with a high school education and B-band salary level). However, despite being more physically active during leisure time, 67% of professionals in the present study had a “low active” PAL compared to 23% of less skilled workers. These findings are in agreement with the findings of Accenture (2003)¹³ that reported a sedentary lifestyle among 62% of Top & Middle Managers.



The three most frequently reported barriers to physical activity participation by the sample population were “Leave to early for work / get home too late”(21%), “Lack of time due to family commitments” (15%) and “Too tired to exercise after work / haven’t got the energy” (13%). The above mentioned reasons are in agreement with the findings of Booth et al (1997)³⁰, Jafee (1998)³⁴ and Desmond et al (1993)³⁶. The latter studies reported time demands, work demands and family commitments as the most important barriers to physical activity participation. In the present study “Lack of time due to work demands” was as frequently reported by women than men. “Lack of time due to family commitments” was reported by five out of ten women and four out of ten men. The higher prevalence of reporting “Lack of time due to family commitments” as a barrier by women was also found by Jafee et al (1998)³⁴. “Working shifts” was reported as a barrier by 55% of rotational shift workers of which 90% were male rotational shift workers. Desmond et al (1993)³⁶ has also found “working shifts” to be a barrier to engagement of physical activity among male blue collar workers. From the above mentioned barriers it is clear that long working hours, and shift work in particular, prevent employees from engaging in physical activity during leisure time.

The most important finding of the present study is the high prevalence of overweight and obesity among employees at DB-VM. The high prevalence of overweight and obesity can be attributed to energy dense diets high in fat (particularly saturated fat) and low in fibre. In addition to contributing to overweight and obesity, the population's relative high total fat intake increases their risks of various cancers, particularly breast, colon and prostate cancer. Furthermore, high SFA and low n-3 PUFA and folate intakes place them at increased risk for coronary heart disease. Of concern is the high prevalence of overweight and obesity among women coupled with "low active" PAL levels. The higher prevalence of a "low PAL" among women in the present study could be ascribed to the majority of women being employed in sedentary occupations e.g. clerical, admin or security occupations and not being physically active during leisure time.

It was evident from the most frequently reported barriers to a healthy lifestyle in the present study that work-related factors contributed to skipping of meals and engagement in physical activity. Most employees skipped breakfast because of having to board the bus early in the morning resulting in too little time to prepare breakfast before work, whereas lunch and dinner were skipped because of a busy work schedule. Moreover employees got home too late in the evening to exercise or were too tired because of working shifts. It is therefore clear that interventions are needed at the workplace to decrease the high prevalence of obesity and risk for CDL.

Recommendations to DB-VM to decrease the prevalence of obesity and risk for CDL:

CDL screening

- All employees should be routinely screened for diabetes, hypertension and coronary heart disease as part of annual medical fitness examinations. If diagnosis of CDL is confirmed by blood samples, employees should be referred to a registered dietician for nutritional assessment, counselling, treatment and monitoring.

BMI risk assessment

- In addition to screening for CDL, the BMI of employees should be evaluated during medical fitness examinations and treated according to the recommendations of the WHO (Figure 4.1)⁶³. Employees with a BMI of > 18.5 and < 25 should avoid gaining weight. In the presence of additional risk factors (e.g. increased waist circumference, hypertension, hyperlipidaemia, glucose intolerance, and a strong family history of diabetes mellitus or premature coronary heart disease), a healthy lifestyle, including smoking cessation, increased physical activity, increased intake of fibre and reduced intake of saturated fats should be recommended. Moderate weight loss should be recommended but should not be the primary target of intervention. If weight gain of

more than 5 kilogram per annum is observed among employees, weight loss is required. For employees with a BMI of > 30 and < 35 , the same lifestyle recommendations as above should apply and moderate weight loss should be encouraged as a priority. For employees with a BMI of ≥ 40 , weight loss should be the primary goal of treatment together with a healthy lifestyle and disease-specific recommendations if required.

Education

- All employees and rotational shift workers in particular should be educated on the South African Food Based Dietary guidelines as well as low-fat, low GI, high fibre snacks suitable to bring to work.
- Although only a small percentage of employees buy food at the canteen (tuck shop) compared with bringing their own food to work, the management and staff of the canteen should be educated by a registered dietician on low-fat cooking methods and balanced meal planning following an assessment of the current meal preparation practices. Furthermore low-fat, sugar-free alternatives should be available at the canteen on request, as the current menu consists mainly of high fat, low fibre food choices.

Wellness interventions

- To address the high fat and low fibre intakes, employees should be provided with a subsidised low-fat, low GI meal at work, since the majority of employees eats at least two meals at work. Meals should be provided in a cafeteria according to regular meal intervals in order to accommodate different work schedules and shifts.
- With regard to physical activity participation, employees should be encouraged to participate in competitive team sports and inter-departmental sport events should be held quarterly e.g. action cricket, soccer, rugby, hockey, and squash tournaments. In addition, a physical activity centre may be established on mine where employees may exercise during working hours, to accommodate employees who get home too late to exercise after work due to a long commute.

Assess overall health risk from BMI and other risk factors e.g. waist circumference

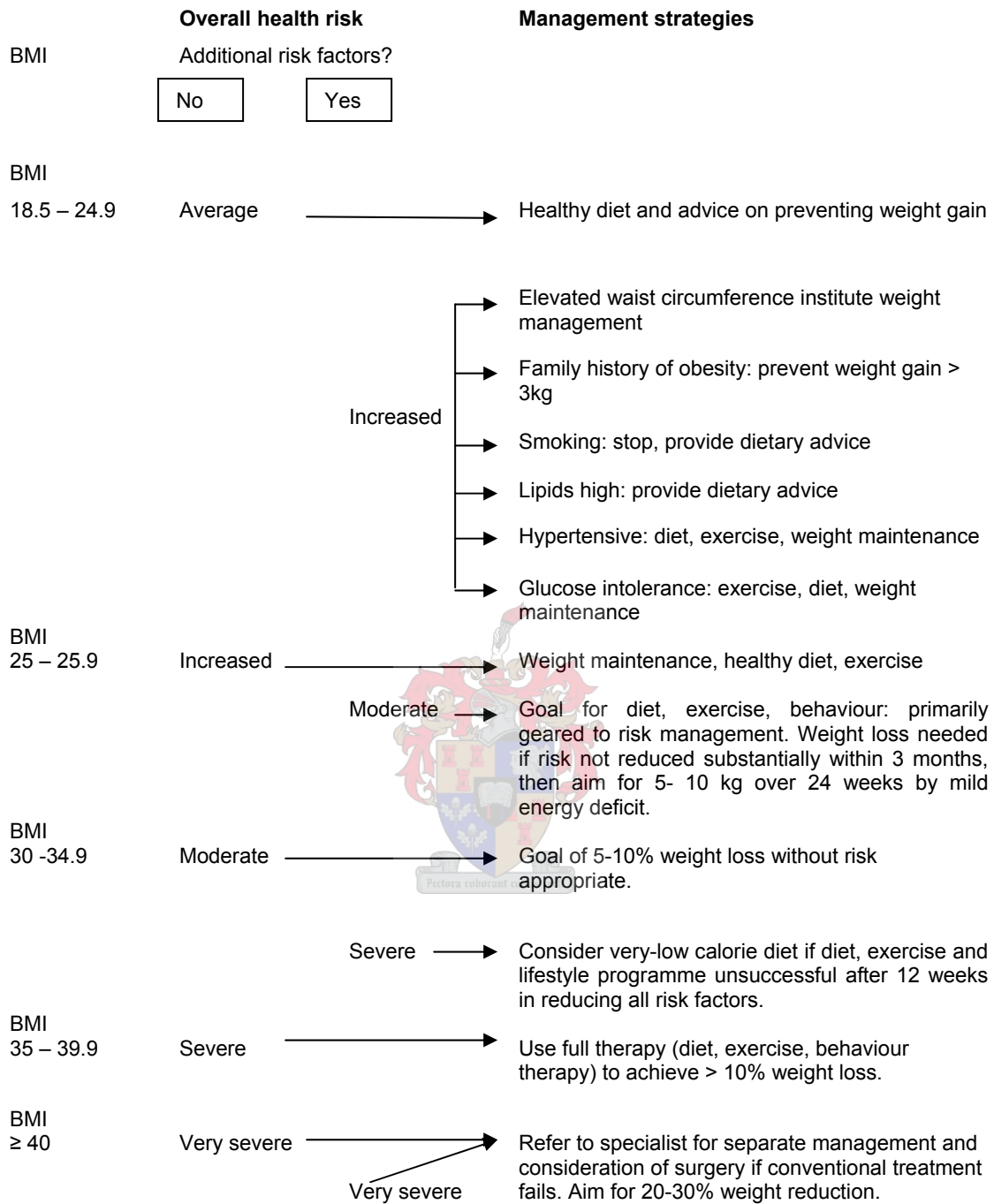


Figure 4.1: A systematic approach to obesity management based on BMI and other risk factors⁶³

Source: World Health Organisation, 2002; p 239.

Study limitations

A number of limitations should be kept in mind in the interpretation of the results. The small size of the population studied and of females in particular may result in wide data variability which limits analysis of differences between subgroups within the population. The high prevalence of overweight and obesity in the sample population could have been overestimated due to the predominantly male sample population whose high BMI values could have been attributed to a high muscle mass rather than a high body fat mass. A limitation of the study was that body fat percentage was not determined and could therefore not distinguish between a high body weight due to muscle mass or due to a high body fat mass. Although the QFFQ have been shown to be a representative method of collecting information on usual dietary intake, a limitation of this method is that it depends on the ability of subjects to describe their diet. Since the sample population was a predominantly male population there could have been a higher inability among males to describe their diets accurately, particularly with regard to quantities and type of fats and sugar used during food preparation which should be kept in mind. Another limitation was self-reported diagnosis of CDL in the sample which could have lead to recall bias. Self-reported diagnosis of CDL should have been confirmed by fasting blood samples.



CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1. CONCLUSIONS

The study investigated the dietary intake, physical activity and risk for lifestyle diseases among employees at a South African open-cast diamond mine.

The study demonstrated a high prevalence of overweight and obesity among employees, characterised by high fat intakes, particularly saturated fat, and low fibre intakes, increasing their risk for developing coronary heart disease and cancer. It was found that work-related factors such as a lack of time due to work demands, a long commute, long working hours and working shifts were barriers to a healthy lifestyle and that specific interventions are needed at DB-VM to decrease the high prevalence of obesity and risk of CDL. These interventions should include CDL screening, BMI risk assessment, education, providing employees with a low-fat, low GI subsidised meal at the workplace and encouraging employees to engage in regular physical activity by promoting competitive sports among different departments and occupational categories.

Although a representative sample was randomly selected, the study was limited by its small sample size and conclusions cannot be extrapolated to other South African diamond mine populations. Furthermore the number of females included in the sample was very small and although the small number was representative of the distribution of females at DB-VM, the small number could have reduced the accuracy of statistical significance and comparison of the data by gender.

5.2. RECOMMENDATIONS

It is recommended that future studies use fasting blood samples to confirm diagnosis of CDL rather than self-reported diagnosis as was used in the present study.

In addition to BMI, body fat percentage should be determined by means of skinfold measurements to distinguish between male subjects with a high body muscle mass and a high body fat mass.

Further studies should be performed on quantifying the cost / benefit ratio of the proposed wellness interventions versus production-, safety- and long-term medical costs in order to enable DB-VM to justify strategic investment in the interventions.

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APPENDIX 1

INFORMED CONSENT FORM

TITLE OF RESEARCH PROJECT:

Dietary intake, physical activity and risk for lifestyle diseases among employees at a South African open-cast mine.

REFERENCE NUMBER: N05/02/020

PRINCIPAL INVESTIGATOR: KAREN STADLER

ADDRESS: 38 PAUL MILLS STREET
MUSINA
0900

CONTACT NUMBER: 082 564 7270

You are being invited to take part in the above research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the investigator any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by Venetia Mine's EXCO members as well as the National Union of Mineworkers (NUM).

This study has also been approved by the **Committee for Human Research at Stellenbosch University** and will be conducted according to the ethical guidelines and principles of the International Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

- The **aim** of this study is to collect information regarding the habits and barriers to a healthy lifestyle in order to determine which workplace interventions are needed at Venetia Mine to decrease health risks and improve the future health of employees.
- You are one of **87** employees that have been selected to participate in this study. This study will be conducted at Shanduka Centre at Venetia Mine.
- The following measurements will be performed: **weight, height and waist circumference**. Each measurement will be measured twice for quality assurance purposes.
- You will also have to fill out questionnaires consisting of the following components:
 - **Socio-demographic** information (questions regarding personal information e.g. age, gender, etc., job-related information e.g. occupational category, department, etc., and health-related information e.g. smoking status and habits etc.)
 - **Meal frequency** information (questions regarding how often and where you eat meals and snacks on work days and off days, as well as reasons for skipping meals on work days)

- **Food frequency** information (questions regarding the types and quantities of your daily, weekly and monthly food intake)
 - **Physical activity** information (questions regarding your usual physical activity at work, sport and during leisure time as well as the main reasons preventing you from exercising)
- The above procedures and questionnaires will take approximately **1 ½ - 2 hours** in total per participant.

Why have you been invited to participate?

- Your name has been randomly selected by a computer from a total number of 867 employees. You have been selected as one of 87 employees representing all the departments and job categories on mine.

What will your responsibilities be?

- You will be expected to complete three questionnaires by yourself. However, the investigator will be present at all times to clarify any questions that you might have. The Food Frequency questionnaire will be completed by the investigator. Your weight, height and waist circumference will also be measured by the investigator.

Will you benefit from taking part in this research?

- You will benefit from this study by providing essential information to improve the future health of employees by introducing appropriate interventions at Venetia Mine, based on the results of this particular study. All participants have the option of getting individual feedback regarding their results. This will enable you as an individual to improve your wellness. Should you wish to get individual feedback, please complete the information in the space provided on the next page.

Who will have access to your information collected during this study?

- All information collected during the study will be treated as confidential and protected. Although this information will be used in the publication of a Masters thesis, the identity of all participants will remain anonymous. Participant identification information will be omitted from study related material to ensure confidentiality. Only the investigator will have access to the information collected during the study.

Will you be paid to take part in this study and are there any costs involved?

- No, you will not be paid to take part in the study. There will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

- You can contact the Committee for Human Research at (021) 938 9207 if you have any concerns or complaints that have not been adequately addressed by the study investigator.
- You will receive a copy of this information and consent form for your own records.

By Signing below, I..... agree to take part in a research study entitled:- Dietary intake, physical activity and risk for lifestyle diseases among employees at a South-African open-cast mine.

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (place).....on (date) 2005

.....
Signature of Participant

.....
Signature of Witness.

FEEDBACK REGARDING YOUR INDIVIDUAL RESULTS

I would like to get feedback regarding my results. *Please mark the appropriate block with an X.*

YES

NO

If yes, please provide the following information:

Participant number:

.....

Name:

.....

Department:

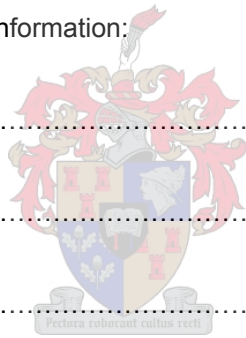
.....

Section:

.....

Contact number (work):

.....



Declaration By Investigator

IKAREN STADLER.....declare that:-

- I explained the information in this document to
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use a translator. *(If a translator is used then the translator must sign the declaration below.*

Signed at (place).....on (date) 2005

.....
Signature of Investigator

.....
Signature of Witness.

Declaration By Translator

I (*name*)declare that:-

- I assisted the investigator (*name*)..... to explain the information in this document to (*name of participant*)..... using the language medium of Afrikaans/Xhosa.
- We encouraged him/her to ask questions and took adequate time to answer them.
- I conveyed a factually correct version of what was related to me.
- I am satisfied that the participant fully understands the content of this informed consent document and has had all his/her question satisfactorily answered.

Signed at (*place*).....on (*date*) 2005

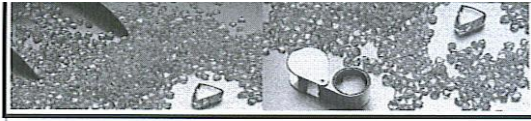
.....
Signature of Translator.

.....
Signature of Witness.



APPENDIX 2

FIRST ADVERTISEMENT OF RESEARCH STUDY

**WELLNESS STUDY**

During 2003, Accenture conducted a Wellness Study at Venetia Mine. The survey found that 16% of the employees at Venetia were functioning extremely **unhealthily**, and thus represent a high-cost/opportunity-lost risk to the company, whereas 55, 2 % of employees were "at significant risk" of being unhealthy. The study has also shown that there was a strong correlation between chronic Medication spend and general lifestyle.

In view of the above findings, an in-depth wellness survey will be conducted at Venetia Mine from 4th April to 15th July 2005. The aim of the survey will be to collect baseline information regarding the habits and barriers to a healthy lifestyle in order to determine which workplace interventions are needed at Venetia Mine to decrease the risk of lifestyle diseases, decrease healthcare costs and improve the future wellness of employees.

A sample of 87 employees representing all the departments and job categories, have been randomly selected to participate in the study. Participants will be requested to complete three questionnaires relating to their eating habits, physical activity patterns and health status. All information gathered during the study will be handled confidentially. Weight, height and waist circumference measurements will also be performed on participants. The above procedures will take approximately 2, 5 hours in total per participant. Three employees will be interviewed per day. Employees that are selected will be informed in advance of the date, time and venue where the interviews will take place. The interviews and measurements will be done by **Karen Stadler** who is a qualified dietician.

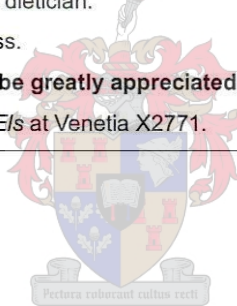


Please note that this is a voluntary process.

Your cooperation with this survey will be greatly appreciated.

Right: Karen Stadler

Any queries may be directed to *Marlene Els* at Venetia X2771.



APPENDIX 3
INFORMATION LEAFLET

VENETIA MINE WELLNESS SURVEY
INFORMATION LEAFLET

What is this survey all about?

- The **aim** of this survey is to collect information regarding the habits and barriers to a healthy lifestyle in order to determine which workplace interventions are needed at Venetia Mine to decrease health risks, decrease health care costs and improve the future health of employees.
- This survey will be conducted on Mondays, Tuesdays and Wednesdays at **Shanduka Centre** from 08h00 until 16h00.

Who will participate in this survey?

- **87 employees** representing all the departments and job categories on mine have been randomly selected to participate in this survey.

What will your responsibilities be?

- You will have to fill out questionnaires consisting of the following components:
 - **Socio-demographic** information (questions regarding personal information i.e. age, gender, etc., job-related information i.e. job category, department, etc. and health-related information i.e. smoking status and habits etc.)
 - **Meal frequency** information (questions regarding how often and where you eat meals and snacks on work days and off days, as well as reasons for skipping meals on work days)
 - **Physical activity** information (questions regarding your usual physical activity at work, sport and during leisure time as well as the main reasons preventing you from exercising)
- You will also have to participate in an interview on your **Food frequency** (questions regarding the types and quantities of your daily, weekly and monthly food intake).
- The following measurements will be performed: **weight, height and waist circumference**.
- The above procedures and questionnaires will take approximately **1 ½ - 2 hours** in total.

How will you benefit from taking part in this survey?

- You will benefit from this survey by providing essential information to improve the future health of employees by introducing appropriate interventions at Venetia Mine, based on the results of this particular survey. You also have the option of getting individual feedback regarding your survey results should you be interested. This will enable you as an individual to improve your wellness.

YOUR PARTICIPATION IN THIS SURVEY WILL BE GREATLY APPRECIATED! 😊

APPENDIX 4**SECOND ADVERTISEMENT AFTER COMPLETION OF THE PILOT STUDY**

Wellness Survey

Jacob Moepi updates us on the Wellness Survey.



The Wellness Survey saw a good start on the 4th April, where the first group was interviewed. These sessions include filling in questionnaires on eating habits, daily physical activity patterns and well-being. This initiative will assist Venetia Mine in identifying habits and barriers to a healthy lifestyle and determine future interventions required to decrease health risks and improve the health of our employees.

All Supervisors who have been notified to date are encouraged to ensure that all employees scheduled to attend and who might not have access to e-mail, are notified and released accordingly.

The sessions are currently scheduled at Shanduka Centre, as well as Musina Office G 05.

Any enquiries may be directed to Jacob Moepi at Venetia X 2766



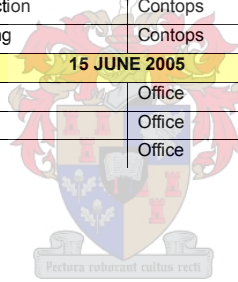
APPENDIX 5

RESEARCH SCHEDULE

Initial	Last Name	Department	Shift configuration	Venue	Time
		04 APRIL 2005			
	Subject 001	Ore Processing	Office	Shanduka Centre	08h00
	Subject 002	Ore Processing	Office	Shanduka Centre	08h00
	Subject 003	Engineering	Office	Shanduka Office	08h00
		06 APRIL 2005			
	Subject 004	Ore Extraction	Contops	Shanduka Centre	08h00
	Subject 005	Ore Extraction	Contops	Shanduka Centre	08h00
	Subject 006	Ore Extraction	Office	Shanduka Centre	08h00
		11 APRIL 2005			
	Subject 007	Human Resources	Office	Shanduka Centre	08h00
	Subject 008	Human Resources	Office	Shanduka Centre	08h00
	Subject 009	Human Resources	Office	Shanduka Centre	08h00
		13 APRIL 2005			
	Subject 010	Human Resources	Office	Shanduka Centre	08h00
	Subject 011	Human Resources	Office	Shanduka Centre	08h00
	Subject 012	Human Resources	Office	Shanduka Centre	08h00
		15 APRIL 2005			
	Subject 013	Admin	Office	Musina Office 182	08h00
	Subject 014	Admin	Office	Musina Office 182	08h00
	Subject 015	Admin	Office	Musina Office 182	0800
		18 APRIL 2005			
	Subject 016	Admin	Office	Shanduka Centre	08h00
	Subject 017	Admin	Office	Shanduka Centre	08h00
	Subject 018	Admin	Office	Shanduka Centre	08h00
		20 APRIL 2005			
	Subject 019	Admin	Office	Shanduka Centre	08h00
	Subject 020	Admin	Office	Shanduka Centre	08h00
	Subject 021	MRM	Office	Shanduka Centre	08h00
		22 APRIL 2005			
	Subject 022	Security	Office	Shanduka Centre	08h00
	Subject 023	Security	Office	Shanduka Centre	08h00
	Subject 024	Security	Office	Shanduka Centre	08h00
		25 APRIL 2005			
	Subject 025	Ore Processing	Office	Shanduka Centre	08h00
	Subject 026	Ore Processing	Office	Shanduka Centre	08h00
	Subject 027	Ore Processing	Office	Shanduka Centre	08h00
		27 APRIL 2005			
	Subject 028	Ore Processing	Office	Shanduka Centre	08h00
	Subject 029	Ore Processing	Office	Shanduka Centre	08h00
	Subject 030	Ore Processing	Office	Shanduka Centre	08h00
		29 APRIL 2005			
	Subject 031	Ore Processing	Office	Shanduka Centre	08h00

	Subject 032	Ore Processing	Office	Shanduka Centre	08h00
	Subject 033	Ore Processing	Office	Shanduka Centre	08H00
	02 May 2005				
	Subject 034	Ore Processing	Contops	Musina Office 182	08h00
	Subject 035	Ore Processing	Contops	Musina Office 182	08h00
	Subject 036	Engineering	Contops	Musina Office 182	08h00
	04 May 2005				
	Subject 037	Ore Processing	Office	Shanduka House	08h00
	Subject 038	Ore Processing	Office	Shanduka House	08h00
	Subject 039	Ore Processing	Office	Shanduka Centre	08h00
	06 May 2005				
	Subject 040	Engineering	Office	Shanduka House	08h00
	Subject 041	Engineering	Office	Shanduka House	08h00
	Subject 042	Engineering	Office	Shanduka House	08h00
	09 May 2005				
	Subject 043	Ore Extraction	Contops	Shanduka Centre	08h00
	Subject 044	Ore Extraction	Contops	Shanduka Centre	08h00
	Subject 045	Ore Extraction	Contops	Shanduka Centre	08h00
	11 May 2005				
	Subject 046	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 047	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 048	Ore Extraction	Contops	Musina Office 182	08h00
	13 May 2005				
	Subject 049	Ore Processing	Contops	Shanduka Centre	08h00
	Subject 050	Ore Processing	Contops	Shanduka Centre	08h00
	Subject 051	Ore Processing	Contops	Shanduka Centre	08h00
	16 MAY 2005				
	Subject 052	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 053	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 054	Ore Extraction	Contops	Musina Office 182	08h00
	18 MAY 2005				
	Subject 055	Engineering	Office	Shanduka Centre	08h00
	Subject 056	Engineering	Office	Shanduka Centre	08h00
	Subject 057	Engineering	Office	Shanduka Centre	08h00
	20 MAY 2005				
	Subject 058	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 059	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 060	Ore Extraction	Contops	Musina Office 182	08h00
	23 MAY 2005				
	Subject 061	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 062	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 063	Ore Extraction	Contops	Musina Office 182	08h00
	25 MAY 2005				
	Subject 064	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 065	Ore Extraction	Contops	Musina Office 182	08h00
	Subject 066	Ore Extraction	Contops	Musina Office 182	08h00
	27 MAY 2005				
	Subject 067	Engineering	Office	Shanduka Centre	08h00

	Subject 068	Engineering	Office	Shanduka Centre	08h00
	Subject 069	Engineering	Office	Shanduka Centre	08h00
	01 JUNE 2005				
	Subject 070	Ore Extraction	Contops	Shanduka Centre	08h00
	Subject 071	Ore Extraction	Contops	Shanduka Centre	08h00
	Subject 072	Engineering	Office	Shanduka Centre	08h00
	06 JUNE 2005				
	Subject 073	Ore Processing	Contops	Musina Office 182	08h00
	Subject 074	Ore Processing	Contops	Musina Office 182	08h00
	Subject 075	MRM	Contops	Musina Office 182	08h00
	08 JUNE 2005				
	Subject 076	Ore Processing	Contops	Musina Office 182	08h00
	Subject 077	Ore Processing	Contops	Musina Office 182	08h00
	Subject 078	Engineering	Contops	Musina Office 182	08h00
	10 JUNE 2005				
	Subject 079	Ore Processing	Contops	Musina Office 182	08h00
	Subject 080	Ore Processing	Contops	Musina Office 182	08h00
	Subject 081	Security	Contops	Musina Office 182	08h00
	13 JUNE 2005				
	Subject 082	Engineering	Contops	Musina Office 183	08h00
	Subject 083	Engineering	Office	Musina Office 183	08h00
	14 JUNE 2005				
	Subject 084	Ore Extraction	Contops	Shanduka Centre	08h00
	Subject 085	Engineering	Contops	Shanduka Centre	08h00
	15 JUNE 2005				
	Subject 086	Projects	Office	Shanduka Centre	08h00
	Subject 087	Projects	Office	Shanduka Centre	08h00
	Subject 088	Security	Office	Shanduka Centre	08h00



APPENDIX 6

ANTHROPOMETRIC QUESTIONNAIRE

Dietary intake, physical activity and risk for lifestyle diseases of employees at a SA open-cast mine

Subject number:

Weight: . kg . kg

Height: . cm . cm

Waist circumference:

. cm . cm

FOR OFFICE USE ONLY	
Average weight	kg
Average height	cm
Average waist circumference	cm
BMI = weight / (height X height)	

APPENDIX 7

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

Dietary intake, physical activity and risk for lifestyle diseases of employees at a SA open-cast mine

Subject number:

--	--	--

Date:

D	D	M	M	Y	Y	Y	Y
---	---	---	---	---	---	---	---

Birth date:

D	D	M	M	Y	Y	Y	Y
---	---	---	---	---	---	---	---

Please mark the appropriate box with a cross (X) in the grey area

Age:

1	2	3	4	5
18-29	30-39	40-49	50-59	60-69

Gender:

1	2
Male	Female

Location of work:

1	2
Venetia Mine	Musina offices

Race:

1	2	3	4	5
Black	White	Coloured	Indian	Other-specify

Marital status:

1	2	3	4	5	6	7
Unmarried	Married	Divorced	Separated	Widowed	Living together	Other-specify

Highest level of education:

1	2	3	4	5
High school	Diploma	Degree	Post-graduate	Other-specify

Occupational category:**X**

Top & middle Management	1	
Supervisor / Foreman	2	
Technical staff <i>(Trainer, Trainee, Officer (Geological), Officer (Environment), Officer (Hygiene), Geotechnical officer, Surveyor, Draughtsperson, Professional nurse, Information technology occupations)</i>	3	
Artisan / Technician	4	
Clerical / Admin / Security	5	
Operator (truck / dozer / shovel)	6	
Operator (other)	7	
Operative	8	

Department:**X**

Admin	1	
Engineering	2	
Human Resources	3	
Ore Extraction	4	
Ore Processing	5	
Security	6	
Capital Projects	7	

Shift configuration:

1	2
Permanent day-shift	CONTOPS

Patterson band:**X**

A-lower	1	
B-lower	2	
B-upper	3	
C-lower	4	
C-upper	5	
D-lower	6	
D-upper	7	
E-lower	8	
E-upper	9	

Do you have any of the following at home (i.e. your home where you stay when working)?

	YES	X	NO	X
Running water (tap water)	1		2	
Electricity	1		2	
Freezer	1		2	
Fridge	1		2	
Stove	1		2	
Microwave oven	1		2	

Have you been diagnosed with any of the following?

	YES	X	NO	X	NOT SURE	X
Diabetes (high blood sugar)	1		2		3	
High blood pressure	1		2		3	
High cholesterol (too much fat in your blood)	1		2		3	

Smoking habits:

1	2	3
Currently smoking	Not smoking now, but used to smoke daily	Not smoking now, never smoked before

If you are a current smoker, how often do you currently smoke?

1	2
Every day	Occasionally

If you are smoking every day, how many cigarettes do you currently smoke daily?

1	2
Less than 15	15 or more

APPENDIX 8

MEAL FREQUENCY QUESTIONNAIRE

Dietary intake, physical activity and risk for lifestyle diseases of employees at a SA open-cast mine

Subject number:

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This Questionnaire consists of two sections. **SECTION A** should be completed by permanent day shift workers (working from 8:00 – 16:00 or 7:00 – 15:00). SECTION B should be completed by CONTOPS shift workers (working from 7:00 – 19:00 and 19:00 – 7:00)

SECTION A PERMANENT DAY SHIFT WORKERS

Please answer the following questions by making a cross (X) in the grey block that most accurately describes your answer.

BREAKFAST

Breakfast is any meal eaten from 5:00 until 9:00 in the morning.

1. How often do you eat breakfast?

(a) On **work days**

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

b) On **days off (weekends)**

1	2	3
Every day	One day	Never

2. If you eat breakfast on **work days**, where do you eat breakfast most of the time?

1	2	3	4	5
At home	At workplace / worksite	At work tea / conference room	On the bus / In a vehicle at work	Other-specify

3. If you **do not** eat breakfast **at home** on **work days**, where do you obtain food most of the time?

1	2	3
Bring own food to work	Buy food at work	Other – please specify

4. If you **do not eat** breakfast on **work days**, indicate the **THREE most appropriate reasons** that prevent you from eating breakfast. *Mark with a cross (X) in the grey block next to your **THREE** choices.*

X

No meal break allowed	1	
Too little time to prepare breakfast before work	2	
Not hungry	3	
Never eat breakfast	4	
Did not bring food from home	5	
Do not have access to a refrigerator or microwave oven at work	6	
Cannot afford to buy food at the canteen	7	
Distance to the canteen is too far away / no transport available	8	
I do not like the food choices available at the canteen	9	
Other-specify	10	

MID- MORNING MEAL OR SNACK

A mid-morning meal or snack is any meal or snack eaten after 9:00 until 11:00 in the morning.

5. On **work days**, how often do you eat a **meal or snack** later in the morning before lunch?

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

6. On **work days**, how often do you **drink a beverage** (e.g. coffee, tea, fruit juice, cold drink, milk or milk drinks) later in the morning before lunch?

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

7. On days **off (weekends)**, how often do you **eat a meal or snack** later in the morning before lunch?

1	2	3
Every day	One day	Never

8. On **days off (weekends)**, how often do you **drink a beverage** (e.g. coffee, tea, fruit juice, cold drink, milk or milk drinks) later in the morning before lunch?

1	2	3
Every day	One day	Never

LUNCH

Lunch is any meal eaten after 11:00 until 14:00 in the afternoon.

9. How often do you eat lunch?

(a) On **work days**

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

(b) On **days** off (weekends)

1	2	3
Every day	One day	Never

10. If you eat lunch on **work days**, where do you eat lunch most of the time?

1	2	3	4	5
At home	At workplace / worksite	At work tea/ conference room	In a vehicle at work	Other-specify

11. If you eat lunch at **work**, where do you obtain food most of the time?

1	2	3
Bring own food to work	Buy food at work	Other – please specify

12. If you **do not eat** lunch on **work days**, indicate the ***THREE*** most **appropriate reasons** that prevent you from eating lunch. *Mark with a cross (X) in the grey area on the right next to your ***THREE*** choices*

		X
No lunch break allowed	1	
Too busy work schedule	2	
Not hungry	3	
Never eat lunch	4	
Did not bring food from home	5	
Do not have access to a refrigerator or microwave oven at work	6	
Cannot afford to buy food at the canteen	7	
Distance to the canteen is too far away / no transport available	8	
I do not like the food choices available at the canteen	9	
Other-specify	10	

MID- AFTERNOON MEAL OR SNACK

A mid-afternoon meal or snack is any meal or snack eaten after 14:00 until 17:00 in the evening.

13. On **work days**, how often do you **eat a meal or snack** later in the afternoon before dinner?

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

14. On **work days**, how often do you **drink a beverage** (e.g. coffee, tea, fruit juice, cold drink, milk or milk drinks) later in the afternoon before dinner?

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

15. On **days off (weekends)**, how often do you **eat a meal or snack** later in the afternoon before dinner?

1	2	3
Every day	One day	Never

16. On days **off (weekends)**, how often do you **drink a beverage** (e.g. coffee, tea, fruit juice, cold drink, milk or milk drinks) later in the afternoon before dinner?

1	2	3
Every day	One day	Never

DINNER

Dinner is any meal eaten after 17:00 until 21:00 in the evening.

17. How often do you eat dinner?

- (a) On **work days**

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

- (b) On **days off (weekends)**

1	2	3
Every day	One day	Never

LATE NIGHT MEAL OR SNACK

A late night meal or snack is any meal or snack eaten after 21:00 until midnight.

18. On **work days**, how often do you **eat a meal or snack** later in the evening?

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

19. On **work days**, how often do you **drink a beverage** (e.g. coffee, tea, fruit juice, cold drink, milk or milk drinks) later in the evening?

1	2	3	4	5	6
Every day	Four days	Three days	Two days	One day	Never

20. On days **off (weekends)**, how often do you **eat a meal or snack** later in the evening?

1	2	3
Every day	One day	Never

21. On **days off (weekends)**, how often do you **drink a beverage** (e.g. coffee, tea, fruit juice, cold drink, milk or milk drinks) later in the evening?

1	2	3
Every day	One day	Never



APPENDIX 9

MEAL FREQUENCY QUESTIONNAIRE

Dietary intake, physical activity and risk for lifestyle diseases of employees at a SA open-cast mine

Subject number:

This Questionnaire consists of two sections. SECTION A should be completed by permanent day shift workers (working from 8:00 – 16:00 or 7:00 – 15:00). **SECTION B should be completed by CONTOPS shift workers (working from 7:00 to 19:00 and 19:00 to 7:00)**

SECTION B CONTOPS SHIFT WORKERS

Please answer the following questions by making a cross (X) in the grey block that most accurately describes your answer.

BREAKFAST

Breakfast is any meal eaten from 5:00 until 9:00 in the morning.

1. How often do you eat breakfast on **work days**?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(a) When working **night shift**

1	2	3
On both work days	One day	Never

2. How often do you eat breakfast on **days off**?

1	2	3	4	5
On all four off days	Three days	Two days	One day	Never

3. If you eat breakfast on **work days**, where do you eat breakfast most of the time?

(a) When working **day shift**

1	2	3	4	5
At home	At workplace / worksite	At work tea / conference room	On the bus / In a vehicle at work	Other-specify

(a) When working **night shift**

1	2	3	4	5
At home	At workplace / worksite	At work tea / conference room	On the bus / In a vehicle at work	Other-specify

4. If you **do not** eat breakfast **at home** on **work days**, where do you obtain food most of the time?

(a) When working **day shift**

1	2	3
Bring own food to work	Buy food at work	Other – please specify

(b) When working **night shift**

1	2	3
Bring own food to work	Buy food at work	Other – please specify

5. If you do **not eat** breakfast on **work days**, indicate the **THREE most appropriate reasons** that prevent you from eating breakfast. *Mark with a cross (X) in the grey block next to your **THREE** choices.*

X

No meal break allowed	1	
Too little time to prepare breakfast before work	2	
Not hungry	3	
Never eat breakfast	4	
Did not bring food from home	5	
Do not have access to a refrigerator or microwave oven at work	6	
Cannot afford to buy food at the canteen	7	
Distance to the canteen is too far away / no transport available	8	
I do not like the food choices available at the canteen	9	
Other-specify	10	

MID- MORNING MEAL OR SNACK

A mid-morning meal or snack is any meal or snack eaten after 9:00 until 11:00 in the morning.

6. On **work days**, how often do you **eat a meal or snack** later in the morning before lunch?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

7. On **work days**, how often do you **drink a beverage** (e.g. coffee, tea, cold drinks, fruit juice, milk or milk drinks) later in the morning before lunch?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

8. On **days off**, how often do you eat a **meal or snack** later in the morning before lunch?

1	2	3	4	5
On all four days off	Three days	Two days	One day	Never

9. On **days off**, how often do you **drink a beverage** later in the morning before lunch?

1	2	3	4	5
On all four days off	Three days	Two days	One day	Never

LUNCH

Lunch is any meal eaten after 11:00 until 14:00 in the afternoon.

10. How often do you eat lunch **on work days**?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(a) When working **night shift**

1	2	3
On both work days	One day	Never

11. How often do you eat lunch on **days off**?

1	2	3	4	5
On all four off days	Three days	Two days	One day	Never

12. If you eat lunch on **work days**, where do you eat lunch most of the time?

(a) When working **day shift**

1	2	3	4	5
At home	At workplace / worksite	At work tea/ conference room	In a vehicle at work	Other-specify

(b) When working **night shift**

1	2	3	4	5
At home	At workplace / worksite	At work tea/ conference room	In a vehicle at work	Other-specify

13. If you **do not** eat lunch **at home** on **work days**, where do you obtain food most of the time?

(a) When working **day shift**

1	2	3
Bring own food to work	Buy food at work	Other – please specify

(b) When working **night shift**

1	2	3
Bring own food to work	Buy food at work	Other – please specify

14. If you **do not eat** lunch on **work days**, indicate the ***THREE*** most **appropriate reasons** that prevent you from eating lunch. *Mark with a cross (X) in the grey area on the right next to your ***THREE*** choices.*

		X
No lunch break allowed	1	
Too busy work schedule	2	
Not hungry	3	
Never eat lunch	4	
Did not bring food from home	5	
Do not have access to a refrigerator or microwave oven at work	6	
Cannot afford to buy food at the canteen	7	
Distance to the canteen is too far away / no transport available	8	
I do not like the food choices available at the canteen	9	
Other-specify	10	

MID - AFTERNOON MEAL OR SNACK

A mid-afternoon meal or snack is any meal or snack eaten after 14:00 until 17:00 in the evening.

15. On **work days**, how often do you **eat a meal or snack** later in the afternoon before dinner?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

16. On **work days**, how often do you **drink a beverage** (e.g. coffee, tea, cold drinks, fruit juice, milk or milk drinks) later in the afternoon before dinner?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

17. On **days off**, how often do you **eat a meal or snack** later in the afternoon before dinner?

1	2	3	4	5
On all four off days	Three days	Two days	One day	Never

18. On **days off**, how often do you **drink a beverage** (e.g. coffee, tea, cold drinks, fruit juice, milk or milk drinks) later in the afternoon before dinner?

1	2	3	4	5
On all four off days	Three days	Two days	One day	Never

DINNER

Dinner is any meal eaten after 17:00 until 21:00 in the evening.

19. How often do you eat dinner on **work days**?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

20. How often do you eat dinner on **days off**?

1	2	3	4	5
On all four off days	Three days	Two days	One day	Never

21. If you eat dinner on **work days**, where do you eat dinner most of the time?

(a) When working **day shift**

1	2	3	4	5
At home	At workplace / worksite	At work tea/ conference room	On the bus / In a vehicle at work	Other-specify

(b) When working **night shift**

1	2	3	4	5
At home	At workplace / worksite	At work tea/ conference room	On the bus / In a vehicle at work	Other-specify

22. If you **do not** eat dinner **at home** on **work days**, where do you obtain food most of the time?

(a) When working **day shift**

1	2	3
Bring own food to work	Buy food at work	Other – please specify

(b) When working **night shift**

1	2	3
Bring own food to work	Buy food at work	Other – please specify

23. If you **do not** eat dinner on **work days**, indicate the **THREE** most **appropriate reasons** that prevent you from eating dinner. *Mark with a cross (X) in the grey area on the right next to your **THREE** choices.*

X

No meal break is allowed	1	
Too busy work schedule	2	
Never eat dinner	3	
Not hungry	4	
Did not bring any food from home to eat at work	5	
Do not have access to a refrigerator or microwave oven at work	6	
Cannot afford to buy food at the canteen	7	
Distance to the canteen is too far away / no transport available	8	
I do not like the food choices available at the canteen	9	
Other-specify	10	

LATE NIGHT MEAL OR SNACK

A late night meal or snack is any meal or snack eaten after 21:00 until midnight.

24. On **work days**, how often do you **eat a meal or snack** later in the evening?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

25. On **work days**, how often do you **drink a beverage** (e.g. coffee, tea, cold drinks, fruit juice, milk or milk drinks) later in the evening?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

26. On **days off**, how often do you **eat a meal or snack** later in the evening?

1	2	3	4	5
On all four days off	Three days	Two days	One day	Never

27. On **days off**, how often do you **drink a beverage** (e.g. coffee, tea, cold drinks, fruit juice, milk or milk drinks) later in the evening?

1	2	3	4	5
On all four days off	Three days	Two days	One day	Never

EARLY MORNING MEAL OR SNACK

An early morning meal or snack is any meal or snack eaten after midnight until before 5:00 in the morning.

28. On **work days**, how often do you **eat a meal or snack** early in the morning before eating breakfast?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

29. On **work days**, how often do you **drink a beverage** (e.g. coffee, tea, cold drinks, fruit juice, milk or milk drinks) early in the morning before eating breakfast?

(a) When working **day shift**

1	2	3
On both work days	One day	Never

(b) When working **night shift**

1	2	3
On both work days	One day	Never

30. On **days off**, how often do you **eat a meal or snack** early in the morning before eating breakfast?

1	2	3	4	5
On all four days off	Three days	Two days	One day	Never

31. On **days off**, how often do you **drink a beverage** (e.g. coffee, tea, cold drinks, fruit juice, milk or milk drinks) early in the morning before eating breakfast?

1	2	3	4	5
On all four days off	Three days	Two days	One day	Never



APPENDIX 10

QUANTIFIED FOOD FREQUENCY QUESTIONNAIRE

Dietary intake, physical activity and risk for lifestyle diseases of employees at a SA-open cast mine

Subject number:

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A. Food items	B. Description of food item	C. Amount usually eaten (household measures)	D. Eaten every day	E. Eaten every week	F. Eaten at least once / month
			Times/ day	Days / week	Times / month
DAIRY					
1. Tea	(with sugar / without sugar) (with milk / without milk) <i>regular / herb / rooibos</i>	tea cup (1/2, full) / mug (1/2, full)			
1. Coffee	(with sugar / without sugar) (with milk / without milk) <i>instant / filter</i>	mug (1/2, full)			
1. Sugar in tea	<i>brown / white</i>	ts (level /heaped) / Ts (level /heaped) / Ss (level /heaped)			
1. Sugar in coffee	<i>brown / white</i>	ts (level /heaped) / Ts (level /heaped) / Ss (level /heaped)			
2. Milk in tea	<i>fresh / long-life / powder / reconstituted / blend / creamer / evaporated / condensed/ soy / goat / (WM / LFM / SM)</i>	fesh (a little / moderate / a lot), powder (ts (level/heaped), Ts (level/heaped)			
2. Milk in coffee	<i>fresh / long-life / powder / reconstituted / blend / creamer / evaporated / condensed/ soy / goat / (WM / LFM / SM)</i>	fesh (a little / moderate / a lot), powder (ts (level/heaped), Ts (level/heaped)			
2. Milk for drinking	<i>fresh / long-life / powder / blend / creamer / evaporated / condensed/ soy / goat / (WM / LFM / SM)</i>	bottle (one) / B glass (1/2, 3/4, full) / s glass (1/2, full)			
3. Buttermilk/maas	<i>buttermilk, cultured / sour milk / maas</i>	carton (med/ large) / tea cup (1/2, full) / mug (1/2, full) / B glass (1/2, 3/4, big) / s glass (1/2 / full) /			
4. Milk drinks (ready to drink)	<i>dairy fruit mix / flavoured milk / milkshake</i>	bottle (small, med, larg) / tea cup (1/2, full) / mug (1/2, full) / B glass (1/2, 3/4, big) / s glass (1/2 / full)			
4. Milk drinks (powder)	(prepared with water / prepared with milk) (with sugar / without sugar) <i>Milo / Horlicks, Nesquick / drinking chocolate (WM / LFM / SM)</i>	powder (ts (heaped /level), / Ts (heaped/level)			
5. Yoghurt	(sweetened / unsweetened) (low-fat / fat-free) <i>drinking / yoghurt (fruit / plain) / frozen joghurt</i>	container (small, med) / plastic bottle (small, med) / B glass (1/2, 3/4, full) / s glass (1/2 / full) / ts (level/heaped) / Ts (level /heaped) / s bowl (1/2, 3/4, full) / d bowl (1/2 / full)			
6. Cottage cheese	<i>fat-free / low-fat / full-fat</i>	on bread (thin, med, thick) / on cracker (thin, med, thick) / container (one) / cup (1/4, 1/2, 1, 1 1/2) / ts (level /heaped) / Ts (level /heaped) / Ss (heaped) /			
7. Hard cheese	<i>brie / camembert / cheddar / feta / gouda / mozzarella / parmesan/ reduced fat / ricotta / Roquefort</i>	grated - cup (1/4, 1/2, 1, 1 1/2) , grated - spoons (heaped ts / heaped Ts / heaped Ss) / pieces / cubes (matchbox , 1,2,3,4) / pre-cut slices			
8. Processed cheese	<i>cream cheese / cheese spread / processed wedges (full-fat / low-fat)</i>	bread (thin, med, thick) / on cracker (thin, med, thick) / cream / spread (heaped ts / heaped Ts) / cheezi / pre-cut slices			
9. Ice cream	<i>soft serve / rich / low-fat / low-fat (artificially sweeten) / sorbet (non-dairy)</i>	scoops (one, two) / ice cream cup (one) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full) / King cone (one) / Choc stick (one) / Magnum (one) / Mega (one)			
9. Ice lollies	<i>ice lolly</i>	ice lolly (one)			

A. Food Item	B. Description of food item	C. Amount usually eaten (household measures)	D. Eaten every day	E. Eaten every week	F. Eaten at least once / month
			Times/ day	Days / week	Times / month
STARCH					
1. Brown bread / rolls	<i>brown / brown (high prot) / whole-wheat / health / rye</i>	white / brown slices (thin, med, thick) / whole-wheat slices (thin, med, thick) / rye (thin / med) / health bread slices (thin, med, thick) / bunny chow (1/4 loaf)			
2. Roti	<i>roti (butter / HM / sun oil)</i>	roti (one piece)			
2. Fatcakes	<i>(with filling / without filling) vetkoek (bread / cake / whole-wheat)</i>	vetkoek (small, med, lar)			
2. Traditional bread	<i>(with margarine / without margarine) (with filling or spread / without filling or spread) pot brood (white / brown / whole-wheat) / roosterkoek</i>	roosterkoek (one piece) / potbrood slices (thin, med, thick)			
2. White bread / rolls	<i>white / white (high prot) / pita / maize meal / french loaf</i>	white / brown slices (thin, med, thick) / maize bread slices (thin, med, thick) / french loaf (thin, med, thick) / bunny chow (1/4 loaf)			
3. Breakfast cereals	<i>(with milk / without milk / with sugar / without sugar) All Bran / Corn flakes / Frosties / Fruit loops / Hi Fibre / Puffed corn / Puffed wheat (plain / sweetened) / Coco pops / Raisin Bran / Rice Crispies / Special K / Weetbix / Muesli (com / home-made) / ProNutro (Great Start/High energy / whole-wheat)</i>	s bowl (1/2, 3/4, full) / d bowl (1/2, full) / 1 serving packet / 1 Weetbix			
Milk with porridge / cereal	<i>fresh / long-life / powder / blend / creamer / evaporated / condensed/ soy / goat / (WM / LFM / SM)</i>	a little (1/4 of volume of cereal) / moderate (1/2 of volume of cereal) / a lot (equals volume of cereal)			
Sugar with porridge / cereal	<i>brown / white</i>	ts (level /heaped) / Ts (level /heaped) / Ss (level/heaped)			
4. Oats porridge	<i>(with milk / without milk / with sugar / without sugar)(with margarine / without margarine) / oats or oatmeal</i>	soft s bowl (1/2, 3/4, full) / d bowl (1/2, full) / ladle spoon (1/2 / full)			
4. Maltabella porridge	<i>(with milk / without milk / with sugar / without sugar)(with margarine / without margarine) / maltabella / Morvite</i>	soft s bowl (1/2, 3/4, full) / d bowl (1/2, full) / ladle spoon (1/2 / full)			
4. Maize & pumpkin porridge	<i>Umxhaxha</i>	soft s bowl (1/2, 3/4, full) / d bowl (1/2, full) / ladle spoon (1/2 / full)			
4. Soft maize porridge	<i>(with milk / without milk / with sugar / without sugar)</i>	soft s bowl (1/2, 3/4, full) / d bowl (1/2, full) / ladle spoon (1/2 / full)			
4. Stiff maize porridge	<i>(with milk / without milk / with sugar / without sugar)</i>	stiff cup (1/4, 1/2, 1, 1 1/2) mugs (1/4, 1/2, 3/4, full) /			
5. Pasta without sauce - macaroni & spaghetti	<i>(with sauce / without sauce / with cheese / without cheese) macaroni (plain / whole-wheat) / spaghetti (plain / whole-wheat) /</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2 / full) instant noodles (whole packet)			
5. Pasta without sauce - noodles	<i>noodles (green) / noodles (plain) / instant noodles</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2 / full) instant noodles (whole packet)			
6. Spaghetti bolognaise	<i>spaghetti bolgnaise (lean mince / reg mince)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2 / full)			
6. Macaroni & cheese	<i>(egg & custard / white sauce, LFM SM WM PUM HM)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2 / full)			
6. Lasagne	<i>(lean mince & cheese sauce / reg mince & cheese sauce)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2 / full)			
7. Rice	<i>(white / brown) (cooked / fried) / (cooked with butter / HM / PUM / sun oil) / rice & lentils</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2 / full)			
7. Samp	<i>maize rice or samp or mealie rice / samp & beans</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2 / full)			
8. Savoury tart	<i>(SM / WM / PUM / HM) savoury tart (asparagus or quiche / tuna / vienna)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
8. Pizza	<i>(with extra topping / without extra topping) / pizza (cheese & tom)</i>	pizza wedge (small / large) / pizza whole / savoury tart wedge(small, med, large)			

A. Food item	B. Description of food item	C. Amount usually eaten (in household measures)	D. Eaten every day	E. Eaten every week	F. Eaten at least once / month
			Times/ day	Days / week	Times / month
FATS					
1. Butter	<i>Butro / butter / ghee</i>	on bread (thin, med, thick) / on cracker (thin, med, thick) / ts (level, heaped) / Ts (level/heaped) / Ss (level/heaped)			
1. Brick margarine	<i>Brand name</i>	on bread (thin, med, thick) / on cracker (thin, med, thick) / ts (level, heaped) / Ts (level/heaped) / Ss (level/heaped)			
1. Tub margarine	<i>tubs / Floro</i>	on bread (thin, med, thick) / on cracker (thin, med, thick) / ts (level, heaped) / Ts (level/heaped) / Ss (level/heaped)			
2. Animal fats / white marg	<i>beef fat / lard (pork fat) / mutton fat / white margarine (Holsum / Wooden spoon)</i>	on bread (thin, med, thick) / on cracker (thin, med, thick) / ts (level/heaped) / Ts (level/heaped) / Ss (level, heaped)			
3. Cream & substitutes	(whipped / not whipped) cream (canned / fresh dessert / sour) / <i>Orley Whip</i> (non-dairy cream)	level ts / level Ts / level Ss			
4. Oils	<i>(canola / olive / palm kernel / sunflower / vegetable)</i>	level ts / level Ts / level Ss			
5. Mayonnaise	<i>mayonnaise (comm / home-made / reg / low-fat) / salad cream</i>	level ts / level Ts / level Ss			
5. Salad dressing	<i>salad dressing home-made (SM butter / SM HM / SM PUM / WM HM / WM condensed milk) / French (vinegar & s oil) / low-oil salad dressing</i>	level ts / level Ts / level Ss			
SPREADS					
1. Jam	(put on how many slices of bread?) (regular / diabetic)	on bread (thin, med, thick) / ts (level/heaped) / Ts (level/heaped)			
1. Syrup & honey	(put on how many slices of bread?)	on bread (thin, med, thick) / ts (level/heaped) / Ts (level/heaped)			
1. Chocolate spread	(put on how many slices of bread?)	on bread (thin, med, thick) / ts (level/heaped) / Ts (level/heaped)			
1. Fish paste	(put on how many slices of bread?)	on bread (thin, med, thick) / ts (level/heaped) / Ts (level/heaped)			
1. Sandwich spread	(put on how many slices of bread?)	on bread (thin, med, thick) / ts (level/heaped) / Ts (level/heaped)			
1. Bovril & Marmite	(put on how many slices of bread?) <i>Bovril or Fray Bentos / Marmite / meat & veg extract</i>	on bread (thin, med, thick) / ts (level/heaped) / Ts (level/heaped)			
1. Cheese spread	(put on how many slices of bread?)	on bread (thin, med, thick) / ts (level/heaped) / Ts (level/heaped)			
1. Peanut butter	(put on how many slices of bread?)	on bread (thin, med, thick) / ts (level/heaped) / Ts (level/heaped)			
SNACKS, SWEETS & COLD DRINKS					
1. Fizzy cold drinks	<i>Type</i>	can (small, med, lar) / B glass (1/2, 3/4, full) / s glass (1/2, full)			
1. Diet cold drinks	<i>Type</i>	can (small, med, lar) / B glass (1/2, 3/4, full) / s glass (1/2, full)			
2. Cold drinks	<i>Type</i>	tea cup (1/2, full) / mug (1/2, full) B glass (1/2, 3/4, full) / s glass (1/2, full)			
2. Energy drinks	<i>Lucozade</i>	<i>Red Bull can / Power aid bottle / Energade bottle</i>			
2. Mageu	<i>mageu</i>	tea cup (1/2, full) / mug (1/2, full) B glass (1/2, 3/4, full) / s glass (1/2, full)			
2. Squashes	<i>squash (diluted / artificially sweetened / powder) / mageu / Lucozade</i>	tea cup (1/2, full) / mug (1/2, full) B glass (1/2, 3/4, full) / s glass (1/2, full)			
3. Crisps	<i>snack savoury (e.g. Nik Naks, Fritos, Ghost pops) / Chipniks / potato crisps</i>	small packet (Chipniks / Flings / Cheese curls / Niknaks / Cheesenaks / Ghosts pops / Fritos / Soweto "niknaks") / med packet (Doritos / Kreols / Niknaks / Cheesenaks/ Lays / Simba / Fritos / Mini cheddars / large packet (Cheese puffs / Chipniks / Doritos / Flings / Kreols / Nik naks / Simba / Lays			
3. Popcorn	<i>popcom (plain / sugar coated)</i>	Soweto popcorn / popcorn (small / lar)			
4. Lollipops	<i>lollipop</i>	(one)			
4. Sweets	<i>chewing gum / coconut ice / dried fruit / fruit gum / fudge or tofee or caramel / soft jelly type / health bar / liquorice / marshmallows / peanut brittle / peppermint / Super C</i>	See additional page			
4. Chocolates	<i>chocolate (assorted centres / coated bar / coated nuts / coated raisins / dark / diabetic / Kit Kat / milk / white)</i>	See additional page			

A. Food item	B. Description of food item	C. Amount usually eaten (in household measures)	D. Eaten every day	E. Eaten every week	F. Eaten at least once / month
			Times / day	Days / week	Times / month
EGGS					
Boiled	whole (boiled / poached / curried)	med / large/ extra-large / jumbo			
Fried	in bacon fat / HM / PUM / sun oil	med / large/ extra-large / jumbo			
Omelette	milk used (LFM / WM) / marg used (PUM / HM / s oil)	thick / thin			
Scrambled	milk used (LFM / WM) / marg used (PUM / HM / s oil)	cup (1/4, 1/2, 1, 1 1/2) heaped Ts / heaped Ss			
FRUIT					
1. Apples	(with skin / without skin) (Golden Delicious / Granny Smith) / stewed (with sugar / without sugar) / applesauce	raw (small, med, large) / stewed or sauce (heaped Ts, heaped Ss) / s bowl (1/2, 3/4, full), d bowl (1/2, full)			
2. Bananas	raw (peeled) / fried in HM	raw (small, med, large) / sliced in rings Ts (level, heaped), Ts (level, heaped)			
3. Berries	blueberries (raw/canned) / cherries (raw/glazed) / gooseberries (raw/canned) / raspberries (raw/ canned) / strawberries (raw/canned)	cherries glazed (one) / gooseberry (one) / strawberry (small, med, lar) / cup (1/4, 1/2, 1, 1 1/2) / s bowl (1/2, 3/4, full) d bowl (1/2, full) / spoons (heaped Ts, heaped Ss) /			
4. Coconut, dates, figs, prickley pears	coconut (flesh / milk) / dates (raw) / figs (raw / dried / stewed without sugar / glazed) / prickley pear (raw and peeled)	fig (small, med, lar) / prickley pear (small, med, lar), coco milk (B glass (1/2, 3/4, full) / s glass (1/2, full)) coco flesh (matchbox 1.2.3.4)			
5. Fruit salad	(with sugar / without sugar) fresh with orange and banana (melon / paw-paw) / canned (in fruit juice / syrup)	heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
6. Grapes	average (raw) / sultanas (not dried)	bunch (small, med, lar)			
7. Guavas	raw (peeled) / canned in syrup / stewed (no sugar)	fresh (small, med, lar) / stewed or sauce (heaped Ts, heaped Ss) / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
8. Leechies	litchi (raw / canned)	litchi (one) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
8. Mangoes	mango (raw / canned)	mango (one)			
8. Paw-paw	paw-paw (raw & peeled)	heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
8. Kiwi	kiwi (peeled)	kiwi (one) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
9. Sweet melon	melon (yellow / green / wild)	melon wedge (small, med, lar) / melon (halve) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
9. Watermelon	watermelon	watermelon (one wedge) watermelon crown (small, med, lar) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
10. Naartjies and mineolas	mineola (raw) / naartjie (raw / canned in syrup)	naartjie / mineola (small, med, lar)			
11. Oranges	orange (raw)	orange (small, med, lar)			
11. Grapefruit	grapefruit (raw)	grapefruit half (med, lar)			
12. Nectarines	nectarines	nectarine (small, med, large) / one slice / half a medium nectarine / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
12. Peaches	raw (yellow cling / other) / canned (in syrup / in fruit juice) / dried (stewed with sugar / stewed without sugar)	peach (small, med, large) / one slice / half a medium peach / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
13. Pears	raw / canned (in fruit juice /in syrup) / dried (stewed with sugar / stewed without sugar)	pear (small, med, lar) / pear, canned (half) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
14. Pineapple	raw / glazed / canned (in syrup / in fruit juice)	pineapple ring (thin, med, thick) / heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
15. Apricots	apricots (raw) / canned (in syrup / in fruit juice) / dried (stewed with sugar/ stewed without sugar)	apricot (one) / apricots (canned)			
15. Plums	plums (raw / wild)	plum (med, lar) / stewed prunes heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
16. Dry stewed fruit	apples / apricots / figs / peach / pear / prunes (stewed with sugar/ stewed without sugar) / fruit salad (stewed with sugar / stewed without sugar)	heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
16. Dried fruit	(raw) apples / apricots / figs / peach / pear / prunes	dried apple ring (one) / dried apricot half (one) / dried fig (one) / fruit roll (one) / dried peach (slice / half / handfull) / dried pear half (one) / prunes (small / med)			
16. Raisins	raisins (hanepoot / Thompson's) / sultanas	raisins / handful cup (1/4, 1/2, 1, 1 1/2) / heaped Ts, heaped Ss/			

A. Food items	B. Description of food item	D. Amount usually eaten (in household measures)	F. Eaten every day	G. Eaten every week	H. Eaten at least once / month
			Times/ day	Days / week	Times / month
17. Fruit juice	(Type / sweetened / unsweetened) Liquifruit / Ceres / nectar / fresh / canned / reconstituted from concentrates	Liquifruit (small) / Ceres carton/ Just juice / Caprison / Clover Krush / Moni, polar icetea cup (1/2, full) / mug (1/2, full) / B glass (1/2, 3/4, full) / s glass (1/2, full) / can (small, med, lar) / plastic bottle (small, med, lar) /			
Canned fruit	apples / guavas / peaches / pears / apicots / pineapples / litchis	heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
SOUP, LEGUMES, NUTS					
1. Instant soup	average (reconstituted) / asparagus / bean with bacon / bean with beef & veg / beef & veg / boillon (beef / chicken) / chicken (cream / noodle) / cucumber / gazpacho / Jabula / lentil, beef & veg / minestrone / mushroom / onion / split pea / tomato / vegetable	soup ladle (full) / tea cup (1/2, full) / mug (1/2, full) / s bowl (1/2, 3/4, full) / d bowl (1/2, full)/			
1. Meat, veg & bean soup	average (reconstituted) / asparagus / bean with bacon / bean with beef & veg / beef & veg / boillon (beef / chicken) / chicken (cream / noodle) / cucumber / gazpacho / Jabula / lentil, beef & veg / minestrone / mushroom / onion / split pea / tomato / vegetable	soup ladle (full) / tea cup (1/2, full) / mug (1/2, full) / s bowl (1/2, 3/4, full) / d bowl (1/2, full)/			
2. Beans and legumes	(not dried / dried) (cooked / cooked with potato, onion, HM / PUM) beans (baked beans / sousbone / sugar beans / haricot / white kidney) / bean sprouts lentils / chick peas	cup (1/4, 1/2, 1, 1 1/2) / spoons (heaped Ts, heaped Ss) / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
3. Peanuts	peanuts	packet (small, med) / handful (small / lar) / cup (1/4, 1/2, 1, 1 1/2)			
3. Nuts and seeds	almonds / brazil / cashew / hazel / mixed / pine / pistachio / pumpkin / walnuts	packet (small, med) / handful (small / lar) / cup (1/4, 1/2, 1, 1 1/2)			
FISH AND SEAFOOD					
1. Calamari	calamari (fried in s oil)	calamari (fried / grilled rings) cup (1/2, 3/4, 1, 1 1/2)			
1. Fish cakes	fish cake (com fried / fried in s oil)	fish cake (one)			
1. Fish fingers	fish finger	fish finger (one)			
1. Fried fish in batter	fatty fish fried in s oil / fish low fat (battered & fried in s oil / fried in s oil) / fish med fat (battered & fried in s oil / fried in HM / fried in s oil) /sole (crumbed, fried in s oil)	fish (fried) matchbox (1,2,3,4)			
2. Grilled fish	sole (grilled) / trout, rainbow (grilled) / high fat (grilled) / low-fat (grilled) / med-fat (grilled)	sole (small)			
2. Haddock	haddock	sole (small)			
3. Pickled fish	Fatty = herring, butterfish, mackerel and salmon / med = galjoen, harder, pilchards, shad, snoek, trout, tuna, yellowtail / low = sole, cob, kabeljou, kingklip, hake, geelbek	can (one) / cup (1/2, 3/4, 1, 1 1/2)			
3. Pilchards	(mayo added / no mayo) pilchards (in brine/ in tomato sauce) / sardines (in oil / in tomato sauce)	sardine (whole) / pilchards piece (one)			
3. Tuna	(mayo added / no mayo added) tuna (in oil / in fish oil / in water)	can (one) / cup (1/2, 3/4, 1, 1 1/2)			
MEAT					
1. Roast beef	(with fat / without fat)	See cold meat roast beef slice (one)			
1. Beef stir fry	(with fat / without fat)	beef pieces matchbox (1,2,3,4)			
1. Beef steak	(with fat / without fat) rump / fillet	matchbox (1,2,3,4)			
1. Beef steak	(with fat / without fat) t-bone	T-bone No picture			
1. Beef chops	(with fat / without fat) beef (brisket / chuck / loin / neck / rib (prime / wing) / silverside / shoulder)	Loin chop (smal / med) / rib chop (small, med) / rib chop (one) / leg chop (one)			
1. Beef stew	with carrots	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
1. Beef stew	with cabbage	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			

A. Food items	B. Description of food item	C. Amount usually eaten (in household measures)	D. Eaten every day	E. Eaten every week	F. Eaten at least once / month
			Times/ day	Days / week	Times / month
1. Beef mince	<i>beef mince (regular, savoury / topside) / bobotie / ostrich mince</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
2. Cottage pie	<i>cottage pie</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
2. Meat balls	<i>meatball (with egg, without egg)</i>	meatball (small, med, lar)			
3. Beef patties	<i>(crumbed / not crumbed) beef patty (grilled)</i>	beef patty (thin, med, thick) / patty (Wimpy, Spur, Steers, rave, Nandos, BJ's)			
3. Pita	<i>pita bread</i>	pita bread (one)			
3. Hamburger	<i>hamburger bun</i>	burger bun (one)			
3. Hotdog	<i>hotdog roll</i>	hotdog roll (one)			
3. Chicken nuggets	<i>chicken nuggets</i>	nuggets(small)			
3. Chicken take away	<i>Nandos / KFC</i>	Nandos chicken strips / KFC (Rounder, drumstick, thigh, breast centre / side, wing)			
3. Chicken burger	<i>chicken patty</i>	chicken patty (one)			
4. Roast chicken	<i>roast chicken</i>	whole chicken (med) / half chicken (med) / chicken breast (med) / drumstick (med) / wing (med) / thigh (med)			
4. Fried chicken pieces	<i>(pan fry / deep fry) battered dipped fried chicken</i>	whole chicken (med) / half chicken (med) / chicken breast (med) / drumstick (med) / wing (med) / thigh (med)			
4. Chicken stew	<i>(grill / boil / bake) chicken (batter dipped & fried / curry)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
4. Chicken stir fry	<i>(with skin / without skin) (fresh / frozen) (dark meat/ white meat) (pan fry / deep fry)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
4. Chicken schnitzel	<i>(pan fry / deep fry) battered dipped fried chicken</i>	chicken breast (med) / drumstick (med) / wing (med) / thigh (med)			
5. Polony	<i>polony</i>	matchbox (2 x , 4 x) Also see sketches			
5. Ham	<i>ham sliced (lean / regular)</i>	matchbox (2 x , 4 x) Also see sketches			
5. Salami	<i>salami</i>	matchbox (2 x , 4 x) Also see sketches			
6. Fat cake & mince	<i>fat cake (bread / cake/ whole-wheat)</i>	fat cake (small, med, lar)			
6. Bunny chow & fat cake fillings	<i>See other meat codes / beef mince (reg, savoury / topside) / cheddar / cheese (red fat) / gouda / ham sliced (lean / reg) / polony / salami / Vienna</i>				
7. Samosas	<i>samosa (mutton filling / veg filling)</i>	samosa (small, lar)			
7. Pies	<i>pie (chicken / Cornish / steak & kidney)</i>	pie (cocktail, small, med)			
7. Sausage rolls	<i>sausage roll</i>	sausage roll (small, large)			
7. Springrolls	<i>springroll</i>	springroll (one)			
8. Roast mutton	<i>(with fat / without fat)</i>	See cold meat roast mutton slice (one)			
8. Mutton loin chop / rib chop	<i>(with fat / without fat) (roast / pan fry / deep fry / grill / boil) / loin chop</i>	loin chop (small, med) / rib chop (small, med)			

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			Times / day	Days / week	Times / month
8. Mutton leg chop	(with fat / without fat) (roast / pan fry / deep fry / grill / boil) <i>leg / leg and shoulder</i>	leg chop (one piece)			
8. Mutton stew without vegetables	<i>no vegetables</i>	stew cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
8. Mutton stew with vegetables	which vegetables added?	stew cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
9. Bacon	<i>(fried / not fried)</i>	rasher bacon (one)			
9. Pork chops	(with fat / wouthout fat / crumbed)	loin chop (one piece)			
9. Roast pork	(with fat / without fat)	See cold meat roast pork slice (one)			
9. Spare ribs	<i>(grilled / fried)</i>	spare ribs (3 ribs)			
10. Boerewors	<i>(grilled / boiled / fried)</i>	Boerewors (thin, thick)			
10. Pork sausages	<i>(grilled / boiled / fried)</i>	pork sausage (one)			
10. Vienas	<i>(fried / boiled)</i>	Vienna or frankfurter (small, med, lar)			
10. Frankfurters	<i>(beef / pork / chicken)</i>	Vienna or frankfurter (small, med, lar)			
11. Chicken livers		chicken liver (one) /cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
11. Mopani worms	<i>mopani worms (dried / canned)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
11. Liver & fat	<i>kidney(beef / lamb or sheep) / liver (beef / sheep)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / sheep liver (one) / beef liver (one)			
11. Pork shank	<i>pork trotters</i>	pork trotter (one)			
11. Sheep intestines & lungs	<i>offal (cooked / curried) / tongue (beef / sheep or lamb) / tripe-stomach & intestines (beef)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
11. Chicken organ meats	<i>(liver / kidney / heart / stomach)</i>	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / chicken stomach (one) / chicken heart (one) / chicken neck (one)			
11. Chicken head & feet	<i>chicken (feet / giblets (cooked / curried) / heads</i>	chicken feet (both) / chicken head (one)			
12. Vegetarian products	<i>soy mince / soy milk / tofu (raw / fried)</i>	soy mince & other prot cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / soy milk tea cup (1/2, full)/ mug (1/2, full)/ B glass (1/2, 3/4, full) / s glass (1/2, full)			
13. Biltong	<i>biltong (beef / ostrich / game)</i>	100 g biltong / loose handful			
13. Droë wors	<i>droë wors</i>	1 sausage			

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VEGETABLES			Times/ day	Days / week	Times / month
1. Asparagus	(with sauce / without sauce / with fat / without fat) green (boiled) / white (canned)	pieces cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss/ whole (one piece)			
2. Avocado pear	raw (peeled)	mashed on bread (thin, med, thick) / on round bun (thin, med, thick) / medium size (1/4, 1/2, whole)			
3. Baby marrows & patty pans	(with sauce / without sauce / with HM PUM s oil / without fat) baby marrow (fresh / frozen) (boiled) / patty pans (boiled)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
4. Beetroot	boiled / salad (sliced / grated) (with vinegar / with sugar)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
5. Butternut and pumpkin	(with sugar / without sugar / with HM PUM / without fat / baked with breadcrumbs) butternut / hubbard / pumpkin / queen squash (boiled)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
6. Broccoli	(fresh / frozen) (with HM PUM / without fat / with cheese / without cheese)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
6. Cauliflower	(fresh / frozen) (with HM PUM / without fat / with cheese / without cheese)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
6. Brussel sprouts	(fresh / frozen) (with HM PUM / without fat / with cheese / without cheese)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
7. Cabbage	raw / boiled / cooked with pot, onion & HM / cooked with pot, onion & s oil / first fried in HM / first fried in s oil / raw / red (boiled / raw) / salad (mayonnaise / commercial)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
8. Carrots	(fresh / frozen / canned) (boiled only / cooked with pot & onion / candied) (HM / PUM / s oil / no shortening) (with sugar / without sugar) raw (boiled/ with sugar) / salad (pineapple & orange / orange juice)	small carrot (one) / cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss /			
9. Gem squash	boiled / boiled with sugar	gem squash (small, med, lar) / cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
10. Green beans	(fresh / frozen / canned) (boiled only/ cooked with pot & onion) (HM / PUM / s oil / no shortening)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
11. Mealies	(eaten with HM / PUM / butter / no fat added) mealies baby (boiled / canned) / sweetcorn (cream style canned / whole kernels canned / frozen kernels boiled / fritters)	mealie whole (med) / cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / baby mealie / mealie fritter (small, med)			
12. Mixed vegetables	(fresh / frozen / canned) (raw / boiled / stir-fry) (no fat / HM / PUM / s oil) (cauliflower, carrot & green beans / carrot, corn, peas & green beans)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
13. Mushrooms & brinjals	brinjal (boiled / fried) (dipped in egg / HM / s oil) / brinjal (with green pepper, tom, onion) / mushrooms (canned / fried in HM / fried in s oil) / boiled)	brinjal (one slice) / cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
14. Peas	(fresh / frozen / canned) (raw / boiled) (HM only / sugar only / HM & sugar) / split peas (cooked / with spices & fried in s oil) / peas in pod / peas & carrots	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
15. Roasted potatoes	(roasted in beef fat / in chicken fat / in lamb fat / in pork fat / in s oil)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
15. Potato salad	salad (with mayo)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
15. Mashed potatoes	(fresh / frozen / canned) (HM/ PUM / fried in s oil) (SM / WM)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
16. Boiled & baked potatoes	(fresh / frozen / canned) (boiled / baked / microwave) / (flesh & skin / flesh only) (with sour cream & chives)	potato (small, med, large)			
16. Potato chips	fried in s oil / baked in oven	cup (1/4, 1/2, 1, 1 1/2) / Macdonald's (small, med, lar, x-lar) / Spur side portion / Steers / Wimpy side plate / KFC / Nando's			
17. Cucumber	cucumber (english / reg)	cup (1/4, 1/2, 1, 1 1/2)			
17. Peppers	green pepper (boiled / cooked with tom, onion & s oil / raw) / red pepper (boiled / raw) / yellow pepper (raw)	cup (1/4, 1/2, 1, 1 1/2)			
17. Mixed salad	salad (Greek / mixed veg / mixed green) (with salad dressing / without salad dressing) / celery (boiled / raw) / ettuce / onion (fried in HM / fried in s oil / raw / batter coated & fried in s oil) / onion rings / tomato (raw / raw with sugar / sundried)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss / cucumber (med slice) / lettuce leaf (med) / celery stick / baby mealie (small / med)			
18. Spinach, beetroot leaves and pumpkin leaves	(boiled / raw) (HM / PUM / s oil /) (boiled only / cooked with pot & onion) beetroot leaves / pumpkin leaves/ spinach (small leaved / swiss chard)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
19. Sweet potatoes	(with sugar / without sugar) (fresh / frozen) (baked with skin / boiled without skin / candied with HM)	sweet potato (med, lar) / cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
20. Tomatoes	tomato (raw / raw with sugar / sundried / canned) / tom & onion (canned (no sugar) / tomato fried (in bacon fat / in HM / in s oil)	tomato (small, med, lar) / cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			
21. Tomato & onion stew	tom & onion (canned / stewed (no sugar) / stewed (with sugar)	cup (1/4, 1/2, 1, 1 1/2) / heaped Ts / heaped Ss			

A.Food item	B.Description of food item	C. Amount usually eaten (in household measures)	D. Eaten every day	E. Eaten every week	F. Eaten at least once / month
BISCUITS, CAKE & PUDDING			Times/day	Days/week	Times/month
1. Biscuits / cookies	<i>cookies (commercial / homemade) (plain / with filling / with jam filling) / dried fruit fridge</i> Comm plain = Digestives, Marie, Tennis / Comm shortbread = Eet-Sum More / Comm with filling = lemon Creams, Romany creams	Comm plain (one) / Comm s/bread (one) / Comm + filling (one) / Digest (one) / h-made plain (one) / h-made + jam filling (rectangul/square/coffee cookie) / h-made oats (finger / square small / square lar) / dried fruit biscuits (rectangul/ small square / lar square)			
2. Biscuits / savoury	(with spread / without spread) high fat (Tuc, Bacon kips) / <i>whole-wheat</i> (Harvest wheat) / <i>Cream crackers / Provita / Ry-vita</i>	Bacon Kips / Bran-S / Cheddars / Cheese straws / Cream cracker / Provita / Ritz / Salticrax / Tuc			
3. Special buns	(with spread / without spread) bun (<i>hot cross / Copenhagen, Danish, raisin</i>) / <i>croissants</i>	croissant (small, med) / Hot cross or Copenhagen bun			
3. Scones	(with spread / without spread) / (LFM & HM / SM & s oil / WM & HM)	scone (small, med, lar)			
3. Muffins	(with spread / without spread/ muffin (bran / oat bran/ plain)	muffin (small, med, lar)			
4. Tart	<i>tart (apple pie / coconut pie / cottage cheese/ fruit chiffon / ginger / jam / lemon / milk tart / jam tartlet / tippy tart)</i>	apple tart wedge / milk tart wedge / tartlet / slice tart / pie (small, med)			
4. Cake	<i>cake</i> (butter / carrot / cheese / chocolate / fruit / Madeira / plain / sponge)	butter cake (rectangular) / sponge cake / cheese cake (baked / fridge) / slice cake (one layer /double layer) / cup cake (one)			
5. Eclairs	<i>éclair</i> (<i>with chocolate icing & fresh cream filling</i>)	éclair (one)			
5. Koeksisters	<i>koeksister</i>	koeksister (2 twists / 3 twists)			
5. Doughnuts	<i>doughnut</i> (jam / plain / with icing)	doughnut round (with jam / no jam) / long doughnut (filled / unfilled)			
6. Waffles	(with syrup/ without syrup) (with ice cream / without ice cream) / (with cream / without cream)	waffle (1/4 , whole)			
6. Pancakes and crumpets	(with filling / without filling) (with sugar / without sugar) pancake / crumpet (LFM / SM / WM) (s oil)	pancake (small, med)/ crumpet (one)			
7. Trifle	<i>jelly dessert</i> (with water / with fruit)	heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
7. Baked pudding	(custard added / cream added / sauce added / nothing added) (LFM / WM / SM) (PUM / HM) pudding (apple crumble / baked pudding no syrup / bread, rice or sago /baked in syrup)	heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
7. Instant pudding	instant	heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
7. Custard	<i>custard</i> (baked / made with powder / custard slice) / <i>jelly dessert</i> (with water / with fruit) / / <i>pineapple whip / blancmange</i> (plain / chocolate)	heaped Ts / heaped Ss / s bowl (1/2, 3/4, full) / d bowl (1/2, full)			
8. Rusks	(commercial / home-made) (with sugar / without sugar) bran / buttermilk / boerebeskuit / all bran / whole-wheat / white	rusk commercial (small, med) / rusk home-made (small, med)			
9. Special non-savoury breads	(with spread / without spread) (LFM / SM / WM) (PUM / HM) banana loaf / date loaf / ginger bread / raisin bread	slice (thin / thick)			

A.Food item	B>Description of food item	C.Amount usually eaten (in household measures)	D. Eaten every day	E. Eaten every week	F. Eaten at least once / month
SAUCES & CONDIMENTS			Times/ day	Days / week	Times / month
1. Cheese sauce	(LFM / SM / WM) (PUM / HM)	heaped ts / heaped Ts			
1. White sauce	(LFM / SM / WM) (PUM / HM)	heaped ts / heaped Ts			
2. Tomato sauce	<i>tomato sauce</i>	a little = scattered , biggest part of food not covered / med =biggest part of food covered / a lot = drenched in sauce / ts (heaped / level) / Ts (heaped / level)			
2. Chutney	<i>chutney (fruit / tomato)</i>	a little = scattered , biggest part of food not covered / med =biggest part of food covered / a lot = drenched in sauce / ts (heaped / level) / Ts (heaped / level)			
2. Atchar	<i>atchar</i>	a little = scattered , biggest part of food not covered / med =biggest part of food covered / a lot = drenched in sauce / ts (heaped / level) / Ts (heaped / level)			
2. Chakalaka		a little = scattered , biggest part of food not covered / med =biggest part of food covered / a lot = drenched in sauce / ts (heaped / level) / Ts (heaped / level)			
3. Salt	<i>table salt</i>	ts (heaped / level)			
3. Flavouring agents	<i>gravy powder / Aromat (fondor) /soya sauce / salt</i> (onion, garlic & herbs / BBQ spices)	ts (heaped / level)			
Other sauces / gravy	<i>meat gravy</i> (made with powder / made with stock unthickened / made with stock thickened) / <i>sausages</i> (BBQ / curry / jam / monkey gland / orange/ mushroom / mustard / soy / sweet sour	a little = scattered , biggest part of food not covered / med =biggest part of food covered / a lot = drenched in sauce / ts (heaped / level) / Ts (heaped / level)			
ALCOHOLIC DRINKS					
1. Coolers	<i>Type</i>	bottle (one) / B glass (1/2, 3/4, full) / s glass (1/2, full)			
1. Beer & traditional beer	<i>beer (light / regular / sorghum or traditional / stout)</i>	dumpy / sorghum beer (large carton) / can ("Long Tom" / med) / B glass (1/2, 3/4, full) / s glass (1/2, full)			
1. Ciders	<i>Type</i>	bottle (one) / B glass (1/2, 3/4, full) / s glass (1/2, full)			
2. Wine	(white / red / rose) / <i>wine / flavoured grape liquor or wine mix</i>	wine bottle (regular, half) / wine glass (small / med) / B glass (1/2, 3/4, full) / s glass (1/2, full) /			
2. Sparkling wine	<i>champaigne</i>	wine bottle (regular, half) / wine glass (small / med) / B glass (1/2, 3/4, full) / s glass (1/2, full) /			
3. Spirits (brandy, gin, whiskey, cane)	(with mixers / without mixers) / <i>Coke / tonic / lemonade / bitter lemon / fruit juice / tom juice</i>	tot (metric / non-metric) / miniature bottle / nippy / half-jack / B glass (1/2, 3/4, full) / s glass (1/2, full)			
4. Liqueurs and fortified wines	<i>liquor</i> (regular / with cream) / <i>sherry, vermouth</i> (dry) / <i>sherry, port or muscadel</i> (sweet)	sherry bottle / sherry glass / liquor glass / B glass (1/2, 3/4, full) / s glass (1/2, full)			

APPENDIX 11

HABITUAL PHYSICAL ACTIVITY QUESTIONNAIRE

Dietary intake, physical activity and risk for lifestyle diseases of employees at a SA open-cast mine

Subject number:

Please answer the following questions by making a cross (X) in the grey block that most accurately describes your answer.

SCOPE OF PHYSICAL WORK			X
1. What is the degree of physical labour related to your job?	No hard physical labour	1	
	1-4 hours of physical labour per day	2	
	More than 5 hours of physical labour per day	3	

WORK INDEX			X
1. What is your main occupation	Manager, supervisor, foreman, clerical work, security officer, operator, any other occupation requiring a tertiary qualification	1	
	Technician, artisan, operative	3	
2. At work I sit	Never	1	
	Seldom	2	
	Sometimes	3	
	Often	4	
	Always	5	
3. At work I stand	Never	1	
	Seldom	2	
	Sometimes	3	
	Often	4	
	Always	5	
4. At work I walk	Never	1	
	Seldom	2	
	Sometimes	3	
	Often	4	
	Always	5	
5. At work I lift heavy loads	Never	1	
	Seldom	2	
	Sometimes	3	
	Often	4	
	Always	5	
6. After work I'm tired (physically)	Very often	5	
	Often	4	
	Sometimes	3	
	Seldom	2	
	Never	1	
7. At work I sweat	Very often	5	

	Often	4	
	Sometimes	3	
	Seldom	2	
	Never	1	
8. In comparison to others of my own age I think my work is physically	Much heavier	5	
	Heavier	4	
	As heavy	3	
	Lighter	2	
	Much lighter	1	

FOR OFFICE USE ONLY		
Calculate work index	$\frac{[(6 - (\text{points for sitting})) + \sum(\text{points for other 7 parameters})]}{8}$	

SPORT INDEX				X
9. Do you play sports	Yes			
	No (go directly to question 10)			
If YES , please answer the following questions by making a cross (X) in grey block next to the answer that most accurately describes your sport activities.				
a) What sport do you play <u>most</u> frequently?	Billiards, bowling, sailing, golf	LI	0.76	
	Cycling, dancing, swimming, tennis, squash	MI	1.26	
	Boxing, soccer, rugby, rowing	HI	1.76	
	Other:			
b) How many hours do you play your most frequent sport in a week?	Less than 1 hour		0.5	
	1-2 hours		1.5	
	2-3 hours		2.5	
	3-4 hours		3.5	
	More than 4 hours		4.5	
c) How many months do you play your most frequent sport in a year?	Less than 1 month		0.04	
	1-3 months		0.17	
	4-6 months		0.42	
	7-9 months		0.67	
	More than 9 months		0.92	
d) What sport do you play <u>second most</u> frequently?	Billiards, bowling, sailing, golf	LI	0.76	
	Cycling, dancing, swimming, tennis, squash	MI	1.26	
	Boxing, soccer, rugby, rowing	HI	1.76	
	Other			
e) How many hours do you play your second most frequent sport in a week?	Less than 1 hour		0.5	
	1-2 hour		1.5	
	2-3 hours		2.5	
	3-4 hours		3.5	
	More than 4 hours		4.5	
f) How many months do you play your second most frequent sport in a year?	Less than 1 month		0.04	
	1-3 months		0.17	
	4-6 months		0.42	
	7-9 months		0.67	
	More than 9 months		0.92	

FOR OFFICE USE ONLY		
<i>Calculate simple sport score</i>	<i>(a) + (b) + (c) + (d) + (e) + (f)</i>	
Simple Sport Score (9)	<i>Sport score ≥ 12</i>	5
	<i>Sport score 8 to < 12</i>	4
	<i>Sport score 4 to < 8</i>	3
	<i>Sport score 0.1 to < 4</i>	2
	<i>Sport score = 0</i>	1
	<i>No</i>	1

			X
10. In comparison with others of my own age I think my physical activity during leisure time is	Much more	5	
	More	4	
	The same	3	
	Less	2	
	Much less	1	
11. During leisure time I sweat	Very often	5	
	Often	4	
	Sometimes	3	
	Seldom	2	
	Never	1	
12. During leisure time I play sports	Never	1	
	Seldom	2	
	Sometimes	3	
	Often	4	
	Very often	5	

LEISURE INDEX			X
13. During leisure time I watch television	Never	1	
	Seldom	2	
	Sometimes	3	
	Often	4	
	Very often	5	
14. During leisure time I walk	Never	1	
	Seldom	2	
	Sometimes	3	
	Often	4	
	Very often	5	
15. During leisure time I cycle	Never	1	
	Seldom	2	
	Sometimes	3	
	Often	4	
	Very often	5	
16. How many minutes do you walk and/or cycle per day to and from work and shopping?	Less than 5 minutes	1	
	5-15 minutes	2	
	15-30 minutes	3	
	30-45 minutes	4	
	More than 45 minutes	5	

FOR OFFICE USE ONLY		
Calculate Leisure Index	$[6 - (\text{points for watching television})] + \sum (\text{remaining 3 items}) / 4$	

FOR OFFICE USE ONLY	
Work Index	
Sport Index	
Leisure Index	
TOTAL Activity Index	

BARRIERS TO EXERCISE		
<p>17. If you are not physically active during leisure time, indicate the THREE most appropriate reasons that prevent you from engaging in physical activity during leisure time. Mark with a cross (X), in the grey block next to your THREE choices.</p>		
		X
Already physically active at work / prefer not being physically active during leisure time	1	
Lack of time due to work demands	2	
Lack of time due to family commitments	3	
Regularly working overtime	4	
Working shifts	5	
Leave too early for work / get home too late	6	
Too tired to exercise after work / haven't got the energy	7	
Do not enjoy exercising / not the sporty type / too inconvenient to exercise	8	
Too self-conscious / shy/ embarrassed / too fat to exercise	9	
Lack motivation to exercise / too lazy / can't get started / never persist	10	
Don't have the right clothes or equipment / facilities to exercise	11	
Can't exercise because of poor health / an injury / disability	12	
Has nobody to exercise with	13	
Too old to exercise	14	
Other please specify:	15	