THE PREVALENCE OF CHRONIC CONDITIONS ASSOCIATED WITH MODIFIABLE HEALTH RISK FACTORS IN CORPORATE EMPLOYEES IN SOUTH AFRICA

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ABSTRACT
The Sunday Times Discovery Healthiest Company Index Survey collected a dataset of 13 578 responses from corporate employees in 101 companies. This dataset has been used to assess the prevalence of self-reported modifiable health risk factors and the association with chronic conditions. The analysis indicates that there is a greater likelihood of an individual reporting a chronic condition where their lifestyle risk factors are outside of the healthy range.

KEYWORDS
Chronic condition, disease management programme, modifiable health risk factors.

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1. INTRODUCTION

1.1 Chronic diseases, particularly non-communicable chronic diseases related to lifestyle pose a huge and increasing global problem. These diseases such as hypertension, type-2-diabetes, dyslipidemia and certain cancers are the leading causes of morbidity and mortality, not only in developed countries but even more so in developing countries.

1.2 The World Health Organisation (WHO, 2002) has noted that the majority of deaths and disability cases worldwide are a result of chronic conditions. “Chronic” refers to a condition that is long lasting or recurrent, with long lasting defined as a period longer than three months (WHO, 2002a).

1.3 As the prevalence of these diseases continue to grow in the future, these conditions will claim many more lives. In 2005, Strong et al. (2005) established that of the 58 million deaths expected worldwide, approximately 35 million deaths were related to chronic conditions. Furthermore, he predicted that in the ten years subsequent to the study, 388 million people will die because of these diseases.

1.4 By the year 2020, forecasts done by the WHO show that 73% of all deaths will be attributable to chronic conditions if current trends continue (WHO, 2005). Additionally, mortality will primarily occur in the age groups that are economically active and most productive.

1.5 Steyn (2006) reported that the magnitude and implications of chronic conditions are not widely acknowledged in South Africa. Most resources are allocated to other

diseases, implying that in the future, the burden attributable to these conditions will be much greater than that experienced in developed countries.

1.6 Bradshaw et al. (2003) estimated that chronic diseases account for almost 40% of adult deaths in South Africa. Of the five hundred thousand deaths that occurred in the year 2000, the South African National Burden of Disease Study claimed that 37% were due to chronic conditions, excluding AIDS. HIV and AIDS alone caused 30% of all deaths, injuries accounted for 12% of deaths and 21% were caused by infectious diseases and underdevelopment.

1.7 Chronic diseases are the main cause of the disease burden in individuals' aged 60 years and older in South Africa. In 2000, chronics caused almost 84% of deaths in this age group (Bradshaw et al, 2003).

2. RISK FACTORS

2.1 Healthy lifestyle behaviors, which include regular physical activity and good nutrition, have been associated with longevity (Abegunde & Stanciole, 2006). As diet and exercise have been identified as risk factors for non-communicable diseases, the prevalence of these diseases can be attenuated by modifying these behaviours (WHO, 2005 and Steyn, 2006).

2.2 Other elements of an unhealthy lifestyle that contribute to the onset of chronic conditions are prolonged tobacco usage and alcohol consumption (Steyn, 2006).

2.3 Although the significance of each risk factor varies by region and culture, Khatib (2004) suggests that on a global scale, the modifiable factors account for 75% of the disease burden.

2.4 NUTRITION

2.4.1 With increasing industrialisation, urbanisation and economic development, there have been changes in the way in which food is produced, packaged and labelled. Extensive advertising campaigns and marketing techniques have found that fatty, refined, sweet and salty foods are more profitable than healthier alternatives, and this finding has led to fast food outlets becoming increasingly popular in developing countries (Steyn, 2006 and WHO, 2001).

2.4.2 In South Africa, and other African regions, the African diet has been sidelined by the western diet, resulting in a change in the nutrition patterns of Africans. This change is well documented in studies by Tanner & Lukmanji (1987) and MacIntyre et al. (2002). They found that the traditional African rural diet comprises of a high carbohydrate component, low fat intake and large amounts of plant protein. This is in contrast to western diets which are associated and categorised by high levels of saturated fats, high levels of sugar, salt and alcohol intake and low fruit, vegetable, fibre and vitamin intake.

2.4.3 Recent research by the World Health Organisation (WHO, 2006) pointed out the following undesirable trends in the South African diet:

- Low fruit and vegetable intake, which equates to low fibre intake
- Increases in energy intake, fat intake and alcohol consumption and
- Decreased milk consumption.

2.4.4 Fruit and vegetables are an essential part of a balanced diet. They help to prevent many diseases and cancers (particularly those relating to the digestive tract) because they contain antioxidants, fibre (which maintains a healthy digestive system) and nutrients which suppress the action of carcinogens (WHO, 2006).

2.4.5 Results from analyses conducted by the WHO suggest that almost 2.7 million deaths annually can be attributed purely to low fruit and vegetable intake. In developed countries, this accounts for 3.9% of the total disease burden (WHO, 2006).

2.5 ALCOHOL

2.5.1 Globally, Europeans are the leading alcohol consumers and further rises in consumption are expected (WHO, 2002). In developed countries, it is estimated that 9.2% of the disease burden arises from alcohol use.

2.6 SMOKING

2.6.1 Smoking affects sickness and death rates at all ages (WHO, 2002). In 2000, approximately 4.83 million deaths worldwide were attributed to cigarette smoking. Of these, 2.43 million deaths occurred in industrialised countries, and 2.41 million occurred in low and middle-income countries. This accounts for 12% of adult global mortality (Ezzati & Lopez, 2003)

2.6.2 In the Americas, research by the WHO shows that tobacco usage is the leading cause of avoidable deaths. It is estimated that a third of all deaths from heart disease and cancer are tobacco-related. Saloojee (2006) generalises this idea by claiming that this finding is reaffirmed by results of mortality investigations in most developed nations. Results show that smoking related deaths in developed nations primarily result from lung cancer and cardiovascular disease.

2.6.3 Case studies, for example by Mzileni et al. (1999) and Pacella-Norman et al. (2002) have found a significant relationship between smoking and the onset of lung, oesophageal and oral cancer. If people stopped smoking, Saloojee (2006) suggests that 58% of all lung cancer deaths, 37% of deaths from chronic obstructive pulmonary disease, 20% of tuberculosis deaths and 23% of all vascular deaths can be prevented. Upon termination of smoking, there is a substantial drop in mortality and morbidity as time progresses.

2.6.4 Smoking prevalence varies by country, gender, race and socioeconomic group. The number of people that consume tobacco products, together with the amount that is consumed jointly provides an indication of tobacco use. Whilst cigarettes are a popular instrument for tobacco consumption, in most of Africa, snuff is a tobacco product

that is commonly used. In South Africa, Steyn et al. (2002) found that black women are more likely to use snuff than smoke cigarettes. Ayo-Yusuf et al. (2004) found that in some cases, commercial snuff can be as potent as smoking twenty cigarettes daily. Furthermore, quitting snuff may be as difficult as quitting smoking.

2.6.5 Urbanisation in developing countries is another factor that has led to many more poor people engaging in smoking. In this regard, some research has been done. Levitt (1993) and Steyn (1997) established that women residing in urban South Africa were more likely to smoke.

2.6.6 Fortunately, in South Africa, tobacco usage is decreasing. Over the last decade, strong government commitment and community support has ensured that tobacco use has successfully been restrained (Saloojee, 2006).

2.6.7 In surveys implemented by the South African Advertising and Research Foundation, it was found that smoking rates in adults fell by twenty percent in the period from 1995 to 2004. Almost 2.5 million individuals stopped smoking during this period. Saloojee (2006) reported that over the ten-year period from 1993 to 2003, cigarette consumption decreased by 33% (from 1.8 billion packs annually to 1.2 billion packs). The per capita consumption decreased overall, because the population had grown over the period.

2.6.8 Of all South African adults, between 20% and 25% smoke, according to Ayo-Yusuf (2004) and Steyn et al. (2002). Steyn et al. (2002) found that approximately 57% of adult coloured males in South Africa smoke. This is followed by a 47.7% prevalence rate in Indian males. Of all females, coloured female adults smoke most commonly, with a 40% prevalence rate. Of all other ethnic groups, the incidence rate amongst white females was the next highest, equalling 23.2%. Despite the statistics above, it was found that the white community smoked most heavily, with an average of 18 cigarettes smoked daily. Indians smoke about 11 daily, coloureds, 9 and blacks, 7. On average, when compared to men, women smoke about two cigarettes less each day.

2.7 PHYSICAL INACTIVITY

2.7.1 An estimated 3.3% of the total disease burden in developed countries is due to physical inactivity, according to the WHO. Members of the World Health Organisation's ministerial round table sum up the situation very eloquently. They stated that:

"Advances in telecommunications and transportation have minimised the need for physical activity. Ironically, while technology has reduced the time it takes to perform specific tasks, use of these mechanisms has been accompanied by an increasing perception of lack of time or lack of control over time for activities that are beneficial to health. Hence, it is easier to ride a vehicle than to walk." (WHO, 2002b)

2.7.2 In studies by Bouchard (2001) and Haskell (2001), the authors claim that switching from a sedentary to a moderately active lifestyle has the greatest effect on reducing chronic diseases in men and women. Furthermore, Lambert & Kolbe-Alexander

(2006) stated that as physical activity levels increase, greater health benefits accrue. A mere thirty minutes of daily exercise can offer protection from many chronic diseases.

2.7.3 Farrell et al. (1998) supports this view and attempts to quantify the accrued benefits. He asserts that physical inactivity increases the risk of diseases like ischaemic heart disease, diabetes mellitus and hypertension by 1.5 to 2 times.

2.7.4 In Europe, over 30% of adults are not sufficiently active and physical activity levels continue to decline (WHO, 2002b). Increased urbanisation and urban zoning polices that promote car-dependent suburbs, with no attention being paid to cyclists and pedestrians while designing towns, have led to the increasing prevalence of sedentary lifestyles. In some areas, high levels of crime force people to remain indoors for safety reasons. With the advent of the television, and computers, the use of these devices for entertainment and work is growing. More people are lounging and sitting at desks for hours on end (WHO, 2002b).

2.7.5 The International Physical Activity Questionnaire discovered that in 2003, less than a third of South Africans performed physical activity to the extent that it was health-enhancing. Results also showed that nearly half of all South Africans were inactive. Women in South Africa were found to be less active than men in studies by Reddy et al. (2003), Steyn et al. (2004) and Kruger et al. (2002).

2.7.6 South African adults are not the only ones leading sedentary lifestyles. Trends show that the youth of South Africa is quickly following suit. South African researchers, Reddy et al. (2003), found that of all youths that participated in the National Youth Risk Behaviour Survey in 2002, more than a third were insufficiently active. Of all those surveyed, more than a quarter watched television for more than three hours daily. DiPietro et al. (1993) found that physical activity levels dropped as age increased.

2.7.7 In the rural villages of South Africa, and many other developing countries, cars are a luxury which very few can afford. The primary mode of transport is by foot (Steyn, 2006). Rural lifestyles encompass physical tasks like fetching water, chopping and gathering firewood, farming livestock and cultivating crops. When compared to urban lifestyles, those from rural areas tend to do more labour-intensive work, and therefore have higher physical activity levels (Steyn, 2006 and WHO, 1998).

2.7.8 The WHO advocates that increasing physical activity, stopping smoking and changing to a healthier diet can reduce coronary heart disease cases by up to 80% and 90% of diabetes mellitus cases can be reduced. Also, one third of all cancers can be avoided (WHO, 2002).

3. DISEASE MANAGEMENT PROGRAMMES

3.1 It is clear, from everything aforementioned, that unhealthy lifestyles facilitate and lead to the emergence of certain chronic conditions. Some of these conditions include hypertension, diabetes, obesity, cancers, ischaemic heart disease and chronic obstructive pulmonary disease.

3.2 The interrelationship between unhealthy lifestyle and chronic conditions create the need for integrated, comprehensive intervention programmes (Steyn, 2006). These programmes should ideally look at the various risk factors and their interaction effects, thereby considering all the implications holistically. Implementing intervention strategies for each risk factor in isolation will have a limited impact on reducing the chronic disease burden. Not only do intervention strategies decrease the prevalence of chronic conditions, but they also reduce the amount of disability associated with an existing illness (WHO, 2002a).

3.3 Chronic diseases related to lifestyle pose an increasing financial burden on insurers for a number of reasons:

- Aging associate with increasing prevalence of chronic diseases (Schneider & Guralnik, 1990)
- Lower thresholds for diagnosis and greater detection, through screening, of certain chronic conditions.
- Newer and more expensive medical and technological interventions.
- Increasing rates of obesity, physical inactivity, unhealthy diet and smoking (in certain populations) which are all risk factors for chronic diseases.

3.4 Insurers have attempted to contain costs related to chronic conditions by benefit designs and by offering differential plan types. These measures include the application of evidence-based algorithms for approving chronic medication, the use of generic and formulary drugs, co-payments for chronic medication and deductibles for certain procedures. Combined with these measures, insurers and health maintenance organisations (HMO) have sought to manage the costs associated with chronic and high risk patients by implementing disease and case management programmes.

3.5 Disease management programmes seek to improve compliance and self-management and thereby improve outcomes and long term costs. While many of these programmes have shown improvement in clinical care and health outcomes they have not, definitively, been proven to be cost-effective. One reason for this may be that disease management programmes that are ‘carved-out’ and are managed by disease management companies - separate from primary care- concentrate on providing care for high-risk patients and are less concerned with preventions initiatives and lower-risk patients (Bodenheimer, 1999).

3.6 Some insurers have recently become conscious of the need to shift from simply containing costs and managing disease to improving the primary health of members. This shift encourages plan members to adopt healthier practices offered by preventive and wellness programmes.

3.7 Pronk et al (1999) found that members of a health insurance plan who never smoked, with a mean BMI of 25/kg/m² and who participated in physical activity three days per week had mean annual healthcare charges that were approximately 49% lower than physically inactive smokers with a BMI of 27.5kg/m². They argue that funders

seeking to minimize health care charges may wish to consider strategic investments in interventions that modify adverse health risks.

3.8 Wolf & Colditz, 1998 compared healthcare expenditure, over a one year period, between a lifestyle intervention group and a usual care group in obese Type 2 diabetic patients who were members of a health insurance plan. They reported that after taking into account the costs of a lifestyle intervention programme the total costs were $3586 per person, per year less among the intervention group compared to the usual care group.

3.9 Many Health plan-provided health promotion and disease prevention programmes are packaged within disease management programmes and are only offered to those members with established disease or who are at high risk (Ozminkowski, 1999). A primordial program, on the other hand which is directed to the entire population of a health insurance plan has the advantage of improving the health of those at risk and maintaining the health and awareness of those members who are not at immediate risk of chronic diseases.

3.10 The provision of health-promotion/ disease-prevention programme by Health Plans has some distinct advantages. Programmes provided by Health plans are able to maintain employee confidentiality, link health assessment to claims, leverage resources in terms of staff and expertise and align prevention programmes to healthcare providers (Schult et al, 2006).

3.11 In the USA, health promotion programs have largely been provided by employers, with about 70% of employees covered by health promotions programmes. These employee wellness programmes have been offered with the aims of improving the general wellbeing of employees (human capital), improving productivity, decreasing absenteeism and reducing long-term healthcare cost (Schult et al, 2006)

3.12 Many employee programmes have shown qualitative improvements in lifestyle practices and in health risks and outcomes (Pescatello et al, 2001 and Ozminkowski et al, 2000)

3.13 There is also compelling evidence for reduced health care costs from worksite wellness programmes. Ozminkowski et al (2000) reporting on the Johnson & Johnson health and wellness programme found that the programme saved the company an average of $226.66 per employee per year for the four years after programme introduction.

3.14 Edington et al, 1997 also showed, in a longitudinal study of a worksite wellness programme, that people who moved from being low risk in 1985 to high risk in 1988 increased their annual costs from $680 to $1414, an average yearly increase of $734 - all standardized to 1996 dollars. People who moved from being high risk in 1985 to low risk in 1988 experienced an annual decrease of $129. They emphasize the importance of paying attention to both low and high risk groups.

3.15 Ultimately the success of health promotion/disease prevention programme is dependent on the participation of members/ employees. While there is substantial evidence for the health benefits of interventions such as increasing physical activity and healthy eating there is much less quantitative data on the cost-benefits of such interventions, particularly cost savings for healthcare funding organisations. Patel et al (2011) found that there was a significant improvement in engagement in fitness-related activities amongst members of an incentivised health promotion programme over a 5 year longitudinal study and those with higher levels of engagement were found to have lower probabilities of hospital admission.

4. THE DISCOVERY HEALTHY COMPANY INDEX SURVEY

4.1 The Discovery Health Healthy Company Index (DHCI), was a national initiative seeking to promote worksite wellness and to identify the healthiest companies in South Africa. The campaign was initiated by *Discovery Health*, the largest private health insurer in South Africa, in partnership with the *Sunday Times*, a South African national newspaper.

4.2 The methodology for conducting the DHCI received clearance from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand in 2010.

4.3 A media campaign informing South Africans of the Healthy Company Index and inviting worksites to register was launched in October 2010. The Human Resource Managers of existing corporate clients of Discovery Health were invited via email to participate in the DHCI. A website *www.healthycompanyindex.co.za* was established to publicize the campaign and to register companies that wished to participate.

4.4 Human Resource Managers or similar company representatives then enrolled their company in the Health Company Index survey website. Once registered, they received an email from the research team, confirming participation. The Human Resource manager was requested to send their employees an email informing them of the survey and inviting them to participate in the DHCI. Confidentiality and emphasis on voluntary participation was emphasized. Employees were reassured that their employers and Discovery Health would not have any access to their data, as all results were encoded and collated with no personal identifiers.

4.5 Following the information from the Human Resource Manager, employees received an email inviting them to register their participation on the DHCI website, and to complete the Employee Questionnaire within two weeks of the invitation. This questionnaire was accessed using a protected online domain. The employee invitations were sent out in bi-weekly batches from 31 January 2011 to 28 February 2011 and the survey was closed on 15 March 2011.

4.6 In order to ensure a minimum level of statistical credibility only companies with 50 or more employees (with internet access) were eligible to participate in the DHCI. Those employers which had a response rate of 24 responses or 30% of email invitations sent, received collated company reports. Those employers where the number of

responses exceeded the minimum calculated using a Bernoulli error of 5% (calculated as n/((n*0.05^2)*4+1) where n = the number of email invitations) were eligible for rating in the DHCI.

4.7 The manager responsible for the company's workplace health management programme or the Human Resource Manger completed the Employer Questionnaire online. The questionnaire comprised of the following sub-sections; demographic information, current health promotion initiatives, on-site facilities, company health-related policy and leadership support. The survey was largely based on the National Worksite Health Promotion Survey (Linnan et al, 2008).

4.8 The Employee Questionnaire was primarily a health risk assessment in which employees self reported clinical measures including blood pressure, height, weight and cholesterol results. Self-reported lifestyle behaviors such as smoking status, habitual levels of physical activity and nutrition habits, and the employee's willingness to improve these measures were included in the questionnaire.

4.9 101 companies participated in the survey and email invitations were sent to 58 737 employees. 13 578 employees completed the employee questionnaire. 72 companies were eligible for awards (12 410 employees). The analysis presented in this paper is at an employee level and so the full data set of 13 578 employees has been used. For analysis relating to the practice of employers, only the data relating to eligible companies was used.

4.10 The employee survey included the following question with respect to chronic conditions:
Has a doctor told you that you have any of the following conditions? If yes, please indicate whether or not you are currently on medication.

- *Heart Disease*
- *High blood pressure*
- *Diabetes*
- *High cholesterol*
- *Cancer*
- *Chronic lung disease (for example, emphysema, chronic bronchitis)*
- *Depression*

The presence of the conditions were therefore self-reported. There was also no indication provided of the severity of the condition.

5. RESULTS

5.1 58 737 employees were invited to participate in the DHCI survey and 13 578 responded. The average age of the responding employees was 36.4 years (at the date of survey) and 59.2% were female. Age and gender were used as the key risk factors for segmenting the population. The distribution by age and gender for all respondents is shown in Table 1.

Table 1: Distribution of respondents

	Total
Number of companies	101
Number of eligible employees	58737
Number of responses	13578
Response Rate	23.1%
Age	
<30	3940
30-39	5153
40-49	2783
50-59	1417
>60	285
Average age	36.40
Gender	
Female	8036
Male	5542
Grand Total	13578
% Female	59.2%

5.2 3 299 of the respondents reported having at least one of the chronic conditions listed in the question (see section 4.10). 765 respondents reported having two or more of the conditions.

Table 2: Prevalence of total number of chronic conditions by age

	1	2	3+	At least 1
<30	11.2%	1.2%	0.2%	12.5%
30-39	16.7%	2.5%	0.7%	19.9%
40-49	24.8%	5.9%	2.2%	33.0%
50-59	31.4%	13.5%	4.3%	49.2%
>60	34.4%	17.2%	6.3%	57.9%
All	18.7%	4.3%	1.4%	24.3%

Table 3: Prevalence by age and gender for at least one chronic condition

	Female	Male	All
<30	15.2%	10.5%	12.5%
30-39	19.7%	19.4%	19.9%
40-49	31.6%	32.5%	33.0%
50-59	45.3%	49.8%	49.2%
>60	53.7%	51.0%	57.9%
All	24.0%	24.8%	24.3%

5.3 Taking into account multiple conditions, there were 4281 cases reported across the 13 578 respondents.

Table 4: Cases Reported per chronic condition

	Number of cases	Prevalence (n = 13 578)
Heart disease	181	1.3%
High blood pressure	1419	10.5%
Diabetes	416	3.1%
High cholesterol	1160	8.5%
Cancer	122	0.9%
Chronic Lung Disease	76	0.6%
Depression	907	6.7%

5.4 The prevalence of each of the conditions by age is shown in Table 5.

Table 5: Prevalence of each chronic condition by age

	Heart	High blood	Diabetes	High cholesterol	Cancer	Chronic Lung Disease	Depression
<30	0.69%	3.31%	1.12%	2.70%	0.10%	0.25%	5.88%
30-39	0.95%	7.22%	2.23%	6.17%	0.56%	0.49%	6.40%
40-49	1.58%	15.24%	4.60%	12.18%	1.55%	0.79%	7.87%
50-59	2.82%	27.59%	7.69%	22.37%	2.54%	1.06%	7.69%
>60	7.64%	36.00%	7.27%	28.73%	3.27%	1.09%	5.82%

5.6 RISK FACTORS

5.6.1 The employee questionnaire included questions relating to various risk factors that have been shown to affect an individual's health status. These included the following:

- BMI (Body Mass Index = Weight in kilograms divided by the square of the height in metres)
- Physical activity (measured as minutes of exercise per week at moderate intensity)
- Smoking (current smoker, past smoker or never smoked)
- Nutrition (measured in terms of fruit and vegetable servings per day)
- Alcohol (measured as units of consumption per week).

5.6.2 The responses per risk factor were classified as low, medium or high risk as set out in Table 6. The low risk category is considered as being within the healthy range.

Table 6: Risk factors

BMI (wt/ht2)	Range	<18.5	18.5-24.9	25-29.9	30+
	Measure	High Risk	Low Risk	Medium Risk	High Risk
Physical activity (min/ week)	Range	<120	120-149	150+	
	Measure	High Risk	Medium Risk	Low Risk	
Nutrition (servings per day)	Range	0	1-2	3-4	5+
	Measure	High Risk	High Risk	Medium Risk	Low Risk
Smoking	Range	Non	Ex > 5yrs	Ex < 5 yrs	Smoker
	Measure	Low Risk	Low Risk/Medium Risk	Medium Risk	High Risk
Alcohol (units per day)Males	Range	0	1-2	3+	
	Measure	Low Risk	Medium Risk	High Risk	
Alcohol (units per day)Females	Range	0	1	2+	
	Measure	Low Risk	Medium Risk	High Risk	

5.6.3 The proportion of respondents who fell outside of the healthy range (i.e. were classified as medium or high risk) for alcohol consumption was very low (2.64%) and so no further analysis was done on this factor. This may be attributable to the self-reporting nature of the questionnaire.

5.6.4 The comparison of the proportion of respondents who fell within the healthy range (i.e. are classified as low risk) for each of the risk factors is shown in the table below. The comparison of the proportions in each group (those respondents reporting at least one chronic condition and the balance) is made using a two-sample sign test (Mood et al, 1974). All of the risk factors except nutrition (measured in terms of the number of fruit and vegetable servings per day) were significantly different ($p<0.001$) for the group reporting at least one chronic condition compared to the balance.

Table 7: Proportion of respondents classified with elevated risk

% not in healthy range		BMI	Physical activity	Nutrition	Smoking
Chronic	No (n=10 279)	59.3%	79.0%	81.7%	36.4%
	Yes (n = 3 299)	73.9%	85.3%	81.7%	42.1%
	Significance	***	***	ns	***

*** p < 0.001, ** p < 0.01, * p < 0.05, ns not significant

5.6.5 The relative distribution by age group and risk category is shown graphically in figures 1 to 4.

Figure 1:

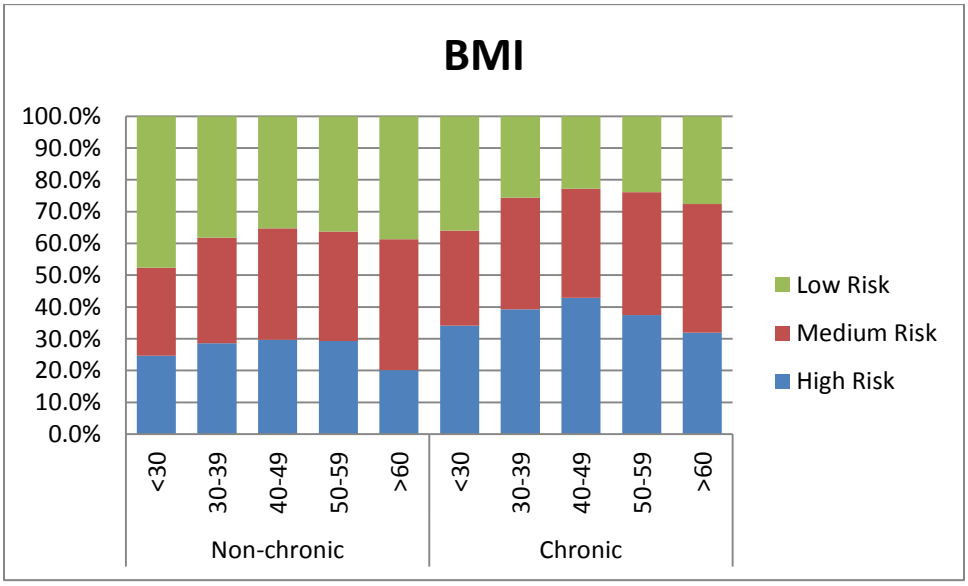


Figure 2:

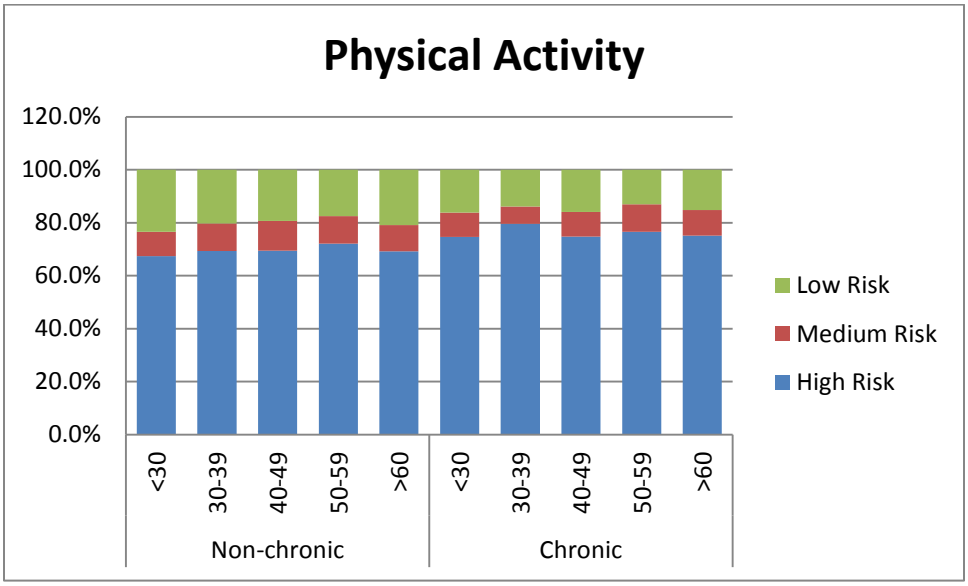


Figure 3:

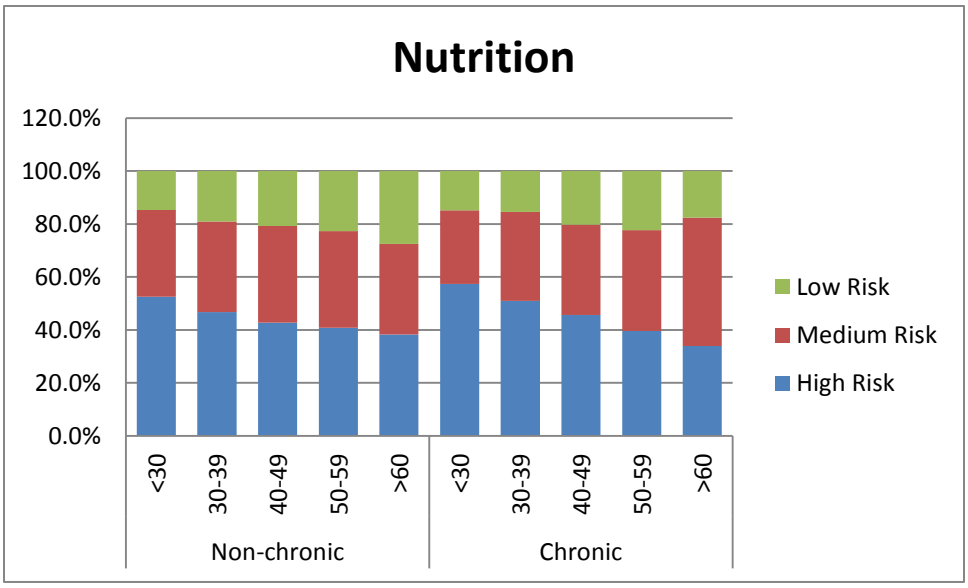
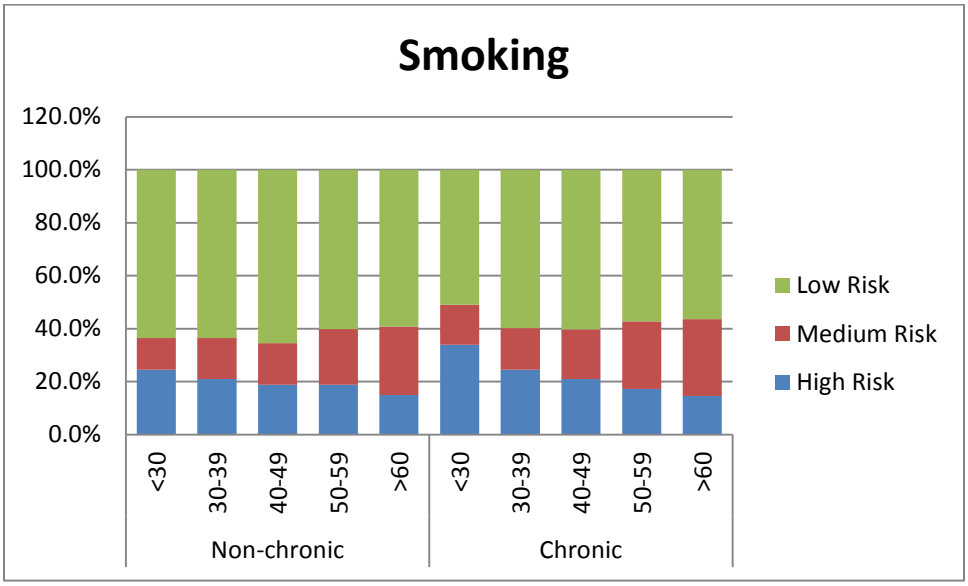


Figure 4:



5.6.6 The relative proportions of respondents classified as having elevated risk for each risk factor were also considered for each condition. The levels of significance are affected by the smaller sample size when the respondents are broken down into the different conditions.

Table 8: Risk factors per chronic condition

% not in healthy range		BMI	Physical activity	Nutrition	Smoking
Heart	No (n = 13 397)	62.7%	80.5%	81.7%	37.6%
	Yes (n = 181)	72.8%	87.8%	84.5%	53.0%
	Significance	**	*	ns	***
High BP	No (n = 1 419)	60.5%	79.9%	81.6%	37.6%
	Yes (n = 12 159)	83.0%	86.6%	82.7%	39.3%
	Significance	***	***	ns	ns
Diabetes	No (n = 416)	62.1%	80.3%	81.7%	37.6%
	Yes (n = 13 162)	84.8%	89.4%	83.7%	43.5%
	Significance	***	***	ns	*
High Chol	No (n = 1160)	61.7%	80.4%	82.0%	37.5%
	Yes (n = 12 418)	75.4%	82.2%	79.0%	41.2%
	Significance	***	ns	*	*

Cancer	No (n = 122)	62.8%	80.5%	81.8%	37.7%
	Yes (n = 13 456)	63.6%	85.2%	77.0%	48.4%
	Significance	ns	ns	ns	*
Chronic Lung Disea	No (n = 76)	62.8%	80.5%	81.7%	37.7%
	Yes (n = 13 502)	70.7%	89.5%	90.8%	48.7%
	Significance	ns	*	*	*
Depression	No (n = 907)	62.7%	80.1%	81.7%	37.1%
	Yes (n = 12 671)	65.0%	86.7%	81.6%	47.9%
	Significance	ns	***	ns	***

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, ns not significant

5.6.7 The respondents reporting a heart condition had greater proportions of respondents in the medium and high risk categories than the balance of respondents for all risk factors except nutrition. Smoking had the highest level of significance.

5.6.8 The respondents reporting high blood pressure (the most prevalent condition) had greater proportions of respondents in the medium and high risk categories than the balance of respondents for BMI ($p<0.001$) and physical activity ($p<0.001$).

5.6.9 The respondents reporting diabetes had greater proportions of respondents in the medium and high risk categories than the balance of respondents for all risk factors except nutrition. Smoking had the lowest level of significance.

5.6.10 The respondents reporting high cholesterol had greater proportions of respondents in the medium and high risk categories than the balance of respondents for BMI ($p<0.001$) and smoking ($p<0.05$). For nutrition, the proportion of respondents reporting high cholesterol in the low risk category was greater ($p<0.05$) than the balance of respondents. This may indicate some behavioural change by these respondents due to their condition.

5.6.11 The respondents reporting cancer only had a greater proportions of respondents in the medium and high risk categories than the balance of respondents for smoking ($p<0.05$).

5.6.12 The respondents reporting chronic lung disease had greater proportions of respondents in the medium and high risk categories than the balance of respondents for all risk factors except BMI but at the lowest level of significance. This condition had the lowest prevalence.

5.6.13 The respondents reporting depression had greater proportions of respondents in the medium and high risk categories than the balance of respondents for physical activity ($p<0.001$) and smoking ($p<0.001$).

5.6.14 The association between the risk factors noted above and the chronic conditions is assessed using odds ratios in Table 9. These indicate that having a BMI

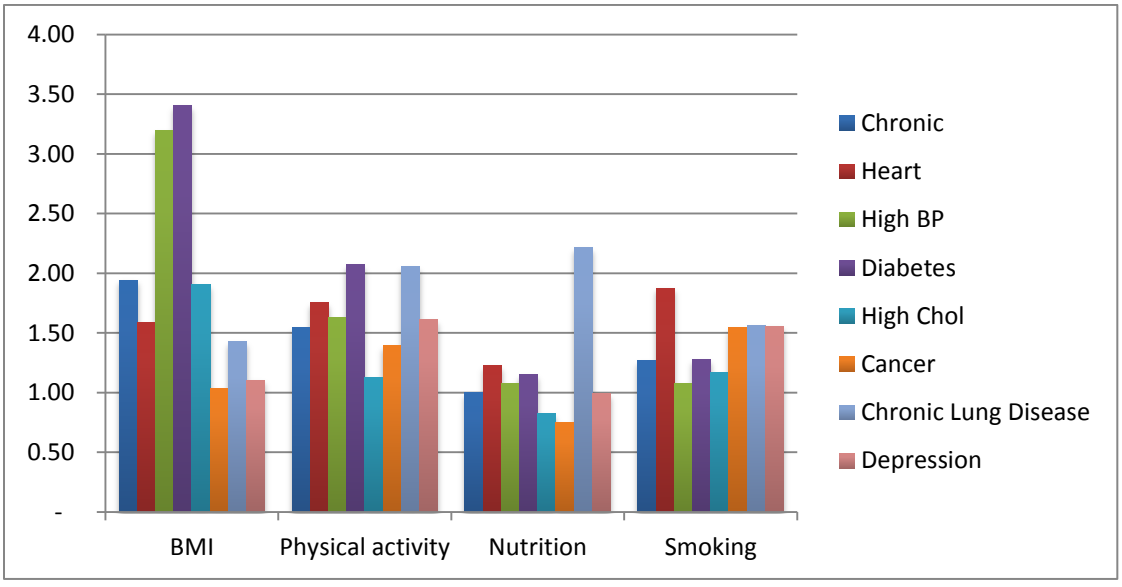
outside of the healthy range is associated with a 1.94 greater likelihood of reporting at least one chronic condition.

Table 9: Odds ratios per chronic condition and risk factor

	BMI	Physical activity	Nutrition	Smoking
At least on chronic	1.94	1.54	1.00	1.27
Heart disease	1.59	1.75	1.23	1.88
High BP	3.20	1.63	1.07	1.08
Diabetes	3.41	2.08	1.15	1.28
High Cholesterol	1.91	1.13	0.83	1.17
Cancer	1.04	1.40	0.75	1.55
Chronic Lung Disease	1.43	2.06	2.21	1.57
Depression	1.11	1.61	0.99	1.56

5.6.15 The odds ratios per chronic condition and risk factor are shown graphically in Figure 5. The association between elevated BMI and increased likelihood of High BP and Diabetes is evident as well as the association between lower physical activity and increased likelihood of Diabetes and Chronic Lung Diseases. Only for Nutrition are there any odds ratios less than 1.

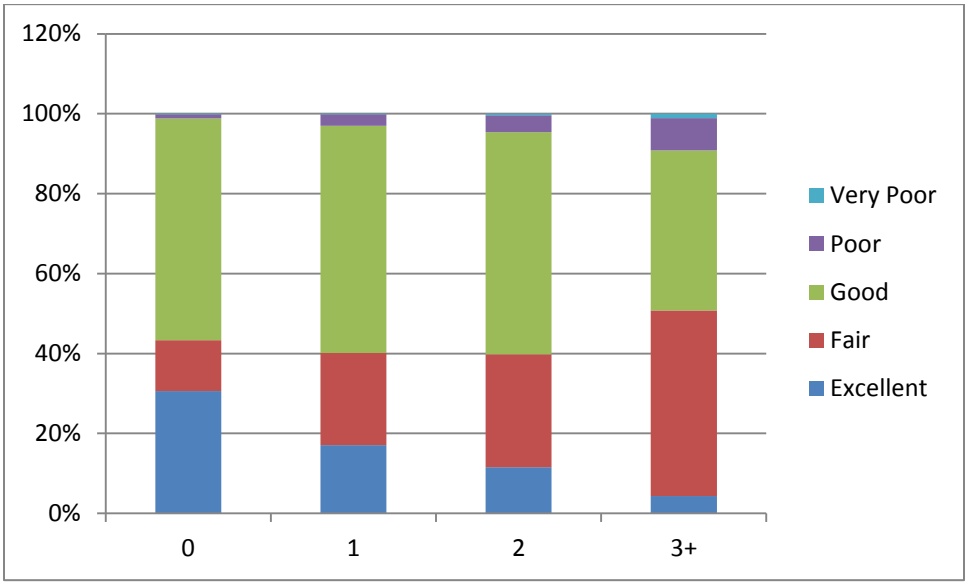
Figure 5: Odds ratios per chronic condition and risk factor



5.7 SELF REPORTED HEALTH STATUS

5.7.1 Respondents were asked to classify their state of health. 15.4% of respondents reporting at least one chronic condition indicated that they consider their health to be excellent as compared to 30.6% in the balance of the population. 3.6% of the respondents with at least one chronic condition classified their health as poor or very poor as compared to 1.1% in the balance of respondents.

Figure 6: Perception of health by number of self-reported chronic conditions



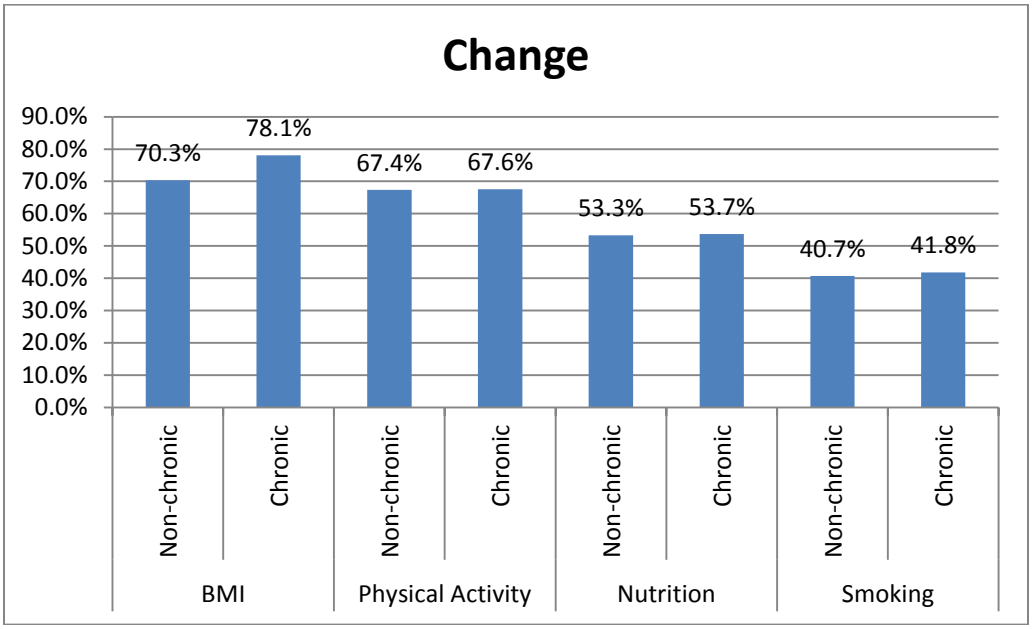
5.7.2 A challenge for promoting behavioural change is for individuals to recognize that their lifestyle choices are affecting their health status and that this can be modified (Shi & Singh, 2011). The results of the health perception question indicate that respondents reporting at least one condition are more aware of the adverse implications on their health, however 40.7% consider their health to be good or excellent and are therefore less likely to adjust their behavior.

5.7.3 Respondents who fell outside of the healthy range for each risk factor were asked about their willingness to change their behavior in respect of that risk factor. The respondent is therefore included where the risk factor lies outside the healthy range and they are allocated a score of 1 if they are willing to change or 0 if not for the following factors:

- BMI
- Physical Activity
- Nutrition
- Smoking

5.7.4 Only for BMI is the willingness to change significantly ($p<0.001$) higher for respondents reporting at least one chronic condition. For the other risk factors the willingness to change is similar for both the chronic and non-chronic categories.

Figure 7: Willingness to change per risk factor



5.8 SCREENING TESTS

5.8.1 Respondents were also asked about whether they had, in the last 12 months, undergone screenings for Blood pressure (BP), Cholesterol, Glucose and HIV and to indicate the results of these screenings. The respondents reporting at least one chronic conditions were more likely to have undertaken the screening tests for all the screening tests ($p<0.001$) except HIV where they were less likely to have had a test ($p<0.001$).

Table 10: Proportion of respondents taking a screening test in the past 12 months.

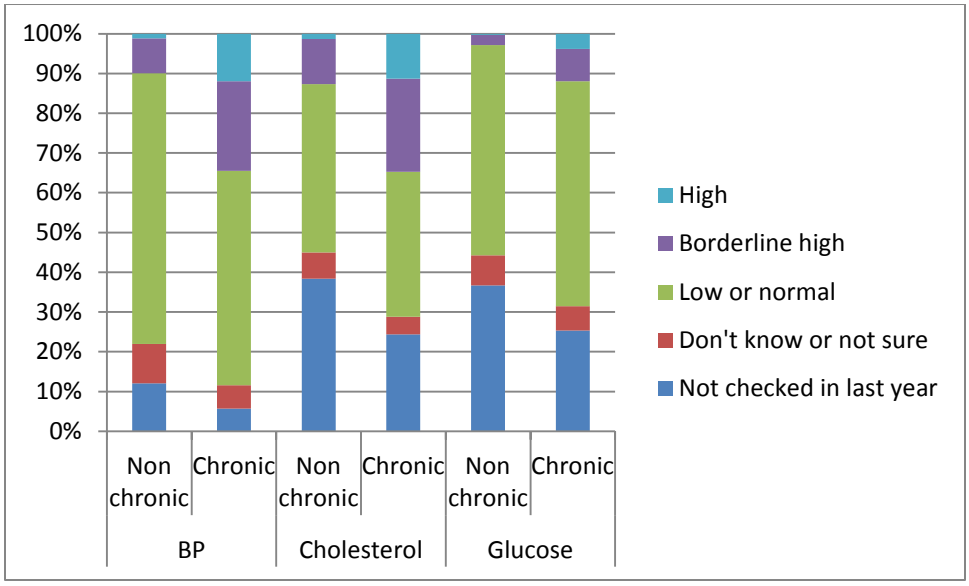
	Non chronic	Chronic	Significance
BP	88%	94%	***
Cholesterol	62%	76%	***
Glucose	63%	75%	***
HIV	60%	56%	***

5.8.2 The respondents who had taken a test in the last 12 months and who could remember the result were asked to indicate the result. The classifications into low, borderline and high for the Blood Pressure, Cholesterol and Glucose tests were defined as per Table 11.

Table 11: Classification of test results

	Low or Normal	Borderline	High
BP	at or below 120/80mmHg	120/80mmHg to 139/89mmHg	140/90mmHg or higher
Cholesterol	Below 5.0mmol/l	5.0mmol/l to 6.0mmol/l	6.1mmol/l or higher
Glucose	Below 7.8mmol/l	57.9mmol/l to 9.9mmol/l	10mmol/l or higher

Figure 8: Results of screening tests for respondents reporting at least one condition compared to the balance.



7. COMPARISON TO MEDICAL SCHEMES

7.1 South African medical schemes report on the prevalence of 26 chronic conditions among their beneficiaries to the Registrar of Medical Schemes as part of a shadow process for implementing a Risk Equalisation Fund (REF). The clinical criteria for classifying a beneficiary as having a chronic condition are defined clinically by the Council for Medical Schemes (Council for Medical Schemes, 2005). These criteria therefore require clinical diagnosis as compared to the self-reported nature of the DHCI.

7.2 A count of medical scheme beneficiaries per chronic condition was published by the Council for Medical Schemes in March 2010. The cases per 1000 beneficiaries for the conditions comparable to those addressed in the DHCI survey are shown in Table 12.

Table 12: REF cases per 1000 beneficiaries for comparable conditions

	High Blood Pressure	High Cholesterol	Depression	Diabetes	Heart Disease	Chronic Lung Disease
<30	1.966	0.990	0.767	2.496	0.234	7.652
30-39	12.984	4.640	1.077	6.537	1.409	11.718
40-49	47.637	16.835	1.279	19.559	7.089	15.261
50-59	101.595	45.671	1.391	35.617	22.586	21.955
>60	146.486	78.440	1.552	46.295	52.919	35.570

7.3 The age distribution of the DHCI respondents was applied to the REF prevalence to determine an expected number of cases. The comparison of actual to expected found that only chronic lung disease had a higher expected prevalence when using the REF results.

Table 13: Comparison of actual to expected cases per 1000 respondents using REF prevalence

	High Blood Pressure	High Cholesterol	Depression	Diabetes	Heart Disease	Chronic Lung Disease
Expected	28.94	11.91	1.07	11.90	5.52	12.83
Actual	104.51	85.43	66.80	30.64	13.33	5.60
Ratio	28%	14%	2%	39%	41%	229%

Figure 9: DHCI chronic prevalence by age compared to REF

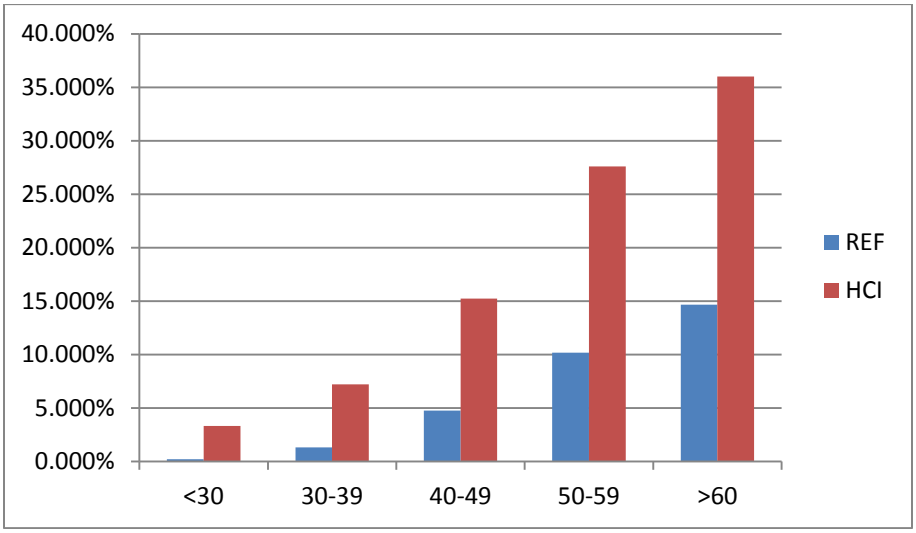
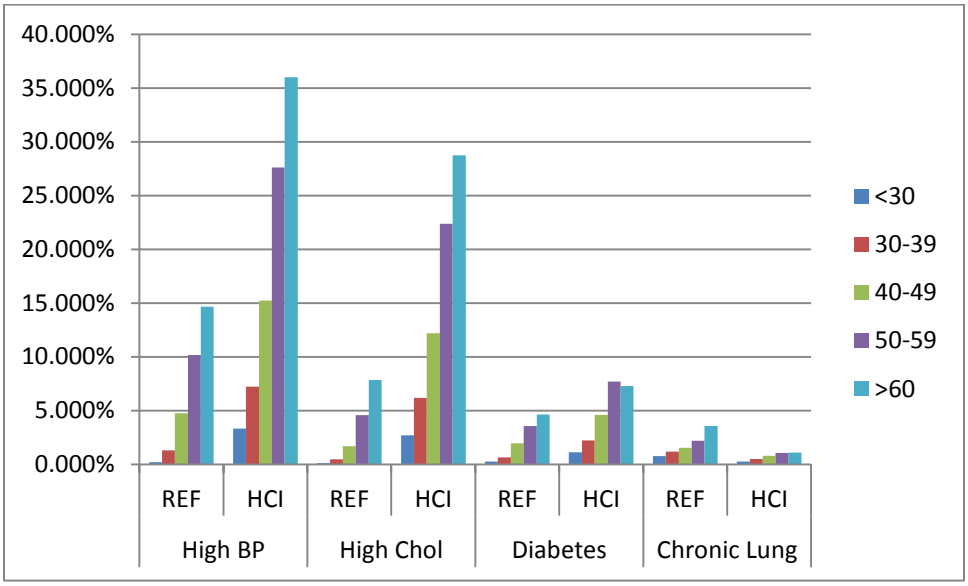


Figure 10: DHCI chronic prevalence by age and condition compared to REF



7.4 The higher prevalence in the DHCI group (except for Chronic Lung Disease) may reflect the effect of self-reported data.

9. DISCUSSION

9.1 The DHCI survey data indicates a higher prevalence of chronic conditions associated with lifestyle conditions than the REF data. This may be attributable to self-reporting but indicates that there is a risk of such conditions developing to the point that they meet the clinical criteria required by REF.

9.2 The prevalence of chronic conditions of lifestyle in an employee population has implications in terms of absenteeism, treatment costs and productivity (Goetzel et al, 2003) and so there is clear evidence of such risk in the South African employed population.

9.3 The proportion of individuals with modifiable health risk factors outside of the healthy range is higher amongst those DHCI respondents that reported having at least one chronic condition as compared to the balance of respondents, except for nutrition. This suggests that there is an opportunity to encourage healthier lifestyle practices among employees in order to contain the risks associated with chronic conditions.

9.4 The respondents who reported high cholesterol had a higher proportion ($p<0.05$) in the healthy range for fruit and vegetable consumption which suggests that they may have already changed behavior as a result of their chronic condition.

9.5 The modifiable risk factors of smoking and BMI had the highest significance for respondents reporting at least one chronic condition.

9.6 BMI is the only risk factor considered where the respondents reporting at least one chronic condition indicated a greater willingness to change ($p<0.001$) than the balance of respondents. It is not clear whether individuals reporting chronic conditions are aware of the potential positive effects that modifying their behavior can have on their health. There appears to be a particular need to promote behavioral change in smoking and levels of physical activity, however it appears that the challenge is to convince people that their current lifestyle choices are affecting their long-term health.

9.7 45% of the companies that participated in the DHCI reported having a comprehensive onsite wellness programme and 39% of the participating employers reported having a disease management programme. While employees in the balance of participating companies may have access to disease management programmes through their medical scheme, the employer may be able to encourage greater enrolment in such programmes by offering them directly, possibly in co-operation with their medical schemes. An area for further work is to assess whether the employees reporting chronic conditions who are employed at a worksite where a disease management programme is offered, have lower risk factors and better health outcomes than the balance.

9.8 While this paper has reported on an association between the prevalence of self-reported chronic conditions among respondents and their health risk factors, it is a cross-sectional analysis and so now definitive conclusions regarding cause and effect.

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