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

By R da Silva, K Milner, TL Kolbe-Alexander, M Greyling and D Patel

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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. This suggests that there are opportunities to manage the costs of health insurance, medical expenses and productivity losses by applying risk management tools aimed at addressing modifiable risk factors.

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

CONTACT DETAILS
Roseanne da Silva, School of Statistics and Actuarial Science, University of the Witwatersrand, Private Bag 3, Wits, 2050, South Africa; Tel: +27(0)11 884 9128; Fax: +27(0)11 884 9128; email: Roseanne.daSilva@wits.ac.za

1. INTRODUCTION

1.1 The World Health Organization (WHO) has noted that the majority of deaths and disability cases worldwide are a result of chronic conditions. 'Chronic' refers to a condition that persists for longer than three months or is recurrent.[1]

1.2 Chronic diseases, particularly non-communicable chronic diseases (NCDs) pose a large and growing global health problem. These diseases include cardiovascular disease, type-2 diabetes, certain cancers, chronic lung disease and depression. They are the leading causes of morbidity and mortality, not only in developed countries but even more so in developing countries (Mayosi et al., 2009).

1.3 The burden of NCDs in sub-Saharan Africa reveals that the epidemiological transition from infectious diseases such as HIV/AIDS and tuberculosis to NCDs is well under way (Dalal et al., 2011). A quarter of all deaths in the sub-Saharan Africa region were due to NCDs in 2004, and this is projected to increase to 46% by 2050 (Dalal et al., op. cit.). Furthermore, the burden of NCDs based on age-standardised death rates is currently higher in the Democratic Republic of Congo, Ethiopia, and South Africa than that in high income countries (Dalal et al., op. cit.).

1.4 Given the burden of NCDs both internationally and in South Africa, there is increasing attention being paid to prevention efforts focused on addressing modifiable risk factors. The World Health Assembly's Resolution on Diet, Physical Activity and Health highlights the need to reduce the risk factors for NCDs that arise primarily from inactivity and unhealthy diets.[2] This resolution encourages member states to increase awareness of the impact of these risk factors and the potential benefits of preventative intervention programmes. Similarly, the South African Declaration on the Prevention and Control of Non-Communicable Disease[3] promulgated and signed in September 2011, reflects the need to address lifestyle factors that contribute to NCDs. Thus there is a global, national and regional commitment to reduce the burden of NCDs.

1.5 In addition to the human costs of NCDs, the economic burden is well documented (Lim et al., 2013, Murray & Lopez, 2013) Indeed, in the World Economic Forum's Executive Opinion Survey more than half of business leaders across low-, middle- and high-income countries expressed concern that NCDs will adversely affect their bottom line in the next five years (Mayer-Foulkes, 2011).

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1 Global Burden of Disease Estimates. World Health Organization, Geneva, 2002a

2 Regional strategy and plan of action on an integrated approach to the prevention and control of chronic diseases, including diet, physical activity and health. 138th Session of the Executive Committee of the World Health Organization, Provisional agenda item 4.9 CE 138/17, 2006a

3 Participants in the South African Summit on the Prevention and Control of Non-Communicable Diseases in Gauteng from 12–13 September 2011

1.6 From an actuarial perspective, escalations in the prevalence of chronic conditions places upward pressure on the cost of insuring the mortality and morbidity risks associated with such conditions. Actuaries are involved in mortality and morbidity forecasting as well as calculations to test the financial benefits of treatment protocols associated with chronic conditions under health insurance products. Understanding the relationship between modifiable health risk factors and chronic conditions will assist actuaries with pricing and risk management.

1.7 There is relatively little research in this area in South Africa, especially in relation to the South African employed population. This represents a gap in the literature as the South African employed and insured population is of particular interest in the context of disease management. As interventions need to be evidence-based, this paper aims to investigate chronic disease prevalence and modifiable lifestyle factors in a sample from this population, as well as to assess the association between modifiable lifestyle risk factors and chronic conditions in the studied population. This evidence may be helpful in targeting the implementation of disease management programmes.

1.8 Section 2 of the paper discusses the risk factors that are associated with NCDs and their effects. Risk management opportunities and programmes are then addressed in Section 3. Section 4 describes the Discovery Health Healthy Company Index (DHCI) survey and the results are set out in Section 5. Section 6 provides a comparison of results to other sources leading to a discussion and conclusion in Section 7.

2. RISK FACTORS

2.1 Healthy lifestyle behaviours, which include regular physical activity and good nutrition, are associated with longevity.[4] Risk factors such as tobacco use, lack of physical activity and unhealthy diet are associated with cardiovascular disease, diabetes and cancer (Mayosi et al., op. cit.). As poor diet, insufficient physical activity, alcohol and smoking have been identified as risk factors for non-communicable diseases, the prevalence of these diseases can be attenuated by modifying these lifestyle behaviours (Steyn, 2006). 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.

2.2 Patel et al. (2010) identified the presence of a chronic condition of lifestyle as being a primary factor for predicting hospital admission rates.

4 Dele Abegunde & Anderson Stanciole (unpublished). An estimation of the economic impact of chronic noncommunicable diseases in selected countries. Working paper, World Health Organization, Geneva, 2006b

2.3 NUTRITION

2.3.1 Fruit and vegetables are an essential part of a balanced diet.[5] They help to prevent many diseases and cancers—particularly those relating to the digestive tract—because they contain antioxidants, fibre and nutrients which suppress the action of carcinogens.[6] 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.[7]

2.3.2 Extensive advertising campaigns and marketing techniques have made fatty, refined, sweet and salty foods more profitable than healthier alternatives, and this finding has led to fast food outlets becoming increasingly popular in developing countries (Steyn, op. cit.). 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 has been 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 with high levels of saturated fats, high levels of sugar, salt and alcohol intake and low fruit, vegetable, fibre and vitamin intake.

2.4 ALCOHOL

2.4.1 In developed countries, it is estimated that 9,2% of the disease burden arises from alcohol use. According to the 2003 South Africa Demographic Health Survey (SADHS), 21,4% of men and 6,9% of woman aged between 15 and 64 had problems related to alcohol consumption (Mayosi et al., op. cit.).

2.4.2 According to the South African Department of Health 'sensible drinking' is defined as three or two standard drinks per day for men and women respectively, where a standard drink is defined as a can of beer, one tot of spirits, one glass of wine or one small glass of sherry (Vorster, 2001). Serfontein et al. (2009) conducted a sample study of the African population in the North West province of South Africa. They found that found that 18% of their sample population consumed more than 30g of alcohol per day for males and 6% of the study population consumed more that 15g per day for females and hence were defined as heavy drinkers, but there is little research on the prevalence of alcohol consumption within the urban employed population in South Africa.

2.5 SMOKING

2.5.1 In 2000, approximately 4,83 million deaths worldwide were attributed to cigarette smoking.[8] Of these, 2,43 million deaths occurred in industrialised countries, and 2,41 million occurred in low and middle-income countries (ibid.). This accounts for 12% of adult global mortality (Ezzati & Lopez, 2003). Saloojee (2006) proposes that

5 World Health Organization, 2006a, agenda item 4.9 CE 138/17, supra
6 ibid.
7 ibid.
8 WHO, 2002a, supra

if people stopped smoking 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.

2.5.2 Between 20% and 25% of all South African adults are smokers (Ayo-Yusuf, Swart & Pickworth, 2004; Steyn et al., 2002). Campaigns and anti-smoking legislation appear to have had some effect. 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 (Saloojee, op. cit.).

2.6 PHYSICAL INACTIVITY

2.6.1 An estimated 6% of the burden of coronary artery disease and 7% of type-2 diabetes is due to physical inactivity (Yusuf et al., 2001). Lee et al. (2012) has estimated that 9% of premature mortality is due to physical inactivity and if the prevalence of inactivity decreased by 10%, more than 533 000 deaths could be avoided per year. Members of the WHO's ministerial round table sum up the situation eloquently:

> 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.[9]

2.6.2 A review of recent research in this area shows that there is a dose response between the amount of physical activity and the risk of coronary artery disease (Sattelmair et al., 2011). Individuals who met the physical activity guidelines of 150 minutes per week had a 14% lower risk of coronary artery disease, while those who exercised more than 150 minutes per week had a 20% reduced risk (Sattelmair et al., op. cit.).

2.6.3 In South Africa, 44,7% of men and 47,6% of women are insufficiently physically active and not meeting the guidelines for health-enhancing physical activity (Guthold et al., 2008)

3. DISEASE MANAGEMENT PROGRAMMES

3.1 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 (Jurisich & da Silva, 1996). Combined with these measures, insurers and health-maintenance organisations have sought to manage the costs associated with chronic and high-risk patients by implementing disease and case management programmes (Chapman, Lesch & Baun, 2007).

9 World Health Organization, 2002b, supra

3.2 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 there is no definitive proof that they are effective. One reason for this may be that programmes managed by disease-management companies tend to be separate from primary care and focus on providing care for high-risk patients (Bodenheimer, 1999). These programmes thus tend to be less concerned with prevention initiatives and lower-risk patients (ibid.).

3.3 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 (Patel et al., 2010). This is based on research evidence relating to cost saving. For example, Pronk et al. (1999) found that members of a health insurance plan who never smoked, with a mean BMI of 25kg/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 minimise health care charges may wish to consider strategic investments in interventions that modify adverse health risks. Similarly, 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 US$3 586 per person per year less among the intervention group compared to the usual-care group for an intervention cost of US$328.

3.4 Despite significant expenditure on managed care initiatives, South African medical schemes have reported an escalation in the prevalence of chronic conditions amongst covered beneficiaries. The Council for Medical Schemes (CMS) reports that the top 10 chronic conditions have shown the fastest increase in prevalence from 2006 to 2011.[10] This escalation may be influenced by the requirement to cover PMBs at cost. The top 10 conditions are given in Table 1.

3.5 Thus it is clear that insurers, and the actuaries that advise them, have a direct interest in managing the financial burden of chronic illness in the workplace by addressing modifiable risk factors. In order to do this effectively however, it is necessary to obtain more information on chronic conditions in the workplace, as well on the prevalence of risk factors in the specific population of interest. In the following sections, the authors report on the DHCI survey which provides information on the prevalence of chronic conditions, risk factors and the association between them, in a large sample of South African corporate employees. The authors also compare these findings, which are based on self-reported data, with reference data from the risk equalisation fund (REF) data in order to establish some level of validity in relation to the self-reported data.

10 Annual Report 2012, CMS, Pretoria, 2013

Table 1. Prevalence of chronic conditions in the South African medical scheme population

Chronic condition	2006	2011	% increase
Hypertension	57,6	78,8	36,8%
High blood pressure	23,9	32,9	37,7%
Type-2 diabetes	12,0	22,1	84,2%
Hypothyroidism	9,7	13,7	41,2%
Glaucoma	1,8	2,7	50,0%
Rheumatoid arthritis	2,0	2,6	30,0%
Bipolar mood disorder	0,7	2,3	228,6%
Parkinson's disease	0,5	0,8	60,0%
Chronic renal disease	0,2	0,3	50,0%
Systemic lupus erythematosus	0,16	0,22	37,5%

Source: Annual Report 2012, CMS

4. THE DHCI SURVEY

4.1 The 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 administrator of the largest open medical scheme in South Africa, in partnership with the *Sunday Times*, a South African national newspaper (Patel et al., 2013).

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 DHCI 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 publicise the campaign and to register companies that wished to participate. Participation was not limited to existing Discovery Health clients.

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 the voluntary nature of participation were emphasised. 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. The questionnaire is included in the Appendix for completeness.

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. Participating employers where the response rate exceeded a certain threshold received a report benchmarking the health risk factors of their employees who participated in the survey with the full set of survey respondents. For employers with between 50 and 80 invitations sent, the threshold response rate was 30% of invitations sent while for participating employers with 80 or more invitations sent, a minimum of 24 responses was required. Those employers where the number of responses gave a maximum Bernoulli error of 5% were eligible for rating in the DHCI. The formula for calculating the Bernoulli error is given in equation 1:

$$\frac{n}{4(0,05)^2 n+1} \tag{1}$$

where n represents the number of email invitations sent to employees of that employer.

4.7 The manager responsible for the company's workplace health management programme or the human-resource manager completed an online employer questionnaire, which included sections on 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) which had similar aims.

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. The employer questionnaire was used to assess only which interventions were available in the workplace, and was not used in any further analysis. For the purposes of the analysis presented in this paper, the employee questionnaire was used to assess what chronic conditions were present. This was assessed by asking:

> 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.

The conditions listed were heart disease, high blood pressure, diabetes, high cholesterol, cancer, chronic lung disease (for example, emphysema, chronic bronchitis), and depression. The presence of the conditions was therefore self-reported. There was also no indication provided of the severity of the condition or the type of treatment used for chronic conditions. The questionnaire did not distinguish diabetes type. The employee questionnaire did not include questions on medical scheme membership.

4.9 Self-reported lifestyle behaviours 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 employee questionnaire.

4.10 101 companies participated in the survey and email invitations were sent to 58 737 employees. There were 13 578 employees who completed the employee questionnaire. This represented a response rate of 23,1%. The data presented in this study were collected solely from the employee questionnaire.

4.11 Since the data from this survey was sourced from email invitations, the scope is limited to employees with internet access and this means that the results may not be applicable to the broader South African workforce.

5. RESULTS

5.1 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 2.

Table 2. Number of respondents by age and gender

Age group	Females	Males	Total
<30	2 292	1387	3 940
30–39	3 158	2090	5 153
40–49	1 664	1203	2 783
50–59	760	709	1 417
>60	162	153	285
All	8 036	5542	13 578

5.2 Of the employee respondents, 3 299 reported having at least one of the chronic conditions listed in the question given in ¶ 4.8 and were termed 'chronic' for the purposes of this paper. Of the employee respondents, 765 reported having two or more of the conditions and the distribution of these responses is shown in Tables 3 and 4.

Table 3. Prevalence of total number of chronic conditions by age

Age group	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 4. Prevalence by age and gender for the chronic group

Age group	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 4 281 cases reported across the 13 578 respondents and the distribution thereof is shown in Table 5.

Table 5. Prevalence of each chronic condition by age
(number of reported cases in parenthesis)

Age group	Heart disease	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%
All	1,3% (181)	10,5% (1 419)	3,1% (416)	8,5% (1 160)	0,9% (122)	0,6% (76)	6,7% (907)

5.4 RISK FACTORS

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

– Body mass index (BMI) defined as 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 status, defined as current smoker, past smoker or never smoked;
– Nutrition measured in terms of fruit and vegetable servings per day; and
– Alcohol measured as units of consumption per week.

5.4.2 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' and the medium and high risk categories are considered to be 'outside the healthy range' (Kolbe-Alexander et al., 2008).

5.4.3 The proportion of respondents who fell outside of the healthy range for alcohol consumption as defined in ¶5.4.2 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 or binge-drinking behaviour, which was left for future analysis by the authors.

Table 6. Risk factors and behavioural risk categorisation

	Healthy range	Outside the healthy range	
	Low risk	Medium risk	High risk
BMI (kg/m^2)	18,5–24,9	25–29,9	<18,5 or 30+
Physical activity (min/week)	150+	120–149	<120
Nutrition (servings per day)	5+	3–4	0–2
Smoking	Non-smoker or quit smoking 5 or more years previously	Quit smoking less than 5 years ago	Smoker
Alcohol (units per day) Males	0	1–2	3+
Alcohol (units per day) Females	0	1	2+

5.4.4 The comparison of the proportion of respondents who fell within the healthy range for each of the risk factors is shown in Table 7. The comparison of the proportions in the chronic group and lives with no self-reported chronic conditions is made using a two-sample sign test (Mood, Graybill & Boes, 1974). All of the risk factors defined in ¶5.4.1 except nutrition, were significantly different (p<0,001) for the chronic group compared to the non-chronic group. The non-significance of the nutrition factor may be due to the simplified measurement in terms of fruit and vegetable intake only. Further work has been done on defining this factor subsequent to the first DHCI survey.

Table 7. Proportion of respondents outside the healthy range

	BMI	Physical activity	Nutrition	Smoking
Non-chronic (N =10 279)	59,3%	79,0%	81,7%	36,4%
Chronic (N=3 299)	73,9%	85,3%	81,7%	42,1%
Significance	***	***		***

*** p < 0,001, ** p < 0,01, * p < 0,05

5.4.5 The relative distribution by age group and risk category is shown graphically in figures 1 to 4. It is interesting to observe that the patterns by age are different for the various risk factors and that for smoking and nutrition, the prevalence of high-risk behaviour tends to reduce with age.

5.4.6 The relative proportions of respondents classified as being outside the healthy range for each risk factor were also considered for each condition. The results are shown in Table 8. The levels of significance are affected by the smaller sample size when the respondents are divided into different chronic conditions.

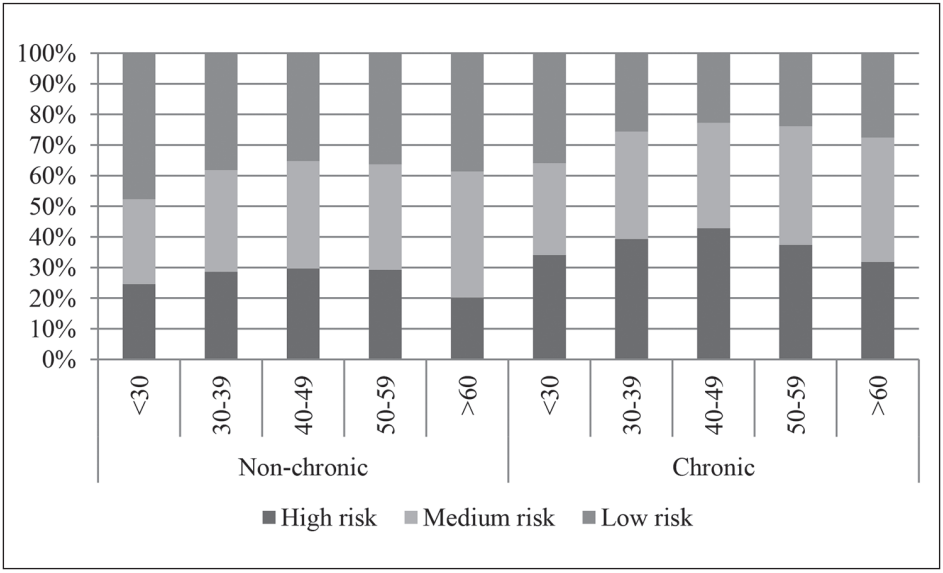

Figure 1. BMI risk status by age group and chronic status

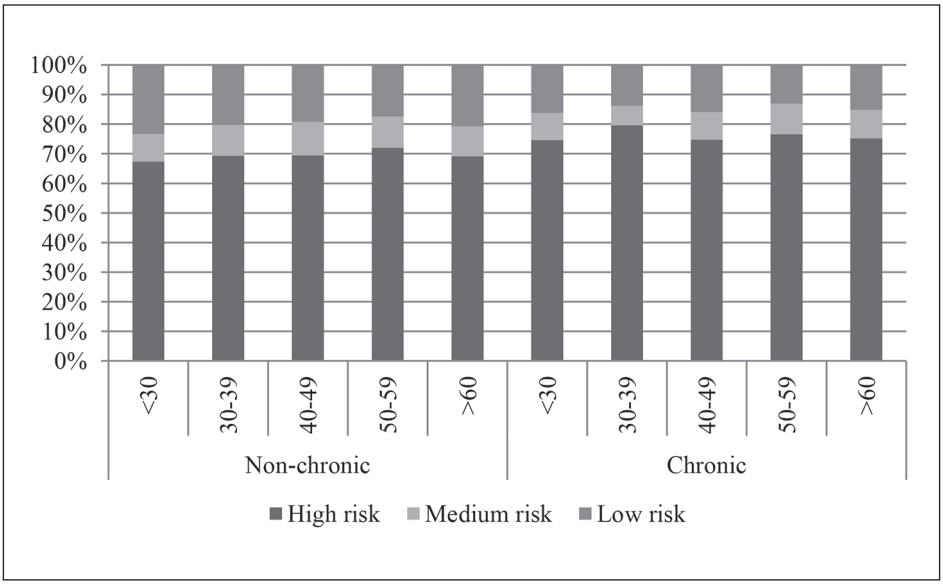

Figure 2. Physical activity risk status by age group and chronic status

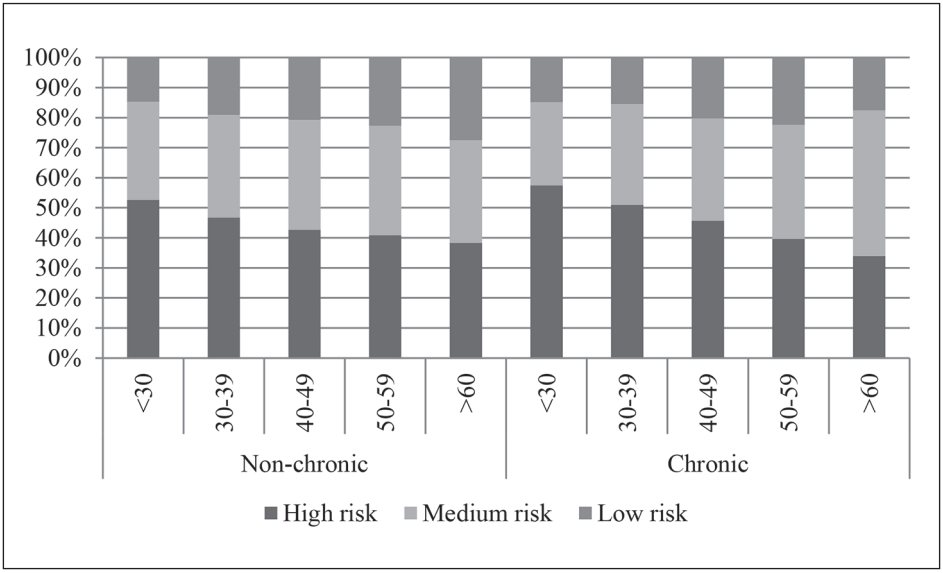

Figure 3. Nutrition risk status by age group and chronic status

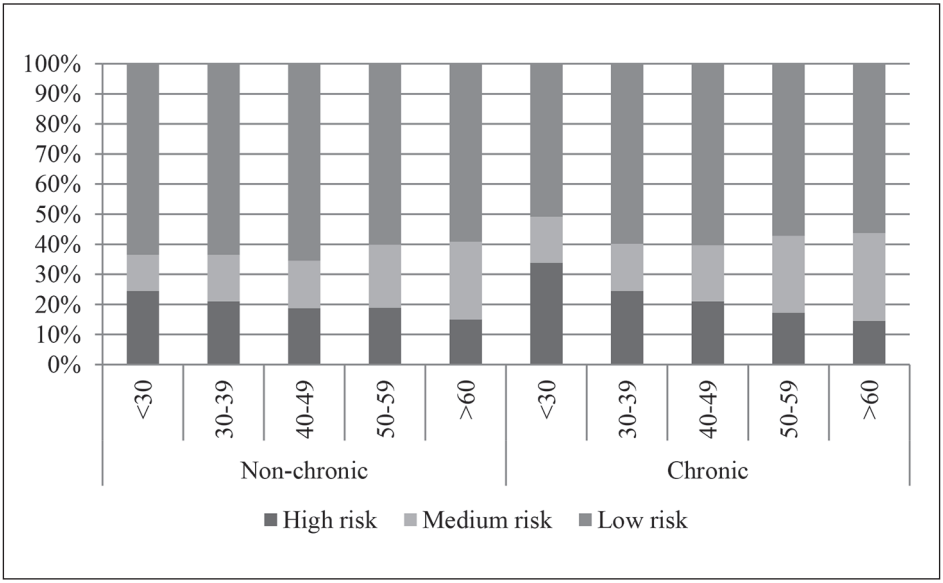

Figure 4. Smoking risk status by age group and chronic status

Table 8. Percentage of respondents not in the healthy range for various risk factors per chronic condition

		BMI	Physical activity	Nutrition	Smoking
Heart disease	No (*N*=13 397)	62,7%	80,5%	81,7%	37,6%
	Yes (*N*= 181)	72,8%	87,8%	84,5%	53,0%
	Significance	**	*		***
High blood pressure	No (*N*=12 159)	60,5%	79,9%	81,6%	37,6%
	Yes (*N*= 1 419)	83,0%	86,6%	82,7%	39,3%
	Significance	***	***		
Diabetes	No (*N*=13 162)	62,1%	80,3%	81,7%	37,6%
	Yes (*N*= 416)	84,8%	89,4%	83,7%	43,5%
	Significance	***	***		*
High cholesterol	No (*N*=12 418)	61,7%	80,4%	82,0%	37,5%
	Yes (*N*= 1 160)	75,4%	82,2%	79,0%	41,2%
	Significance	***		*	*
Cancer	No (*N*=13 456)	62,8%	80,5%	81,8%	37,7%
	Yes (*N*= 122)	63,6%	85,2%	77,0%	48,4%
	Significance				*
Chronic lung disease	No (*N*=13 502)	62,8%	80,5%	81,7%	37,7%
	Yes (*N*= 76)	70,7%	89,5%	90,8%	48,7%
	Significance		*	*	*
Depression	No (*N*=12 671)	62,7%	80,1%	81,7%	37,1%
	Yes (*N*= 907)	65,0%	86,7%	81,6%	47,9%
	Significance		***		***

*** $p < 0{,}001$, ** $p < 0{,}01$, * $p < 0{,}05$

5.4.7 The respondents reporting a heart condition had greater proportions of respondents outside the healthy range for smoking (p<0,001), BMI (p<0.01) and physical activity (p<0.05) than respondents not reporting a heart condition.

5.4.8 Similarly the respondents reporting high blood pressure—the most prevalent condition—had greater proportions of respondents outside the healthy range for BMI (p<0,001) and physical activity (p<0,001) than respondents not reporting high blood pressure.

5.4.9 The respondents reporting diabetes had greater proportions (p<0,001) of respondents outside the healthy range for BMI and physical activity. For smoking the proportion outside the healthy range was greater than for non-diabetics but with a lower level of significance (p<0,05). It is interesting that the nutrition factor is not significant as dietary changes are associated with diabetes treatment.

5.4.10 BMI (p<0,001) and smoking (p<0,05) were also associated more with respondents reporting high cholesterol than respondents without high cholesterol. The proportion of respondents reporting high cholesterol but in the healthy range for nutrition

was greater (p<0,05) than for respondents not reporting high blood pressure. This may indicate some behavioural change by these respondents due to their condition.

5.4.11 The respondents reporting cancer only had a greater proportion in the medium- and high-risk categories than the balance of respondents for smoking (p<0,05).

5.4.12 Behaviour outside the healthy range for smoking (p<0,05), nutrition (p<0,05) and exercise (p<0,05) was also more prevalent among respondents reporting chronic lung disease than respondents not reporting this condition. Chronic lung disease was the condition with the lowest prevalence and so these results are based on a very small sample and should be interpreted with caution.

5.4.13 The respondents reporting depression were more likely to be outside the healthy range for physical activity (p<0,001) and smoking (p<0,001) than respondents not reporting depression.

5.4.14 The association between the individual risk factors noted above and the chronic conditions is assessed using odds ratios in Table 9. These indicate that, for example, having a BMI outside of the healthy range is associated with a 1,94 greater likelihood of reporting at least one chronic condition. It was not possible to calculate the odds ratios for co-morbidities due to the small sample size.

Table 9. Odds ratios per chronic condition and risk factor

	BMI	Physical activity	Nutrition	Smoking
At least one chronic condition	1,94***	1,54***	1,00	1,27***
Heart disease	1,59**	1,75*	1,23	1,88***
High blood pressure	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***

*** p < 0,001, ** p < 0,01, * p < 0,05

5.4.15 The odds ratios per chronic condition and risk factor are shown graphically in Figure 5. The association between BMI being outside of the healthy range and increased likelihood of high blood pressure and diabetes is evident as well as the association between lower physical activity and increased likelihood of diabetes and chronic lung disease. Only for nutrition are there any odds ratios less than 1.

5.4.16 In order to examine the association between the risk factors and the chronic conditions a logistic regression was performed, including all risk factors and covariates to normalise for age and gender. The standard Wald hypothesis test (Hosmer & Lemeshow, 2004) was used to assess the likelihood of each risk factor being outside the healthy range for each condition. The significant factors are shown in Table 10. For

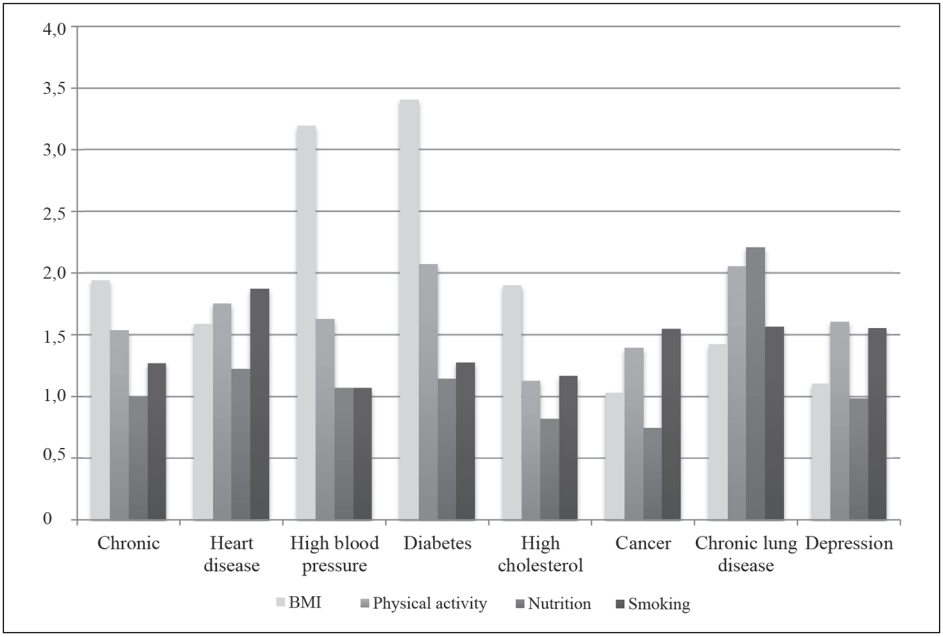

Figure 5. Odds ratios per chronic condition and risk factor

Table 10. Likelihood of respondents with specific chronic conditions reporting risk factors outside the normal range relative to respondents not reporting the condition

Condition	Risk factor	Likelihood	Significance
Cancer	Smoking	1,660	**
Chronic lung disease	Nutrition	2,564	*
Chronic lung disease	Smoking	1,642	*
Depression	BMI	1,167	*
Depression	Exercise	1,330	**
Depression	Smoking	1,712	***
Diabetes	BMI	2,872	***
Diabetes	Exercise	1,986	***
Diabetes	Smoking	1,231	*
High blood pressure	BMI	2,684	***
High blood pressure	Exercise	1,564	***
High blood pressure	Nutrition	1,265	**
High cholesterol	BMI	1,521	***

*** $p < 0{,}001$, ** $p < 0{,}01$, * $p < 0{,}05$

example, respondents with cancer were 1,66 times more likely to be smokers than respondents not reporting cancer and respondents with diabetes were 2,872 times more likely to have a BMI outside of the healthy range than non-diabetic respondents. The table only shows the risk factors that were significant and BMI and smoking feature the most across the diseases followed by exercise and nutrition.

5.5 CHRONIC CONDITIONS AND SELF-REPORTED HEALTH STATUS

5.5.1 Respondents were asked to classify their state of health and the responses are shown in Figure 6. Of the respondents reporting at least one chronic condition, 15,4% indicated that they consider their health to be excellent as compared to 30,6% of the non-chronic group which is significant at the 0,01% level. Of the respondents in the chronic group, 3,6% classified their health as poor or very poor as compared to 1,1% in the non-chronic group which is significant at the 0,01% level.

5.5.2 It can be challenging to convince an individual that their lifestyle choices are affecting their health status and that these can be modified (Lim et al., op. cit.). The results of the health perception question indicate that respondents in the chronic group are more aware of the adverse implications on their health than the non-chronic group. However 40,7% of chronic respondents consider their health to be good or excellent and are therefore less likely to adjust their behaviour according to Lim et al. (op. cit.).

5.6 CHRONIC CONDITIONS AND SCREENING TESTS

5.6.1 Respondents were also asked about whether they had undergone screenings for blood pressure, cholesterol, glucose and HIV in the previous 12 months and to indicate the results of these screenings. HIV was included due to the importance

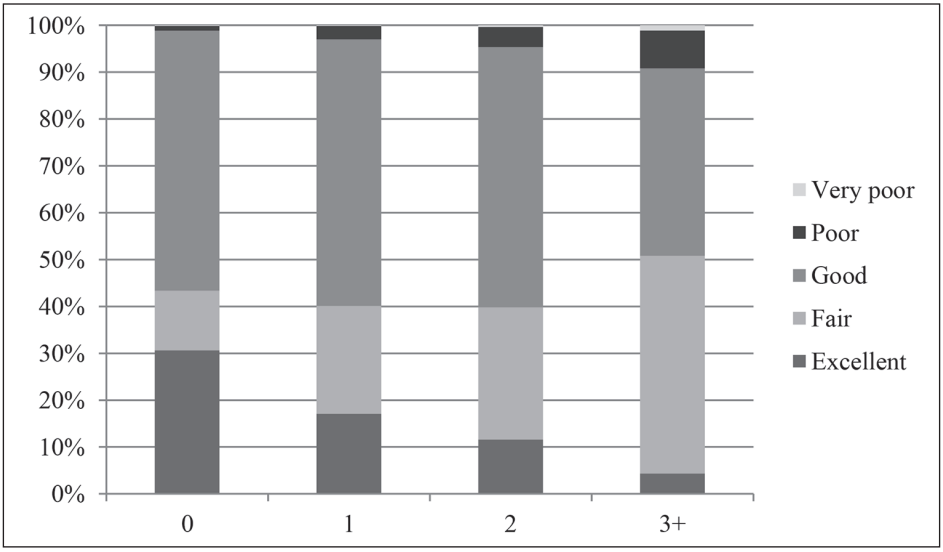

Figure 6. Perception of health by number of self-reported chronic conditions

of HIV risk awareness in the South African population. The respondents reporting at least one chronic condition were more likely to have undertaken all the screening tests (p<0,001) than the non-chronic group except HIV where they were less likely to have had a test (p<0,001). These results are shown in Table 11.

Table 11. Proportion of respondents taking a screening test in the previous 12 months

	Non-chronic	Chronic	Significance
Blood pressure	87,9%	94,3%	***
Cholesterol	61,6%	75,6%	***
Glucose	63,3%	74,6%	***
HIV	59,7%	55,8%	***

*** p < 0,001, ** p < 0,01, * p < 0,05

5.6.2 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 of the test results into low, borderline and high for the blood pressure, cholesterol and glucose tests were defined as per Table 12. Figure 7 shows that there was a higher prevalence of high and borderline results among chronic respondents than among non-chronic respondents. This effect was less marked for glucose.

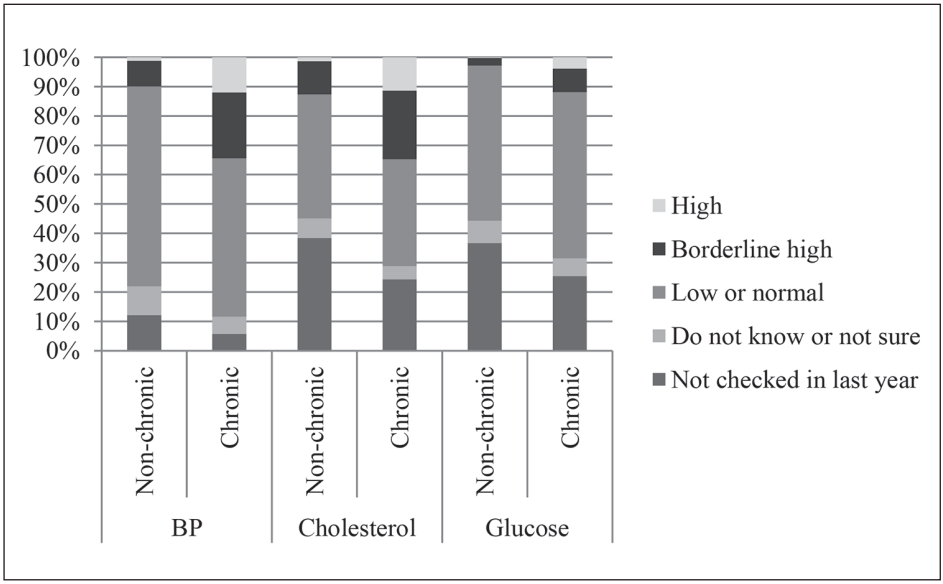

Figure 7. Results of screening tests for chronic and non-chronic respondents

Table 12. Classification of test results

	Low	Borderline high	High
Blood pressure	at or below 120/80 mmHg	120/80mm Hg to 139/89 mmHg	140/90 mmHg or higher
Cholesterol	Below 5,0 mmol/l	5,0 mmol/l to 6,0 mmol/l	6,1 mmol/l or higher
Glucose	Below 7,8mmol/l	7,9 mmol/l to 9,9 mmol/l	10 mmol/l or higher

6. COMPARISON OF RESULTS TO OTHER SOURCES

6.1 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 REF. The clinical criteria for classifying a beneficiary as having a chronic condition are defined clinically by the CMS.[11] These criteria therefore require clinical diagnosis as compared to the self-reported nature of the DHCI.

6.2 A prevalence of medical scheme beneficiaries per chronic condition was published by the CMS in 2007 based on a study conducted across the four largest administrators.[12] The treated case prevalence per 1 000 beneficiaries for the conditions comparable to those addressed in the DHCI survey are shown in Table 13. Since type-1 and type-2 diabetes were not distinguished in the DHCI questionnaire, the DHCI diabetes statistics have been compared to the REF type-1 and type-2 diabetes combined statistics.

Table 13. REF treated-case prevalence per 1 000 beneficiaries for comparable conditions by age

Age group	High blood pressure	High cholesterol	Depression	Type-1 and type-2 diabetes	Heart disease	Chronic lung disease
<30	2,480	1,191	0,794	2,538	0,246	7,913
30–39	17,250	6,083	1,110	6,783	1,475	12,524
40–49	67,804	24,181	1,332	21,107	7,429	17,018
50–59	155,680	68,971	1,467	40,617	24,012	24,980
>60	242,257	127,132	1,729	57,524	57,095	40,720

6.3 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 cases found that only chronic lung disease had a higher expected prevalence when using the REF results. The comparison is shown in Table 14. A comparison of the prevalences

11 Guidelines for the identification of beneficiaries with REF risk factors in accordance with the REF entry and verification criteria version 3.1. Council for Medical Schemes, 2008

12 CMS Approved REF Contribution Tables for 2007.xls, www.medicalschemes.com/Publications.aspx

revealed that none were statistically significantly similar. This adjustment takes account of age-based differences in the sample population but not the self-selection effect and the fact that the sample includes only employed people with internet access who may have different predisposition that the general population. The comparisons per age group are shown in Figure 8 and this is extended to condition level in Figure 9.

Table 14. Comparison of actual to expected cases per 1 000 respondents using REF prevalence

	High blood pressure	High cholesterol	Depression	Diabetes	Heart disease	Chronic lung disease
Expected	42,50	17,48	1,11	13,08	5,86	14,00
Actual	104,51	85,43	66,80	30,64	13,33	5,60
Ratio	41%	20%	2%	43%	44%	250%

6.4 The higher prevalence of all chronic conditions except for chronic lung disease in the DHCI group relative to the non-chronic group may reflect the effect of self-reported data as well as the fact that REF eligibility criteria refer to a level of treatment rather than just a diagnosis. The self-reported treatment data in the DHCI data was not specific enough to allow a comparison to the REF eligibility criteria.

6.5 The South African Health Review (Padarath & English, 2013) provides national statistics on hypertension as a proxy for chronic disease indicators. These statistics are

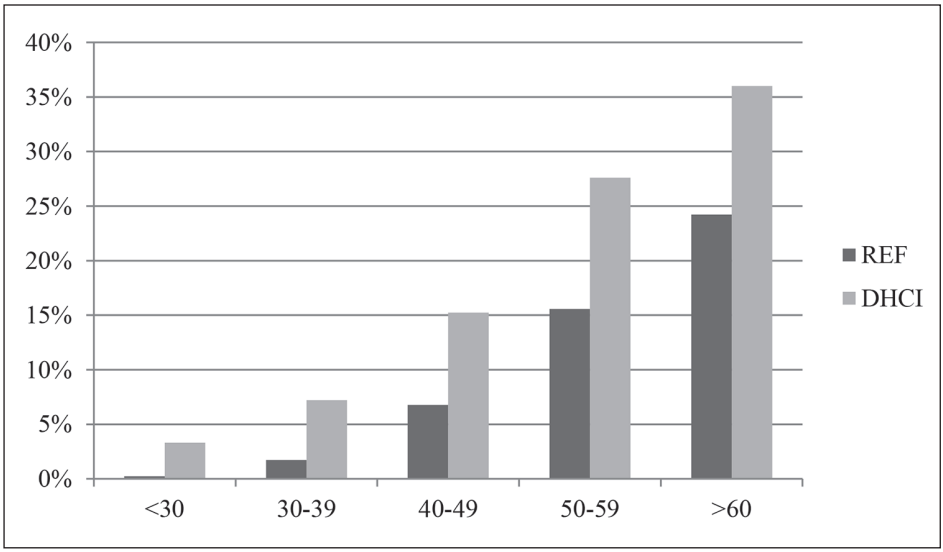

Figure 8. DHCI chronic prevalence by age group compared to REF

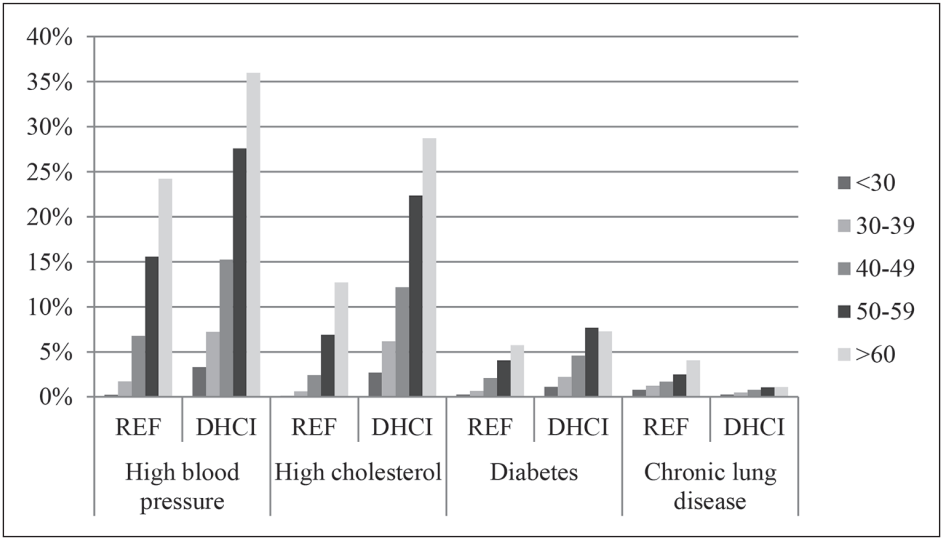

Figure 9. DHCI chronic prevalence by age and condition compared to REF

sourced from the National Income Dynamics Study (NiDS). Table 15 shows that there has been a reduction in this prevalence from the 2008 survey to the 2010 survey (Day & Gray, 2012).

Table 15. Hypertension prevalence per 1 000 lives in South Africa

	Males aged 25+	Female aged 25+	Total aged 25+
NiDS 2008	408	453	434
NiDS 2010	381	426	406
Change	–6,6%	–6,0%	–6,5%

Source: Padarath & English (op. cit.)

6.6 The Actuarial Society of South Africa produced a discussion document in 2010[13] that used the SADHS conducted by the Department of Health to compare population prevalence to medical scheme prevalence for certain conditions including hypertension, asthma, type-1 and type-2 diabetes and hyperlipidaemia. The SADHS prevalence is also self-reported and was compared to the REF prevalence which is treatment based. Hypertension and asthma were found to have a higher prevalence in the general population than in the medical scheme population; diabetes had similar prevalence and hyperlipidaemia had much lower prevalence in the general population.

13 Discussion Document: Burden of Disease. Actuarial Society of South Africa, 8 March 2010, www.actuarialsociety.org.za/Portals/2/Documents/BurdenOfDisease-March2010.pdf, 06/10/2014

7. DISCUSSION

7.1 While this paper 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 no causal relationships can be confirmed. A further limitation of this study is the reliance on self-reported data from a population of employees with internet access. The results therefore relate to the employed population who are likely to be in administrative, sales, management and professional roles rather than a representative spectrum of the employees. The prevalence of chronic conditions for this group may be significantly different to that of the general population.

7.2 The results have demonstrated that the prevalence of certain modifiable risk factors in an employed population can be used as an indicator of the prevalence of NCDs and the propensity for these conditions to develop.

7.3 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.

7.4 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 behaviour as a result of their chronic condition.

7.5 The modifiable risk factors of smoking and BMI had the highest significance for respondents in the chronic group. Higher risk BMI is often a consequence of poor nutrition and a lack of physical activity and so it is important to note that these factors are not necessarily independent.

7.6 It is not clear whether individuals reporting chronic conditions are aware of the potential positive effects that modifying their behaviour can have on their health. There appears to be a particular need to promote behavioural change in smoking and levels of physical activity, however it appears that the challenge is to convince people, particularly those who do not have a chronic condition but are at risk of developing one, that their current lifestyle choices are affecting their long-term health.

7.7 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.

7.8 NCDs are not only associated with increased medical costs. The prevalence of chronic conditions of lifestyle in an employee population has implications in terms of

organisational risks, such as absenteeism, treatment costs and productivity (Goetzel et al., 2003). The prevalence of chronic conditions of lifestyle amongst DHCI respondents suggests that there would be associated organisational risks in the South African employed population. These would have cost implications for the employers and for insurers covering this population.

7.9 Measuring the levels of behaviour with respect to modifiable health risk factors using questionnaires similar to that employed for the HCI provides an opportunity to identify the propensity for developing NCDs in a population. While this is useful for actuarial risk assessment, there is also an opportunity to intervene with programmes targeted at higher risk individuals rather than general health education.

7.10 Many disease management programmes currently adopted by employers and medical schemes are based on treatment of existing chronic conditions by providing access to medication and monitoring rather than promoting behavioural change. The literature noted above and the findings suggest that there is an opportunity to prevent the development of NCDs by encouraging employees to modify their risk behaviours.

7.11 This is a multi-stage process of creating awareness of this risk associated with certain practices and then providing opportunities for behavioural change (Beaglehole et al., 2012). Many of the challenges with reducing NCD prevalence identified by Beaglehole et al. (op. cit.) relate to behavioural change and a survey such as the DHCI contributes to raising public awareness , modifying risk factors and engaging businesses and the community, all of which are goals identified by (Beaglehole et al., op. cit.). Patel et al. (2013) have also identified the workplace as a site where there is an opportunity to promote behavioural change with respect to modifiable risk factors rather than only leaving this to the realm of the medical schemes.

7.12 Based on the employer survey, 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.

7.13 The DHCI data indicate that the self-reported prevalence of chronic conditions among employees in participating companies is associated with modifiable health risk factors. This suggests that there is an opportunity for South African employers to be more active in educating employees on the benefits of modifying their health risk behaviours

and the literature indicates that there is a potential economic benefit from investing in such disease management programmes.

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REFERENCES

Ayo-Yusuf, OA, Swart, TJP &, Pickworth, WB (2004). Nicotine delivery capabilities of smokeless tobacco products and implications for control of tobacco dependence in South Africa. *Tobacco Control* **13**, 186–9

Beaglehole, R, Bonita, R, Horton, R, Ezzati, M, Bhala,N, Amuyunzu-Nyamongo, M, Mwatsama, M & Reddy, KS (2012). Measuring progress on NCDs: one goal and five targets. *The Lancet* **380**(9850),1283–5

Bodenheimer, T (1999) The movement for improved quality in health care. *New England Journal of Medicine* **340**(6), 488–92

Chapman, LS, Lesch, N & Baun, MP (2007). The role of health and wellness coaching in worksite health promotion. *American Journal of Health Promotion* **21**(6), suppl 1–10

Dalal, S, Beunza, JJ, Volmink, J, Adebamowo, C, Bajunirwe, F, Njelekela, M, Mozaffarian, D, Fawzi, W, Willett, W, Adami, HO & Holmes MD (2011). Non-communicable diseases in sub-Saharan Africa: what we know now. *International Journal of Epidemiology* **40**(4), 885–901

Day, C, & Gray, A (eds) (2012). *South African Health Review* 2011/2012. Health Systems Trust, Durban

Ezzati, M & Lopez, AD (2003). Estimating the global mortality attributable to smoking in 2000. *The Lancet* **362**(9387), 847–52

Goetzel, RZ, Hawkins, K, Ozminkowski, RJ & Wang, S (2003). The health and productivity cost burden of the "top 10" physical and mental health conditions affecting six large U.S. employers in 1999. *Journal of Occupational and Environmental Medicine* **45**(1), 5–14

Guthold, R, Ono, T, Strong, KL, Chatterji, S & Morabia, A (2008). Worldwide variability in physical inactivity a 51-country survey. *American Journal of Preventive Medicine* **34**(6), 486–94

Hosmer Jr, DW & Lemeshow, S (2004). *Applied logistic regression*. John Wiley & Sons, New Jersey

Jurisich, SC & da Silva, R (1996). Managed Care and South Africa. *Transactions of the Actuarial Society of South Africa* **6**(2), 560–97

Khatib, O (2004). Noncommunicable diseases: risk factors and regional strategies for prevention and care. *Eastern Mediterranean Health Journal* **10**(6), 778–88

Kolbe-Alexander, TL, Buckmaster, C, Nossel, C, Dreyer, L, Bull, F, Noakes, TD & Lambert, EV (2008). Chronic disease risk factors, healthy days and medical claims in South African employees presenting for health risk screening. *BMC Public Health*, **8**(1), 228

Lee, IM, Shiroma, EJ, Lobelo, F, Puska, P, Blair, SN & Katzmarzyk, PT (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *The Lancet* **380**(9838), 219–29

Lim, SS, Vos, T, Flaxman, AD, Danaei, G, Shibuya, K, Adair-Rohani, H & Degenhardt, L (2013). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet* **380**(9859), 2224–60

Linnan, L, Bowling, M, Childress, J, Lindsay, G, Blakey, C, Pronk, S, Weiker, S & Royall, P (2008). Results of the 2004 national worksite health promotion survey. *American Journal of Public Health* **98**(8), 1503

MacIntyre, UE, Kruger, HS, Venter, CS & Vorster, HH (2002). Dietary intakes of an African population in different stages of transition in the North West Province, South Africa: the THUSA study. *Nutrition Research* **22**(3), 239–56

Mayer-Foulkes, DA (2011). A survey of macro damages from non-communicable chronic diseases: another challenge for global governance. *Global Economy Journal* **11**(1), 1–27

Mayosi, M, Fisher, J, Lalloo, UG, Sitas, F, Tollman, SM & Bradshaw, D (2009). The burden of non-communicable diseases in South Africa. *The Lancet* **374**(9693), 934–47

Mood AM, Graybill FA & Boes DC (1974). *Introduction to the Theory of Statistics*, 3rd edition. McGraw-Hill International Editions, New York

Murray, CJL & Lopez, AD (2013). Measuring the global burden of disease. *New England Journal of Medicine* **369**(5), 448–57

Padarath, A & English, R (eds.) (2013). *South African Health Review 2012/2013*. Health Systems Trust, Durban.

Patel, DN, Lambert, EV, da Silva, R & Greyling, M (2010). The association between medical costs and participation in the Vitality Health Promotion Program among 948,974 members of a South African health insurance company. *American Journal of Health Promotion* **24**(3), 199–203

Patel, D, Goetzel, R, Beckowski, M, Milner, KM, Greyling, MJ, da Silva, R, Kolbe-Alexander, T, Tabrizi, M & Nossel, C (2013). The healthiest Company Index: A campaign to promote worksite wellness in South Africa. *Journal of Occupational and Environmental Medicine* **55**(2), 172–8

Pronk, NP, Goodman, MJ, O'Connor, PJ & Martinson, BL (1999). Relationship between modifiable health risk and short-term health charges. *Journal of the American Medical Association* **282**(3), 2235–9

Sattelmair, J, Pertman, J, Ding, EL, Kohl, HW, Haskell, W & Lee, IM (2011). Dose response between physical activity and risk of coronary heart disease: a meta-analysis. *Circulation*, **124**(7), 789–95

Saloojee, Y (2006). Tobacco Control in South Africa. In Steyn, Fourie & Temple (2006: 48–57) Serfontein, M, Venter, C, Kruger, A, Maclntyre, U & Pisa, PT (2009). Alcohol intake and micronutrient density in a population in transition: the THUSA study. *South African Journal of Clinical Nutrition* **22**(5), S22–S28

Steyn, K, Bradshaw, D, Norman, R, Laubscher, R & Saloojee, Y (2002). Tobacco use in South Africans during 1998: the first demographic and health survey. *European Journal of Cardiovascular Risk* **9**(3), 161–70

Steyn, K (2006). Conceptual framework for chronic diseases of lifestyle in South Africa. In Steyn, Fourie & Temple (2006:1–8)

Steyn, K, Fourie, J & Temple, N (eds.) (2006). Conceptual framework for chronic diseases of lifestyle in South Africa. Technical report, Medical Research Council, Cape Town.

Tanner, M & Lukmanji, Z (1987). Food consumption patterns in a rural Tanzanian community (Kikwawila village, Kilombero District, Morogoro Region) during lean and post-harvest season. *Acta tropica* **44**(2), 229–44

Vorster, HH (2001) South African food-based dietary guidelines. *South African Journal of Clinical Nutrition* **14**(3), S1–S80

Wolf, AM & Colditz, GA (1998). Current estimates of the economic cost of obesity in the United States. *Obesity Research* **6**(2), 97–106

Yusuf, S, Reddy, S, Ôunpuu, S & Anand, S (2001). Global burden of cardiovascular diseases part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* **104**(22), 2746–53

APPENDIX
South African HCI employee questionnaire 2010

About you

What is your date of birth?

Month	Year

What is your gender?

Male	Female

Are you currently pregnant? – *only to appear if FEMALE is selected for previous question*

Yes	No

What is your marital status?

Single	Married	Divorced
Widowed	Common law spouse	

What is your highest education level?

Primary school	High school	College or technical school diploma
University degree	Postgraduate qualification	

What is your ethnic group? – *this question is optional*

African	Coloured	Indian
White	Asian	

What is your annual income range? – *this question is optional*

Under R132 000	R132 001–R210 000	R210 001–R290 000
R290 001–R410 000	R410 001–R525 000	R525 001 and above

What is the best description of your job?

Senior management	Middle management	Professional
Sales	Administrative/clerical	Technician
Security	Other (please specify)	

Which province do you work in?

Gauteng	Eastern Cape	Western Cape
Northern Cape	Free State	KwaZulu-Natal
Limpopo	North West	Mpumalanga

On average, how many hours a week do you work?

Less than 24 hours	25–34 hours	35–44 hours
45–54 hours	55 hours or more	

In the past 30 days, on how many days did you come in early, go home late, or work on your day off? – *Drop down of 0–30 days*

Are you able to work flexi-time, that is are you able to work at times convenient to you (for example, before or after the normal workday)?

Yes	No

Are you mostly:

Office-based	Remote/field-based	Both

Is your position:

Full-time	Part-time	Temporary/contractor

Do you work shifts?

Yes	No

Do you work: – *only to appear if yes is selected for the previous question*

Day shift	Night shift	Shifts vary

In the past 12 months how many days of annual holiday leave have you taken?

0 days	1–2 days	3–4 days	5–6 days
7–8 days	9–10 days	11–13 days	14 days +

In the past 3 months how many times did you visit the doctor?

0	1	2
3	4	5+

In the past 12 months how many times were you admitted to hospital?

0	1	2	3
4	5	6	7
8	9	10	

If 1 or more admissions are selected, the following question appears. Only the number of admissions that the person selected in the previous question should appear. Next to each admission should be a drop down list of answer options:

How many days did you spend in hospital each time?

Admission 1	Less than 1 day	1–2 days	3–4 days
5–6 days	7–8 days	9–10 days	11 days or more

During the time you were at work in the last 12 months, how much did health problems limit you in the kind or amount of work you could do (where "did not limit my work at all" is equal to 0 and "completely prevented me from working" is equal to 10).

0	1	2	3
4	5	6	7
8	9	10	

Your overall health

How would you describe your general health over the last year?

Excellent	Good	Fair
Poor	Very poor	

How tall are you?

centimetres	*or*	feet and inches

How much do you weigh?

kilograms	*or*	pounds

Please choose the option that best describes how you feel about your current weight:

I am happy with my weight
I am not happy with my weight but have no intention of losing or gaining weight any time soon
I would like to change my weight

When was your blood pressure last checked?

Within the past year	One to five years ago	Over five years ago
It has never been checked	Don't know/not sure	

What was it when it was last checked? – *not to appear if either "It has never been checked" or "Don't know/not sure" was selected for Q5*

Low or normal (At or below 120/80)	Borderline high (120/80 to 139/89)
High (140/90 or higher)	Don't know/not sure

When was your cholesterol last checked?

Within the past year	One to five years ago	Over five years ago
It has never been checked	Don't know/not sure	

What was your total cholesterol when it was last checked? – *not to appear if either "It has never been checked" or "Don't know/not sure" was selected for Q6*

Desirable (below 200)	Borderline high (200–239)
High (240 or higher)	Don't know/not sure

When was your fasting blood glucose (blood sugar) last checked?

Within the past year	One to five years ago	Over five years ago
It has never been checked	Don't know/not sure	

What was your fasting blood glucose (blood sugar) level the last time it was checked? – *not to appear if either "It has never been checked" or "Don't know/not sure" was selected for Q7*

Desirable (below 100)	Borderline high (100–125)
High (126 or higher)	Don't know/not sure

Have you ever been told by a doctor or a health professional that you have diabetes or high blood sugar?

Yes	No

When was your haemoglobin A-1C level last checked? – *not to appear if NO was selected for Q8*

Within the past six months	Within the past 7–12 months	More than a year ago
It has never been checked	Don't know/not sure	

What was it the last time you had it checked? – *not to appear if either "It has never been checked" or "Don't know/not sure" was selected for Q8b*

Desirable (6 or lower)	Borderline high (7)
High (8 or higher)	Don't know/not sure

How many *days* of sick leave have you taken over the last 12 months?

0 days	1–3 days	4–6 days	7–10 days
11–14 days	More than 14 days		

How many *times* have you taken sick leave over the last 12 months?

Once	Twice	Three times
Four times	Five times or more	None

Has a doctor told you that you currently have any of the following conditions? If yes, please indicate whether or not you are currently on medication:

Heart disease	
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
High blood pressure	
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Diabetes	
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
High cholesterol	
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Cancer	
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Chronic lung disease (for example, emphysema, chronic bronchitis)	
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Depression	
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Stroke	
Are you on medication? – *only to appear if answer above is YES*	
Yes	No

Arthritis/joint bone problems	
Yes	No
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Asthma/allergy	
Yes	No
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Back or neck problems	
Yes	No
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Hand or wrist problems	
Yes	No
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Chronic headaches or migraines	
Yes	No
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
Digestive problems such as chronic inflammatory bowel disease or colitis	
Yes	No
Are you on medication? – *only to appear if answer above is YES*	
Yes	No
None of the above	

Your fitness

On average, how many days a week do you usually exercise (e.g., cycling, running, walking, sessions in the gym etc.)? *Shows a drop down of 0–7 days*

On the days you exercise, on average how many minutes do you usually exercise for?

- *only to appear if answer to previous question is 1 or more*
- *Shows the following drop downs: 10 mins, 20 mins, 30 mins, 40 mins, 50 mins, 60 mins, 70 mins, 80 mins, 90 mins, 100 mins, 110 mins, 12 mins or more*

How intense are your exercise sessions usually? – *only to appear if answer to first fitness question is 1 or more*

Low – if you can sing several phrases of a song without breathing hard
Moderate – if you can have a conversation and breathe comfortably
Vigorous – if you have to take a breath between every word you say

In an average week, how many times do you work out at the gym? – *only to appear if answer to How many exercise sessions a week is 1 or more*
– *Shows a drop down of numbers from 0–15*

In which of the following sports, exercises or activities do you regularly take part? – *only to appear if answer to first fitness question is 1 or more*
If any of the activities are ticked, a pop up asks:

Do you take part in these through work?

Yes		No	
Aerobics or step class	Rock climbing	Cricket	Soccer
Canoeing	Running	Cycling	Squash
Dancing	Surfing	Hockey	Swimming
Golf	Tennis	Netball	Triathlon
Martial arts	Walking	Pilates or yoga	Rugby
Other	None		

Which statement best describes your exercise habits?

I am happy with the amount of exercise I am doing
I know my fitness level has to improve, but I do not want to exercise more right now
I want to increase my exercise and fitness levels

Your smoking

Do you smoke cigarettes?

No, I have never smoked
No, but I used to smoke before
Yes, I am a current smoker

How many cigarettes do you smoke per day? – *only to appear if answer to previous question is YES, I am a current smoker*
– *Shows drop down of numbers from 1–40 and More than 40*

How long have you been a smoker? – *only to appear if answer to previous question is YES, I am a current smoker*
– *Shows a drop down of: Less than 1; 1; 2; etc to 50 or more*

Please choose the option that best describes your smoking habits – *only to appear if answer to first smoking question is YES, I am a current smoker*

No intention of stopping smoking
Would like to stop smoking but not right now
Want to give up smoking and would like help quitting

How long ago did you stop smoking? – *only to appear if answer to previous question is No, but I used to smoke before*

Less than 1 year	1–2 years	2–5 years
5–16 years	17 years ago or more	

How many cigarettes did you smoke per day? – *only to appear if answer to previous question is NO, but I used to smoke before*
Shows drop down of numbers from 1–40 and More than 40

Your nutrition

How many servings of fruit do you usually eat each day (1 serving = 1 small fruit, ½ cup of fruit salad, or ¼ cup of dried fruit)?

0 servings	1 servings	2 servings
3 servings	4 servings	5 servings or more

How many servings of vegetables do you usually eat each day (1 serving = 1 cup of fresh vegetables, or ½ cup of cooked vegetables)?

0 servings	1 servings	2 servings
3 servings	4 servings	5 servings or more

Which of the statements below best describes your eating habits?

I eat mainly healthy food
I eat approximately equal amounts of healthy and unhealthy foods
I eat mainly healthy food but sometimes eat unhealthy food as well
I eat unhealthy food very occasionally or not at all

What statement best describes how you feel about your diet?

I am happy with my diet
I know my diet needs improvement but don't really want to change it now
I want to change my diet, and would appreciate some help

Your alcohol consumption

In the past month, how often did you consume alcohol?

Never	2–3 days a month	Once a week
2–3 days a week	4–5 days a week	6–7 days a week

Approximately how many alcoholic drinks did you consume on the days you drank – *only to appear if answer to previous question is 1–2 days or more* (one drink is equivalent to 1 beer can (340ml), 1 small glass of wine (150ml), 1 metric tot of spirits (25ml), or 1 small glass of liqueur (25ml))?

0	1	2
3	4	5 or more+

In a typical week, how many times have you had 5 or more drinks on one occasion?

Never	1 time	2–3 times
More than 3 times		

Are you intending to cut down on your alcohol consumption over the next 6 months? – *only appears if answer to first question is 1–2 days or more, or if answer to previous question is ONCE A WEEK OR MORE*

Yes	No

Emotional health and wellbeing

On the whole, people within my organisation get on well with minimal conflict

Strongly agree	Agree	Neither agree nor disagree
Disagree	Strongly disagree	

In general, I do not feel unduly pressurised by my work

Strongly agree	Agree	Neither agree nor disagree
Disagree	Strongly disagree	

Overall, I am satisfied with my job

Strongly agree	Agree	Neither agree nor disagree
Disagree	Strongly disagree	

Overall, I get on well with my immediate manager

Strongly agree	Agree	Neither agree nor disagree
Disagree	Strongly disagree	

I feel run down, burnt out, stressed out or exhausted

Strongly agree	Agree	Neither agree nor disagree
Disagree	Strongly disagree	

Which of these statements would you say best describes you?

I seldom feel stressed and I am coping well
I sometimes feel stressed and I am coping well
I often feel stressed but I am coping well
I sometimes feel stressed and have trouble coping
I often feel stressed and have trouble coping

In the past month, how many work days did you miss because of problems with your physical or mental health?

No days	1–2 days	3–4 days
5 or more days		

Your organisation

My company cares about my health and wellbeing

Strongly agree	Agree	Neither agree nor disagree
Disagree	Strongly disagree	

Work-related stress does not affect my job performance

Strongly agree	Agree	Neither agree nor disagree
Disagree	Strongly disagree	

My work environment enables me to maintain good health e.g. through policies and programmes that support my health and wellbeing

Strongly agree	Agree	Neither agree nor disagree
Disagree	Strongly disagree	