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Risk Factor	Risk Factor Category	Prevalence (%)	Odds Ratio / Relative Risk*	Reference	Data Source	Risk Factor Category	
Physical Activity:	Active	50.7	1.00 (Referent)	[9]	US NHANES		
	Somewhat Active	21.3	1.15				
	Inactive	28.0	1.52				
	No LTPA		1.00 (Referent)	[37]	Meta-analysis (males)		
	Met PA guideline		0.91				
	Exceeded PA Guideline		0.82				
	No LTPA		1.00 (Referent)	[37]	Meta-analysis (females)		
	Met PA guideline		0.80*				
	Exceeded PA Guideline		0.72*				
	1.00 (Referent)						
	Inactive (<150min/wk)		1.17	[38]	BRFSS		
Smoking Status	Non-Smoker	8221.321.3		#21.80			

Therefore the aim of this literature review is to examine current evidence for the role of worksite health promotion programs' role in the prevention of NCD's. The prevalence of risk factors for NCD's among employees, with a focus on physical activity, and the clustering of risk behaviors among employees will be discussed. In addition, the economic consequences of NCD's and possible benefits of worksite intervention programs are briefly addressed. The main component of the literature review reports on the role of health risk appraisals as an entry for worksite health promotion programs.

M d

S a c a a d a c a

The search strategy included using the online database, Pub Med to find relevant manuscripts. Various combinations of the following terms were used when searching the Pub Med database; 'worksite health promotion programs'; 'non-communicable disease risk factors AND cluster of risk'; 'economic burden AND non-communicable diseases'; 'physical activity AND worksite'; and 'physical activity AND employee health'. The references in some of the manuscripts that were sourced were also examined for additional publications. In addition, reports from the World Economic Forum's Workplace Wellness Alliance website (<http://alliance.weforum.org/>) were obtained.

Manuscripts that were published within the last 10 years, as well as systematic reviews and meta-analyses were given priority due to the limited scope of this review and, in some cases, paucity of data available.

R

Ra a f a

It has been estimated that more than 3.6 billion people will form part of the global workforce by 2020 [10]. Consequently, the worksite has identified as an opportune setting for health promotion programs aimed at improving employee health status and productivity since many people can be reached in this setting [11-13]. Employers have the opportunity to engage with employees on an ongoing basis with extensive reach and frequent interaction [14]. Indeed, the Report of the Secretary General, UN General Assembly, May 2011, recommends that the private sector play a role in promoting healthy lifestyle behaviors among employees including both health promotion policies and worksite health promotion programs [3].

Worksite health promotion programs have been shown to result in economic benefits both for the employer and employee [10]. The economic outcomes of worksite intervention programs includes increased productivity and reduced absenteeism and healthcare

expenditure [12]. Evidence from a recent review of the economic benefits of these programs concluded that it is 'one of the most effective strategies for reducing medical costs and absenteeism' [15]. Consequently, more and more employers are implementing health promotion and intervention programs in their companies [12]. The economic outcomes of worksite health promotion programs will be discussed in more detail later in this literature review.

In addition to the economic benefits, previous research has shown that worksite health promotion programs are effective in reducing the risk for NCD's among employees [16]. Although the effect sizes of these interventions on health vary and are less than that observed in clinical trials, it has still been advocated as it results in marginal changes [16]. Small changes in behavior and health parameters have been shown to result in a considerable impact on disease risk when observed at a population level [10].

The next section of the literature review will present data on the prevalence of NCD risk factors followed by an overview of the effectiveness of worksite health promotion programs.

P a c f NCD fac

The main risk factors for NCD's were reported in the introduction of this literature review. The risk factors that encompass lifestyle behaviors, namely, physical activity, and healthy diet (together with obesity) will be the focus of this section of the review. Indeed, the WHO identified these behaviors as among the five leading causes for global mortality [17].

Physical inactivity is widely recognized as a major risk factor for NCD's [7,8]. If it were possible to reduce the global pandemic of physical inactivity, it has been estimated that between 6-10% of all deaths due to NCD's may be prevented [8]. For example, approximately 21-25% of breast and colon cancer and 27% of the burden of diabetes could be reduced by reducing the levels of physical inactivity [17]. However, more than half (58%) of the world's population do not meet the physical activity guidelines, which is similar to the number of Africans who are currently insufficiently physically active (60%) [17].

Changes in dietary behaviors with increased consumption of refined starch, sugar, salt and unhealthy fats has contributed to the increased prevalence global prevalence of obesity, which has more than doubled since 1980 [1,12]. A recent WHO report states that four in ten people are either overweight or obese ($BMI \geq 24.9 \text{ kg/m}^2$) [17]. The 'Workplace Wellness Alliance' reported that the prevalence of obesity in African employees is nearly 20%, and is higher than that reported for Europe and South America [12]. This prevalence is slightly less than that reported in the population average which is from WHO survey which was conducted in adults (not only in the worksite setting) between 1996 and 2009 (Figure 1) [12]. Furthermore, the WHO reported that 41% of all deaths in Africans under the age of 60 years could be attributed to a high Body Mass Index [17].

The prevalence of NCD and cardio-metabolic disease has been investigated in the employed population, although less so in South Africa. Ker et al., 2007 described the frequency of metabolic syndrome among South African corporate executives comprising of men ($n=1367$)

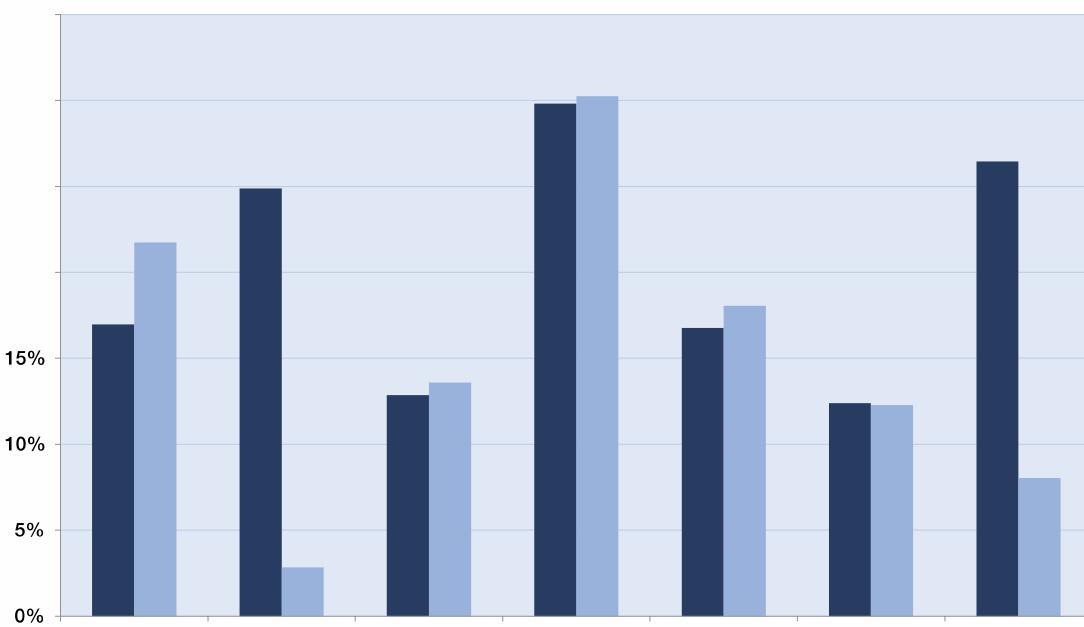


Figure 1 is from the 'The Workplace Wellness Alliance: Making the right investment - Employee Health and Power of Metrics' report [12]
BMI: Body Mass Index

WEF: World Economic Forum

WHO: World Health Organization

Figure 1: Prevalence of obesity ($BMI > 30 \text{ kg/m}^2$) among employees from the WEF Alliance survey and WHO population survey.

rated health status and lifestyle behaviors anonymously [31]. The non-participants also reported on their reason for declining to participate in the HRA intervention program [31]. The main reasons the non-

[36]. Thus those individuals with healthier lifestyle behaviors had lower subsequent medical expenses. Thus HRA's and related intervention programs have might play a role in attenuating the economic impact of NCD's on the economy.

S a

The burden of NCD's is increasing globally, however more so in low-middle-income countries. The workplace provides an opportune setting for health promotion programs which aim to address NCD's and their risk factors. The HRA, can be regarded as the first step towards

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