2016

The Relationship Between Health Risk and Workplace Productivity in Saudi Arabia

Sarah Lorraine Hayman
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral dissertation by

Sarah Hayman

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. James Goes, Committee Chairperson, Health Services Faculty
Dr. James Dockins, Committee Member, Health Services Faculty
Dr. Pat Carmoney, University Reviewer, Health Services Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2016

Abstract

The Relationship Between Health Risk and Workplace Productivity in Saudi Arabia

by

Sarah Hayman

MHA, Phoenix, 2010

PG Dip (Sports Med), Otago, 2005

B (Phty), Otago, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Health Services

Walden University

December 2016

Abstract

Rising worldwide rates of noncommunicable diseases (NCDs) in the Middle East, principally Saudi Arabia, have put an increasing load on the health system and employers. Middle Eastern organizations have been slow to develop targeted health programs, which include an emphasis on employee productivity. The purpose of this study was to determine the relationship, if any, between employee lifestyle and workplace productivity. Productivity is the amount of work produced based on the time and cost required to do so. The underlying theoretical foundations of this research were the socioecological health model and the human capital model. The quantitative, ex post facto design relied on secondary data from Saudi Aramco. Lifestyle data were collected from a health risk assessment including the Stanford Presenteeism Scale. Data analysis consisted of both a correlational and multiple regression analysis. Correlational results indicated that exercise, tobacco use, body mass index (BMI), and nutrition were significantly related to workplace productivity. Exercise and nutrition had a significant positive correlation with workplace productivity, while tobacco use and increasing BMI were negatively correlated with workplace productivity. Multiple regression analysis results explained 21% of the variance in the dependent variable, a sizable percentage with such a large sample. Overall, these results suggest a strong influence of health choices on productivity. Since this research was the first to explore the unique cultural context and draw attention to the increasing NCD burden, the results are notable. Implications of this research should resonate with organizational leaders in the Middle East, and provide a clear opportunity to improve organization and human performance.

The Relationship Between Health Risk and Workplace Productivity in Saudi Arabia

by

Sarah Hayman

MHA, Phoenix, 2010

PG Dip (Sports Med), Otago, 2005

B (Phty), Otago, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Health Services

Walden University

December 2016

Dedication

Raylene, you would have loved this.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

The rising prevalence of noncommunicable diseases (NCDs) worldwide has increased the burden on global health resources (Dollard & Neser, 2013; Edington, 2001). Edington (2001) found that NCDs negatively affect workplace productivity in the United States. Lost productivity contributes to growing direct and indirect costs for employers due to lost work time and reduced employee presenteeism (Sanderson & Cocker, 2013). Presenteeism refers to the time lost when an employee is not focused at work and is producing poor quality and/or quantity of work (Loeppke et al., 2009).

Effective organizational performance requires a healthy and productive workforce. Initially, Schultz (1962) coined the concept of human capital, referring to the value associated with employee education and training capabilities. Subsequently, Grossman refined the human capital concept and introduced the more advanced health and economic components model (Grossman & National Bureau of Economic Research, 1999). The health and economic model includes a consideration of the impact of employee capabilities on organization performance. This work led to an understanding that healthy human capital improves organizational and fiscal performance. Understanding that employee health has a relationship with business performance is the historical foundation for health and productivity management (Luby & Al-Jahdaly, 2005)

The growing costs of medical conditions, especially chronic health issues, are becoming a significant burden for organizations (Dollard & Neser, 2013). As the workforce ages in industrial countries, there is an associated increase in the prevalence of NCDs (Szinovacz, 2011). These NCDs can result in absenteeism or a decline in productivity (Horseman, Freeland, & Guidotti, 2010; Koopman et al., 2002). Chronic health conditions are affecting The Middle East as they among the world leaders in diabetes, obesity, and respiratory diseases (Kilpi et al., 2014).

In Chapter 1, I introduce the background of health and productivity management. In this analysis, I compare the established programs in the United States with those in The Middle East, particularly Saudi Arabia. In this chapter, I describe the current health status in Saudi Arabia and explore the existing health, productivity, and wellness literature. I also identify the differences between the United States and Saudi Arabia in the prevalent NCDs and explore the underlying cultural drivers. Also, I detail the study methodology and design, including the research questions and hypothesis.

Background

Health and productivity are emerging fields, particularly the focus on healthy human capital. Edington (2001) defined human capital as the proportion of an individual employee's total productivity output in the service of the firm. Health is an important component contributing to human capital, along with education, skills, knowledge, and attitude. (Edington, 2009a) found that 14% of organizations measured their employee productivity and their relationship to NCDs. The increasing burden of NCDs currently threatens the supply of healthy human capital (Van den Heuvel, Geuskens, Hooftman, Koppes, & Van den Bossche, 2010). The World Economic Forum (WEF) found that these NCDs are now the leading cause of deaths (WEF, 2012). High NCD rates translate into approximately 63% of annual deaths and 50% of all premature deaths (WEF, 2012). Healthy and productive workers also have a higher life expectancy (Dollard & Neser, 2013).

In addition to the effects on human capital supply, these NCDs pose an economic burden on society. These NCDs will cost $47 trillion over the next 20 years, a staggering 4% of the gross domestic product (GDP; WEF, 2012, p. 7). In conjunction with the direct medical expenditure related to chronic health conditions, organizations must also examine productivity. In countries that have been studied thus far, health conditions and the presence of health risks have been demonstrated to negatively affect workplace productivity (Horseman, Freeland, & Guidotti, 2010). With organizations beginning to understand these implications, worksites implementing preventative health programs are becoming more prevalent. For example, the United States, Australia, and New Zealand are leading the world with their integrated health programs, and the potential to improve performance is vast (WEF, 2013).

In 2007, the Integrated Benefits Institute (IBI) was able to attribute a cost to employees' lost productivity associated with illness. The IBI combined the Health and Work Performance Questionnaire (HPQ) to estimate that an employee loses 8 days annually to health-related productivity loss. Based on United States labor costs, this equates to an annual cost of $2598 (Schultz & Edington, 2007). In a company Saudi Aramco's size (*n*=56,000), this equates to $145 million in lost revenue (Saudi Aramco, 2014).

The Middle East and Saudi Arabia have limited health status data, mainly related to lifestyles. (Mokdad et al., 2014) found that the Middle East have a unique set of NCDs related to their historical, social, cultural, and economic characteristics. Some scholars have examined individual lifestyle behaviors, including fruit and vegetable consumption, physical activity, tobacco use, sitting hours, and Body Mass Index (BMI) (Holden et al., 2011; Iverson, Lewis, Caputi, & Knospe, 2010; Loeppke et al., 2009). As of 2016, health and productivity researchers have not attempted to relate lifestyle to workplace productivity within this region.

Establishing baseline health and productivity data, unique to Saudi Arabia and The Middle East, is a first step in strengthening human capital investment in the region. Rigorous employee wellness program evaluation is challenging without robust data. Therefore, without these data, building a business case for launching new programs is difficult. Health and productivity statistics allow researchers to make a case to engage with policy makers to adopt these wellness initiatives. The workplace is a unique and useful setting for health promotion, delivered via wellness programs.

Problem Statement

NCD rates are rising worldwide and are driving increasing health care costs. Besides direct health care costs, NCDs also impact workplace productivity (World Economic Forum, 2013). The prevalence of NCDs has been linked to modifiable risk factors such as tobacco use, physical activity, fruit and vegetable consumption, alcohol use, and obesity (World Health Organization [WHO], 2012). The link between health and workplace productivity has been researched within the United States, but not within the Middle East, particularly Saudi Arabia.

This quantitative, ex-post facto study enabled an exploration of the relationship between lifestyle health risks and productivity in Saudi Arabia. The location of the study population was a large energy company in Saudi Arabia with 55,000 employees.

Purpose of the Study

The purpose of this quantitative, ex-post facto study was to examine baseline health and productivity data and determine the relationship between lifestyle risk and productivity in Saudi Arabia. In this study, I determined health variables that relate to workplace productivity (absenteeism and presenteeism). A correlational approach was appropriate to determine whether there was a relationship between lifestyle risk factors and productivity. The study population consisted of Saudi Aramco employees, a large energy company in Saudi Arabia. The information gathered in this study allowed me to determine the relationship between lifestyle health risks and workplace productivity in these employees. Productivity data will enable international benchmarking to compare Saudi Arabia to the United States to evaluate whether unique social and cultural health behaviors alter workplace productivity.

Research Questions and Hypotheses

The research question guiding this dissertation was the following: What is the relationship if any, between the incidence of lifestyle health behavior risks and workplace productivity in a large oil company in Saudi Arabia? This general question was divided into five specific research questions. The dependent variable presenteeism was measured by the Stanford Presenteeism Scale (SPS) - 6 (Koopman et al., 2002). Each of the independent variables (physical activity, tobacco use, sedentary occupation [sitting ≥ 6 hours], and nutrition) were measured through self-reported data conducted in a Health Risk Evaluation (HRE; Appendix A). The wellness team measured the BMI as part of a physical screening. The HRE was a self-administered questionnaire that was used to examine health status and behaviors. The six question SPS - 6 was contained within the HRE and was the first step in enrolling in the wellness program.

I investigated the following research questions and hypotheses:

1. To what extent, if any, does physical inactivity relate to productivity among employees in Saudi Aramco?

H_o1: There is no relationship between the level of physical activity and workplace productivity.

$H_1$1: Higher levels of physical activity are related to greater workplace productivity

2. To what extent, if any, does tobacco use relate to productivity in Saudi Aramco?

H_o2: There is no relationship between tobacco use and workplace productivity.

$H_1$2: Low levels of tobacco use are related to greater workplace productivity

3. To what extent, if any, does a BMI over 25 and 30 relate to productivity in Saudi Aramco?

H_o3: There is no relationship between BMI and workplace productivity.

$H_1$3: Lower BMI measures relate to greater workplace productivity

4. To what extent, if any, does a sedentary occupation relate to productivity in Saudi Aramco?

H_o4: There is no relationship between a sedentary occupation and workplace productivity.

$H_1$4: Low levels of sitting a work relate to greater workplace productivity

5. To what extent, if any, does poor nutrition (my plate guidelines) relate to productivity in Saudi Aramco?

H_o5: There is no relationship between consuming a healthy diet and workplace productivity.

H_15: Higher levels of consumption of a healthy diet are related to greater workplace productivity

Conceptual Framework

The primary conceptual framework for the study of workplace health and wellness program was Bronfenbrenner's (1979) ecological health model. The model involves components from the both the psychology and human development fields. Bronfenbrenner's model is a common theoretical foundation in the public health domain and is often termed the socioecological model (Teutsch, 2010). The socioecological health model introduces five key health influences: individual, interpersonal, institutional, community, and social.

The core component of the model is the individual, with the other dimensions forming from the middle (Ettner & Grzywacz, 2001). The individual component includes those services designed to improve health from a single person's perspective (McLeroy, Bibeau, Steckler, & Glanz, 1988). The interpersonal influence includes the health behaviors that require behavior change. Services designed for the interpersonal component target cultural and social norms and any barriers to change. The institutional influence includes organizational procedures and policies that control behaviors. According to the community component, community groups and resources have an effect on behavior. The final element involves policy decision. The policy includes stakeholder groups from government, private, and nonprofit organizations (McLeroy et al., 1988).

Figure 1: Socioecological health model demonstrates the five key factors that impact behavior. Reprinted from "*Socio-Ecological Model*" by Centers for Disease Control and Prevention, 2011, Retrieved from http://www.cdc.gov/cancer/crccp/sem.htm. Copyright 2011 by Centers for Disease Control and Prevention. Reprinted with permission.

From the socioecological model, many health promotion guidelines emerged, including the five-tier health impact pyramid (WHO, 1986). Frieden (2010) identified that health is built from socioeconomic factors, supporting individuals' context, protective interventions, clinical interventions, and education. Socioeconomic factors form the pyramid's base and include improved education and poverty reduction. The second layer consists of interventions that help to support healthy decisions. The next tier involves targeting individuals to provide protective interventions that reduce the likelihood of disease. The fourth and fifth tiers include the standard practice of clinical interventions and one on one patient counseling. According to the five-tier health impact pyramid (Figure 2), the best interventions target the pyramids base (Frieden, 2010).

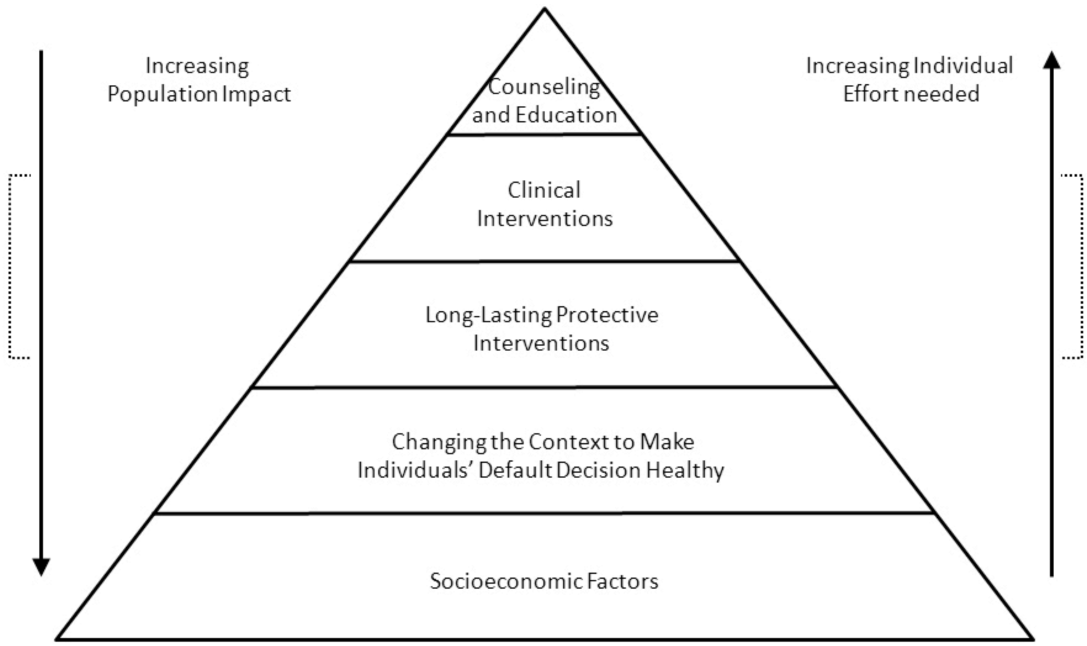

Figure 2: Five-tier health impact pyramid for public health programs. Reprinted from "Five-tier Health Impact Pyramid" by T. Frieden, 2010, *American Journal of Public Health*, 100(4), p. 590. Reprinted with permission.

The workplace setting differs from the usual public health context. The WHO's (1986) settings approach recognizes that the place or social context affects an individual's health. The workplace model includes the individual employee in an attempt to improve productivity, rather than the society as a whole. Organizations do not have the same control over diverse socioeconomic factors and the external environment. The ecological approach is based on the assumption that health is contextual and that health promotion efforts are more or less efficient in different settings (Frieden, 2010). Recognizing the unique workplace context is a part of an evaluation and developing health promotion programs.

In this section I explore the unique cultural context of the workplace in Saudi Arabia. According to Frieden's (2010) pyramid, health-promoting interventions that target the socioeconomic and decision context provide the best return on investment (ROI). Aligning this model with workplace interventions required health promoters to understand the relationship between employee's decision making (decision context) and their productivity. Understanding this relationship could allow organizations to build effective programs with broad population approach.

Nature of the Study

The quantitative, ex-post facto study design involved a correlational approach to examine the relationships between five major health behaviors and workplace productivity. I used correlations and a multiple regression to examine the relationship, if any, between the individual risks and productivity.

The data were from a secondary source requested from Saudi Aramco. The original data were gathered from employee surveys collected by Saudi Aramco. Saudi Aramco is a large, integrated petrochemical company with principal offices based in Dhahran, Saudi Arabia. The company had a workforce of over 56,000 direct employees and 155,000 contractors working both on and offshore (Saudi Aramco, 2013). Saudi Aramco's workplace wellness program conducts employee clinics throughout the company's Saudi Arabian facilities. Employee surveys are collected as part of the wellness programs enrollment package, and the data were considered secondary source.

The study population consisted of current employees working in Saudi Arabia who were not on medical leave at the time of the survey (n = 55,500). These two criteria excluded any employees working overseas who may be exposed to different environmental factors. The medical leave criteria also excluded any active employee who may have an acute illness as this might have influenced their baseline productivity scores.

Definitions

HRE: A tool designed to collect information on an employee's health risk status and to assist in planning health promotion interventions (Centers for Disease Control and Prevention, 2010).

Presenteeism: Any lost workplace productivity when an employee is physically present at work but not producing their standard work quality or quantity (Koopman et al., 2002). Loeppke et al. (2009) also defined presenteeism as lost time when an employee is not focused on his or her work and is producing poor quality work and reduced quantity of work.

Absenteeism: Lost time when an employee is not present at work (Koopman et al., 2002)

Productivity: A measure of an employee's work output and quality (Koopman et al., 2002)

Saudi Aramco Employee: Any full-time, part-time, casual, volunteer, or contractor who is working within a Saudi Aramco facility in Saudi Arabia.

Five-tier health impact pyramid: Health promotion theory that includes the core components of health interventions and their impact (Frieden, 2010).

Assumptions

An important study assumption was that employees responded honestly to the survey. Honest responses are difficult to ensure, but employees were reminded that the HRE is confidential and require consent. All efforts were made to reassure employees that their answers did not affect their performance review. During primary data collection, employees were asked for consent for their information to be used in ongoing studies. Employees could receive the services associated with the HRE, but may opt out of allowing their information to be part of any studies. As part of the internal organizational standards, the HRE data were collected under institutional review board (IRB) approval.

The reliability and validity of the SPS scale was also considered as an assumption. Koopman et al. (2002) evaluated the productivity of 675 employees from a United States company based in California. The demographic breakdown was 4.9% Black/African American, 10.5 % Asian Americans, 14.2% Hispanic/Latino, 63.6% White/European American and 6.8% other. These baseline demographics do not compare to the Saudi Aramco population. The employee population was comprised of 83% Saudi Arabs and 17% expatriates. No scholar reviewed the SPS – 6 in Saudi Arabia or any of the Middle East.

Saudi Arabia has a unique cultural, political, and organizational structure. With the discovery of oil in the 1930s, the country has experienced remarkable growth. As a result of this rapid growth, the country turned to foreign workers to sustain this development. The Central Authority for Statistics (2012) reported that 47% of the workforce consists of Saudi nationals. As the population grew, so did the local unemployment rates, with the census placing the male rates at 10.8% (Central Department of Statistics & Information, 2012). Saudi female employees account for only 6% of the workforce (Central Department of Statistics & Information, 2012). Saudi labor laws currently do not allow for employee dismissal, potentially resulting in high numbers of nonproductive employees. As productivity is the primary focus in this study, this law should be considered when comparing Saudi productivity to other countries.

Islam and Khadem (2013) reviewed workplace productivity in Oman and found that workers within the Middle East employees lacked professionalism, regard for supervisors, and commitment that impact their productivity. Also, Sidani and Thornberry (2010) suggested that the Islamic religion has a role in forming workplace values. Islamic emphasis on family ties is evident in leadership roles and difficulties adapting to change. The combination of unique factors creates questions about the productivity of the Saudi Arabian workforce. These factors could result in different productivity outcomes than those seen in the global workforce benchmarks.

Scope and Delimitations

In this study, I used Saudi Aramco employee HREs to evaluate the current behavioral health risks and presenteeism. These data were collected when employees presented to their onsite wellness clinics. In 2013, 10,236 employees completed an HRE (Saudi Aramco, 2014). Although Saudi Aramco has offices outside of Saudi Aramco, only HREs collected in Saudi Arabia were included in the evaluation. The inclusion was limited to employees based in Saudi Arabia to capture the unique environmental influence. Delimiting these employees limited the study's generalizability to other countries.

Employees were not asked to report their absenteeism levels (i.e., medical leave or restricted duties), but rather only report productivity via the SPS. The HRE did not capture data about grade codes or occupation, excluding this from the evaluation. Also, I excluded any employees who were on medical leave as this may influence their productivity.

Study Boundaries

The study included all Saudi Aramco employees working in Saudi Arabia. These employees presented at a worksite wellness clinic and conducted an HRE. These exclusions already existed within the clinic's operational eligibility.

Generalizability

Saudi Aramco is a large energy company with over 56,000 regular employees and 250,000 contractors (Saudi Aramco, 2013). The large organization population sample allowed for a significant HRE. However, employees were not mandated to attend the wellness clinics and participate in an HRE. One major issue could relate to the sample population representation of Saudi Aramco. Although I provided information on the relationship, if any, between lifestyle health risks and productivity, care must be taken in generalizing this to Saudi Arabia as a whole.

In addition, Saudi Aramco is considered an excellent employer, attracting some of The Kingdom's top talents. These employees are well educated, traveled, and immersed in a corporate environment. These demographics may significantly different from those of the general Saudi population.

Limitations

A potential limitation of this study was the method the HRE data were originally collected. During the study, all employees had access to attend the wellness clinic. The recommendation to employees was to have an annual HRE, but only 20% used this service. Potentially, that 20% could have had different productivity outcomes in comparison to the rest of the population. These differences could be significant if that 20% had a greater interest in the health and wellness field. The exact implication or extent is difficult to determine, but this population's risk profile was compared to the entire Saudi Aramco population.

Another potentially limiting factor was the native employee language. Although the company's official language is English, most employees speak English as a second language. When an employee completed an HRE, a translated Arabic version was available to assist with the questions. Scholars have not examined the validity of an Arabic HRE or SPS-6. In 2013 and 2014, Portuguese and Dutch researchers were able to translate the SPS and found both measures maintained good validity and reliability (Hutting, 2014; Laranjeira, 2013). These questions around generalizability and limitations will be reviewed again in Chapter 5.

Significance

In this study, I was the first to attempt to define the productivity implications of lifestyle health risks in Saudi Arabia. This information could allow the program administrators to draw international comparisons, build targeted programs, and to advocate for strengthened wellness programs. Harrington (1991) stated,

> Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it. (p. 31)

Having some sense of employee's health and productivity status is important. Saudi Aramco has a large workforce and finite resources, which need to be directed towards the major problems.

Currently, the programs are taking from best practice models generated from the United States. These models were formulated from United States data and target their risk profiles. To replicate these directly here in Saudi Arabia could miss a significant opportunity. Also, Saudi Aramco is working with the Institute for Health and Productivity Management Middle East and North Africa (IHPM- MENA) who are leading the workplace wellness initiatives in the region. The IHPM-MENA understands that a healthy and productive workforce is essential for both companies and nations. Saudi Arabia is a developing country, with first world health concerns, making employee health particularly important.

The IHPM-MENA advocates for culturally relevant statistics and supports organizations moving towards collecting their own. Saudi Aramco is considered a regional leader in both population and corporate health and has a role in improving health standards within Saudi Arabia. A benchmarking study, on any relationship between lifestyle behaviors and workplace productivity, would continue to build the business case for investing in employee health.

Summary

NCDs continue to rise, placing an increasing load on health systems and employers. Worldwide, some organizations have recognized the potential economic relationship between health risks, ill health, and workplace productivity. In the Middle East, organizations are yet to develop targeted health management programs, which include an emphasis on employee productivity. In this study, I targeted a large employee, Saudi Aramco, located in Dhahran, Saudi Arabia. I evaluated the relationship, if any, between lifestyle health risks and workplace productivity. The five health risks are physical inactivity, tobacco use, high BMI, sedentary occupation, and poor nutrition. I examined this relationship in this demographic and provided baseline health and productivity for the company.

In the following chapter, I will provide detailed information on underlying theories, supportive literature, and the research problem. The two theoretical models are the socioecological and the human capital models. At the end of Chapter 2, I summarize and provide a transition into the methodology.

Chapter 2: Literature Review

Introduction

Worldwide, NCD rates continue to rise, with the WHO (2014) reported that 68% of yearly deaths are associated with these illnesses. These NCDs are linked to lifestyle risk factors, especially tobacco use, physical inactivity, poor nutrition, and alcohol consumption. The Middle East region is leading the world with high NCD rates, including diabetes, heart disease, obesity, respiratory disease, and cancer. Not only do these NCDs affect life expectancy, but they also reduce the quality of life and economic prosperity. In the United States, organizations now recognize that NCD impact on workplace productivity and are introducing on-site employee health programs. The Middle East, including Saudi Arabia, is yet to explore the influence of chronic health conditions on workplace productivity. Saudi Aramco is one of a limited number of companies offering workplace wellness programs.

The purpose of the quantitative, ex-post facto study was to explore the health and productivity data of a large organization in Saudi Arabia to determine if there was a relationship between health risk and productivity.

Literature Search Strategy

In the literature review, I focused on the workplace, including lifestyle health risks and productivity. As the study population was based in Saudi Aramco, Saudi Arabia, this region and its health and productivity was the central tenet of the literature search. The geographical parameters of the study were expanded to include the Middle East, specifically the United Arab Emirates (UAE), Oman, Bahrain, Egypt, Kuwait, Iran, and Iraq. In preliminary searches, I found no research on the health risk and productivity field within the broader region. Recognizing that this is a developing field within the Middle East, I expanded the literature search strategy to include health risks and productivity in North America, Australia, and New Zealand. These additional regions were selected as they are considered leaders in the HPM field (WEF, 2012). In addition to general productivity and health literature, I included the theoretical foundations, socio ecological model, five-tier health pyramid, and the healthy human capital model. I also integrated resources on the six essential lifestyle variables: tobacco use, physical activity, sedentary occupation, poor nutrition, BMI, and the dependent variable, presenteeism. The SPS was also included to examine its development and psychometric properties.

Because health and productivity can transcend multiple fields, health, economic, and management database searches were conducted. The accessed library databases and search engines used included Google, Google Scholar, Thoreau – Walden University exploratory database, and Cinahl, Index Medicus for Eastern Mediterranean Region Journals. The results of the literature search are represented in Table 1. As expected, no relevant studies were identified in Saudi Arabia or the Middle East on the influence of differing NCD rates on workplace productivity. The absence of literature required the detailed review of primary health and productivity publications. These publications stemmed predominately from the United States in the last 20 years.

It is unclear if the relationship between NCD and lost productivity documented in the United States is also present in Middle Eastern countries. Therefore, this additional literature needs to be examined with caution. The absence of key literature will be discussed further in the business case and productivity sections.

Table 1

Summary Chart of Literature Review Key Terms and Results

Area of research	Books	Scholarly journals	Doctoral Dissertations	Government Reports	Other reports
Productivity		73(18)	24(2)	54(20)	33(3)
Presenteeism		28(23)	16(1)	11(6)	22(0)
Non communicable disease		8(5)		22(3)	24(6)
Health Risks		14(6)	1 (0)	12(1)	14(1)
Tobacco use		30 (4)			
Physical inactivity		12(6)		8(2)	3(0)
Sedentary Occupation		6(2)			
Nutrition					
Obesity + Overweight		39(10)		12(2)	
Stanford Presenteeism	2(2)	4(4)			
Likert-type surveys	1(1)	8(2)			
Socioecological health model		13(2)			
Five-tier health pyramid					
Human Capital theory		3(3)		2(1)	
		5(2)			
Total	3(2)	243(87)	41(3)	121(35)	96(10)

Key search terms included the following words both individually and in combination: *health and productivity management, Saudi Arabia, Middle East, presenteeism, productivity, health risks, modifiable health risk, human capital, socio ecological health model, five-tier health pyramid, public health, SPS, wellness programs,* and *Likert scales.* The database search limits included publication in English, full text, and peer-reviewed after 2007.

Theoretical Foundation

Introduction

The theoretical foundation for this study was the intersection of the socioecological, five-tier health impact pyramid, and the human capital models. Both the socioecological model and five-tier health impact pyramid are many theoretical foundations in the health promotion domain. The human capital model is grounded in the sociology and economic fields and has developed to involve health programs. As I discuss the underlying theoretical foundations, it is important to understand the definition of health. The WHO (1946) defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1946).

Modern medical models increasingly focus on health outcomes for the individual (WEF, 2012). These results are achieved following the medical model's reductionist approach to diagnosis and treatment. In contrast, public health is considered the art and science of preventing disease, prolonging life and promoting health for an entire population (Becker, 2007). In this section, I will introduce the formation of the early health models, their historical development, and the influence on health programs. I will begin with the development of public health programs and how these underpinned the ecological health model.

Public Health Programs

Historically, public health programs developed from recognizing the importance of clean water and waste disposal (Teutsch, 2010). These initial public health efforts developed slowly, until rapid population growth forced the issue. This growth was associated with the industrial revolution and created dense living and working conditions and rapid disease spread. The first formal public health legislation started in England in the 1840s with a focus on sanitation and communicable diseases (Teutsch, 2010). The first recognized United States programs were founded in the late 1860s. These early programs identified that social, biological, and environmental factors impact health (Novick & Mays, 2005). Consequently, due to the success of these early public health programs, the life expectancy of industrialized countries improved. Along with this longevity, the prevalence of NCDs continued to rise.

Over the past 40 years, public health programs have evolved with the understanding that a complex interaction of multiple factors can influence health. In 1979, the Surgeon General released the Healthy People report (United States, Office of the Assistant Secretary for Health & Surgeon General, 1979). In this document, the role of the individual and their health behavior choices was recognized. Although the Surgeon General identified health behavior as a key tenant, he also emphasized that behavior is influenced by context. This report provided the foundation for modern public health theories by including the health context.

Figure 3 displays essential public health components before and after the Healthy People report. This figure demonstrates significant additions to the public health theories, such as the influence of lifestyle and health care organizations. By including health care organizations, the Surgeon General recognized that the responsibility for health promotion stemmed from multiple sources. He also included a focus on individual behaviors such as cigarette smoking and alcohol use.

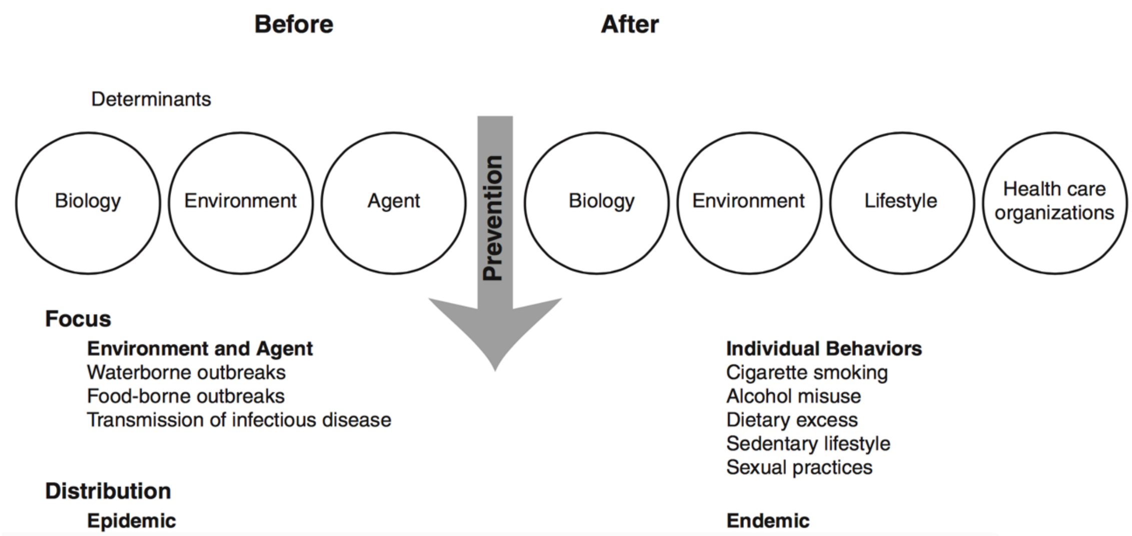

Figure 3. Diagram depicting the evolution of public health programs. Reproduced from "1979 Surgeon General's Report, Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention" by *United States Public Health Service. Office of the Surgeon General*, 1979. Reprinted with permission.

Socioecological Health Model

In 1979, the Healthy People report was released and summarized the complex factors that influence health outcomes. From that report, Bronfenbrenner (1979) integrated these factors to create the ecological framework of human development. The

Bronfenbrenner model was the basis of the ecological health model and is often referred to as the socioecological health model (Figure 4). According to this model, the determinants of behavior exist both internally and externally (Richard, Gauvin, & Raine, 2011).

The individual determinants (knowledge, attitudes, and beliefs) are considered genetically programmed or instincts (Booth et al., 2001). The interpersonal aspects include cultural experiences within the immediate social surroundings. These experiences can become acquired knowledge, attitudes, and beliefs. Organization, community, and policy are considered extra personal influences. These include the setting for which the behavior is generated. In this dissertation, the workplace was considered the unique environment– a proximal leverage point for behavior change.

Figure 4. Socioecological health model demonstrates the five key factors that impact behavior. Reproduced from "Socio-Ecological Model" by *Centers for Disease Control and Prevention,* 2011, retrieved from http://www.cdc.gov/cancer/crccp/sem.htm. Reprinted with permission.

From the socioecological health model, many theories developed to shape health promotion programs. The key dimensions of the socioecological approach are often seen within revised models (Sallis, Owen, & Fisher, 2008). When workplace health promotion is examined, programs are built with an element of the socioecological model. In addition to the socioecological model, Frieden's (2010) five-tier health impact pyramid tailors these basic principles into the workplace setting.

Five-Tier Pyramid

The five-tier pyramid is a framework developed to direct targeted health programs. The five-tier pyramid includes the social, biological, and individual capacity determinates and combines them with medical and behavioral interventions. According to Frieden's model, interventions should target socioeconomic factors, followed by supporting individuals' context, protective interventions, clinical interventions, and education. Frieden's realization that some interventions have greater potential impact informed the selection of the models pyramid shape. Effective public health interventions should target socioeconomic factors (i.e., base of the pyramid). This relationship is depicted in Figure 5, with the proportion of each component reflecting recommended effort. The arrow "increasing population impact" indicates that the most effective program interventions are located at the pyramid's base.

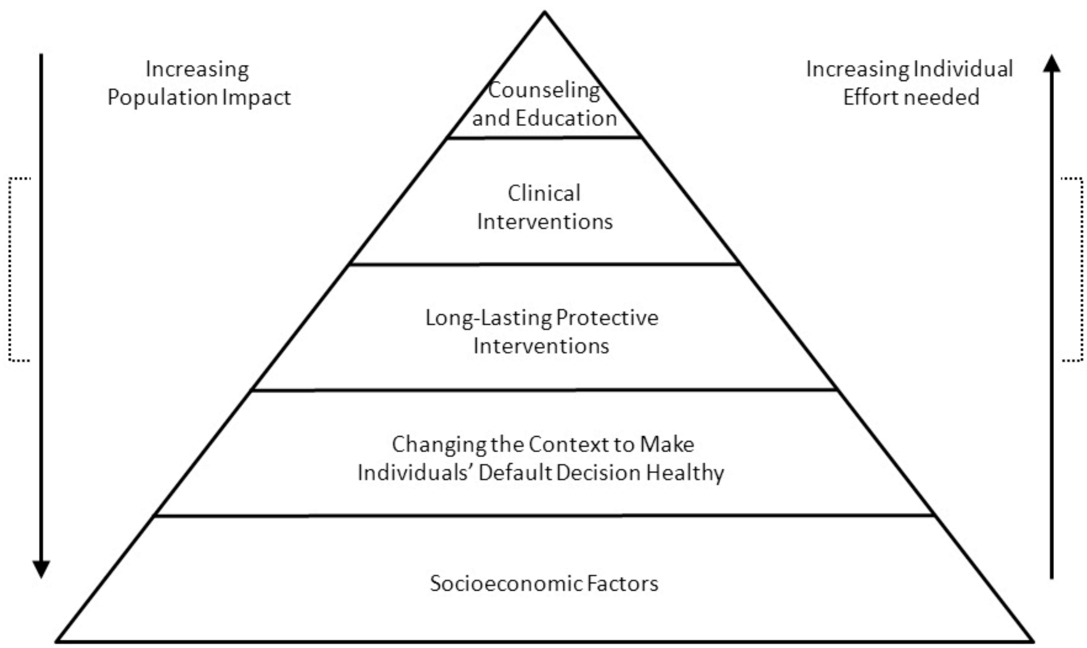

Figure 5. Five-Tier health impact pyramid. Reprinted from "A framework for public health action: the health impact pyramid" by T. Frieden, 2010, *American Journal of Public Health,* 100(4), p. 594. Reprinted with permission.

The socioecological and five-tier health impact pyramid provides two theories that introduce the determinants of health. Both models include internal and external factors that drive behavior choices. The five-tier pyramid builds on these determinants by indicating the role of public health interventions. In this dissertation, the study population was a workforce, which is considered a unique environmental context.

Considering the health of a workforce introduces distinct economic drivers. Therefore, both the socioecological model and five tier pyramids do not provide a complete connection to the workplace. The Human Capital or Healthy Human Capital concepts begin to integrate health with workplace productivity and business performance (Becker, 2007). These ideas are the building blocks or business case for workplace wellness programs.

Human Capital Model

The human capital concept began to emerge in the literature in the early 1960s, particularly with Schultz ‘s (1962) understanding of education, training, and performance. The concept was developed from Grossman’s (1972) studies, which connected increased human investment with increased longevity. The human capital model integrates three main concepts: (a) optimal investments in health, (b) the value of life, and (c) linking health to education (Becker, 2007).

The human capital model connects an employee’s capital to the companies’ performance. This relationship is depicted in Figure 6, with prosperity, health, well-being, and skills determining employee productivity. The human capital model has been prominent in the HPM literature (Chapman, 2012; Goetzel & Ozminkowski, 2008; Mills, Kessler, Cooper, & Sullivan, 2007). Dollard and Neser (2013) described the workplace wellness programs that target healthy human capital as “the gold standard” (p.142).

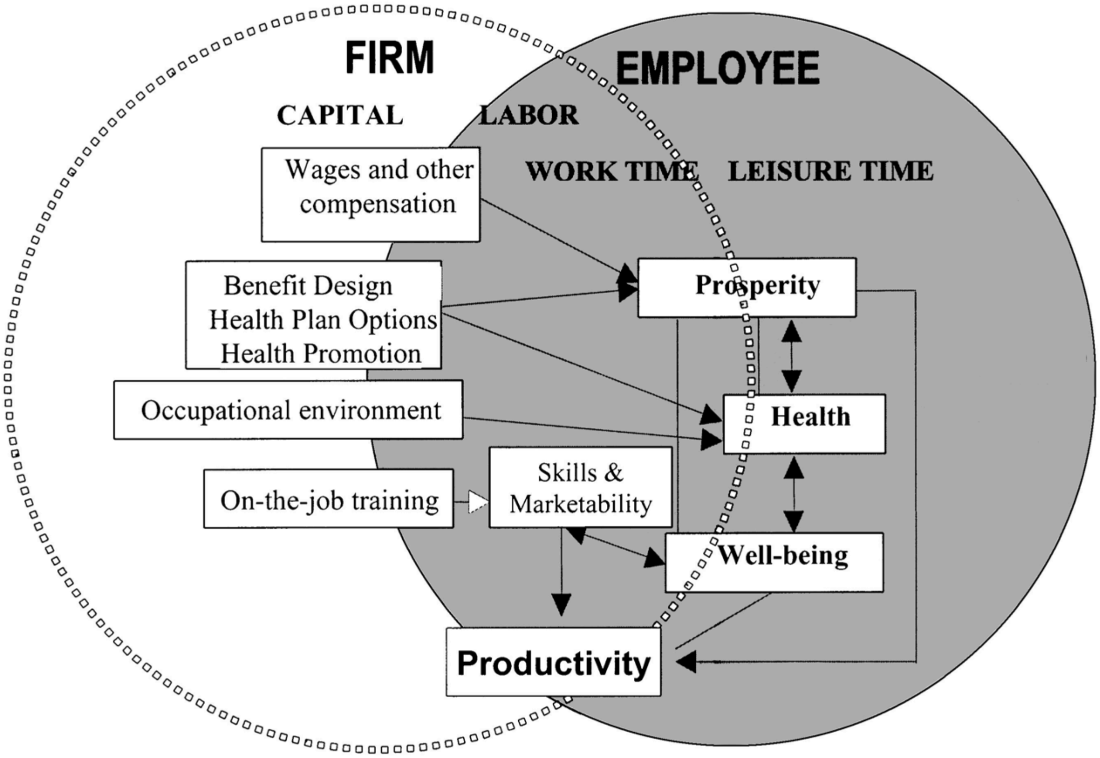

Figure 6. Diagram demonstrating the inter-relationship between productivity cost components. Reprinted from “Alternative valuations of work loss and productivity” by Berger et al, 2001, *American Journal of Occupational and Environmental Medicine*, 43(1), p. 20. Reprinted with permission.

Model Justification

The socioecological health model and five-tier health impact pyramid have been used extensively amongst the public health and health promotion literature. Bronfenbrenner’s ecological paradigm was first introduced in 1974 and at the time he was concerned with the conditions that affect human development. In its creation, Bronfenbrenner focused on the factors that influenced children's development. However, as the understanding grew, he increasingly focused on including human practices. In parallel, the health promotion field experienced a paradigm shift. The shift was away from a singular focus on harmful behaviors towards a need to address behavior within the complex ecological foundation. Since the 1980s, health promoters' began to integrate the ecological model into program planning.

The ecological model is widely used in the social sciences and often as a foundation to evaluate program effectiveness (Sallis et al., 2008). The ecological model provides a comprehensive framework for health promotion as it considers complex health determinants (Dooris, 2006). Richard, Gauvin, and Raine (2011) reviewed the ecological models use in health promotion. They found that the model was particularly successful when applied to particular public health issues. These interventions were promoting physical activity, and fruit and vegetable consumption (Richard et al., 2011). As the ecological model targets multi-points, it has also been applied to tobacco control programs at both the micro (individual) and macro (policy) levels (Sallis et al., 2008).

Goetzel, Hawkins, Ozminkowski, and Wang, (2003) were some of the first authors to connect health to workplace productivity. They used the socioecological model and combined it with emergent disciplines such as organizational sociology. Within the health and productivity literature, the human capital model is often termed Health and Productivity Management (HPM). HPM is referred to extensively in the workplace wellness literature. With the movement towards HPM, authors began to focus on productivity, specifically presenteeism. In 2004, Sullivan stated that productivity drives economic growth and profit. He recognized that healthy human capital should be an essential component of a management plan, building the business case for HPM. Chapman's (2005) paper detailing the role of presenteeism in health promotion, further strengthened the HPM business case.

In health promotion, theoretical foundations have developed to guide targeted interventions. The socioecological model provides a set of core concepts for organizing comprehensive health programs. The five-tier pyramid incorporates the key socioecological components and begins to shape evidence-based practice. The five-tier pyramid displays the shift away from targeting individual behavior change interventions to a population model. The pyramid's base, socioeconomic and individual context, represents the optimal promotion targets. Both the socioecological and five-tier models contain an environment component.

The workplace, as a discrete environment, provides an opportunity for health promoters to introduce behavior change programs. In Grossmans human capital theory, he unites health promotion concepts with economic considerations, specifically productivity. In this research, the underlying theory combined the commonalities of the socioecological/five-tier health pyramid and the human capital model to evaluate the relationship between workplace health behaviors and productivity. This HPM approach is considered the gold standard for workplace wellness programs (Horseman et al., 2010).

Health and Productivity in Saudi Arabia

Introduction

Saudi Arabia is located in Southwest Asia, and is the largest Arab country in the Middle East, with a population of 30 million (WHO, 2013). Of this 30 million, only 32.4% are Saudi nationals. The country is known for having the world's largest oil reserves, and its economy relies heavily on its export. The origins of Saudi Arabia can be traced back to 1744, when the first Saudi State was founded. In 1932, the Kingdom of Saudi Arabia was established by the ruling Al Saud family. Saudi Arabia is a monarchy, currently governed by King Salman, who succeeded the throne on 23 January 2015. The Kingdom is the birthplace of Islam and the home to the two holy cities, Medina, and Mecca. As Saudi Arabia is an Islamic state, Shari‘a or Islamic law is the foundation of the legal system.

Saudi Arabia is rapidly growing, with 60% of its population under 30 years (UNdata, 2014). As mentioned in the introduction, the country has high unemployment levels. Recent reports place national unemployment levels at 12.2% (7.6% for the men, 33.4% for women) and 28.4 percent for the 15 - 29 age group (men: 17.5%, women: 60.3%) [WHO, 2013]. Interestingly, even though the country has such high unemployment rates, they rely heavily on foreign labor. Currently, 6 million foreign workers are employed, predominately (99%) in the private sector. In 2011, the government introduced the Nitaqat campaign, which promotes for Saudization of the workforce, to get more Saudi’s employed (Almalki, FitzGerald, & Clark, 2011).

The United Nations Development Program (UNDP, 2005) reported low and decreasing levels of productivity. In 1960, the productivity of Arab industrial labor was 32% that of the United States but by 1990, it went down to 19% (UNDP, 2005). These low productivity levels are associated with corruption, bureaucracy, red tape, inefficient systems, nepotism, and mismanagement. When examining the workforce and productivity in Saudi Arabia, the role of Islamic values should be considered. Yusuf and Thornberry (2009) urge caution not to attribute worker behavior solely to Islam. The term

Islamic Work Ethic (IWE) has been extensively studied, examining the relationship between work ethics and Islam (Ali & Owaihan, 2008). Researchers found tenants within the Quran advocating solid work behaviors, challenging the notion that Islamic faith impedes productivity. Muslim workers who demonstrated counter productivity behaviors were temporary, and a result of a particular event (Yusuf & Thornberry, 2009).

In Saudi Arabia, there is limited literature examining the recent NCD rates, particularly physical activity, obesity, nutritional intake, sedentary occupation and tobacco use. The latest WHO country profile of Saudi Arabia (2014) has tobacco use at 22% (38% males, <1% females). The WHO data is generated from 2011 data and is not the most up to date rates. Obesity rates were reported at 33% (28.6% males, 39.1% females), again produced from 2008 data. In 2005, the WHO and the Saudi Ministry of Health (MOH) created the step-wise surveillance report. The authors identified tobacco use at 24.7%, obesity 28.6%, physical inactivity 34.4%, and poor nutrition 93.5% (WHO, 2005). The challenge in Saudi Arabia is the inconsistent NCD reporting, likely under-representing the true problems.

In Saudi Arabia, Saudi Aramco is the second biggest employer, sitting behind the government. Saudi Aramco is also the world largest company and is consistently regarded as the top energy company (Saudi Aramco, 2013). Saudi Aramco's size is important as their workforce represents the top private company in the Kingdom.

Saudi Aramco

Saudi Aramco is a large integrated petroleum and chemical company based in Dhahran, Saudi Arabia. The company was founded in 1933, with an agreement between the Saudi government and the Standard Oil of California (Socal, or today's Chevron)

(Saudi Aramco, 2014). In 1944, the company was renamed Arabian American Oil Company or Aramco. From 1973 to 1980, the Saudi government slowly acquired all of Aramco's assets and formed Saudi Arabian Oil Company (Saudi Aramco) in 1988. Currently, Saudi Aramco is the world's top crude oil and natural gas exporter. In 2013, Saudi Aramco's oil production was 3.4 billion barrels, which equates to one in every eight barrels worldwide (Saudi Aramco, 2014). Saudi Aramco has continued to expand beyond oil exports to include hydrocarbon exploration, production, refining, distribution, shipping, and marketing. The company, based in Dhahran, has offices located throughout the kingdom. In 2013, Saudi Aramco won the number one position in *Petroleum Intelligence Weekly's The World's Top 50 Oil Companies* review, a position they have held for the past 25 years.

The Saudi Aramco workforce consists of 57,283 employees, of which 48,385 are Saudis and 8,898 are expatriates (Saudi Aramco, 2014). The Saudi Aramco Wellness Program (SAWP) was established in 2005 as part of the Saudi Aramco Medical Services Organization (SAMSO) (Horseman, 2010). The program employees target the costly chronic health conditions with tailored health promoting programs delivered in the corporate environment. SAWP employees also train and sustain a wellness champion network, with employee champions supporting the program throughout the company. All company direct employees and contractors are eligible to participate in the SAWP. The program also conducts Health Risk Evaluations (HRE's), which are an essential part of this study.

In Saudi Arabia, the field of health and productivity is still in its infancy. The literature review revealed only one study examining basic descriptive health and sickness rates in the Middle East (Rahme, Razzouk, Musharrafieh, Rahi, & Akel, 2006). The impact of NCDs on workplace productivity in this region is yet unexplored. The ex President and CEO of Saudi Aramco (Saudi Arabia), Khalid Al Falih stated:

> "Today, preventing disease is more achievable than ever, and our workforce is better educated than ever; yet, we remain burdened by preventable disease, with the productivity and potential of companies being undermined by the reduced physical capacity of their workforces. This situation is of special concern to us because we live in a region that has one of the highest rates of obesity and diabetes in the world (World Economic Forum, 2013, p. 1)."

This statement is relevant, as we need to understand the problem before we can begin to address it. The relationship between illness and reduced productivity makes the investment in human capital essential. The human capital in Saudi Arabia exists within a different cultural context, making generalization and extrapolation from international literature uncertain at best.

Saudi Arabia Health Profile

Saudi Arabia has one of the highest national incomes per capita of the Gulf Nations (Alkabba, Hussein, Albar, Bahnassy, & Qadi, 2012). The country spends 5% of their GDP on health care, with the Ministry of Health (MoH) providing care for the majority of the population. Despite free health services the Kingdom has faced challenges collecting health data. Table 2 details the WHO risk factor rates for Saudi Arabia. As displayed, these rates are based on 2008 data (obesity, blood glucose, and blood pressure) or 2011 (tobacco use).

Table 2

NCD Risk Factor Rates for Saudi Arab Adults

Adult risk factors			
	Males	**Females**	**Total**
Current tobacco smoking (2011)	38%	<1%	22%
Raised blood pressure (2008)	26%	21.5%	24.2%
Raised blood glucose (2008)	22%	21.7%	21.8%
Obesity (2008)	28.6%	39.1%	33%

Note: Retrieved from "Saudi Arabia Statistical Profile" by the WHO, 2015, from http://www.who.int/gho/countries/sau.pdf?ua= . Reprinted with permission.

A recent report by the International Diabetes Federation found the diabetes prevalence at 20.5% (20-79 years) (International Diabetes Federation, 2014). This is slightly lower than the WHO rate of 21.8 in 2008. Figure 7 shows the prevalence of diabetes for age groups in Saudi Arabia, the Middle East and North Africa (MENA) and the world. The figure demonstrates the high prevalence of diabetes in all age categories when compared to both MENA and the world.

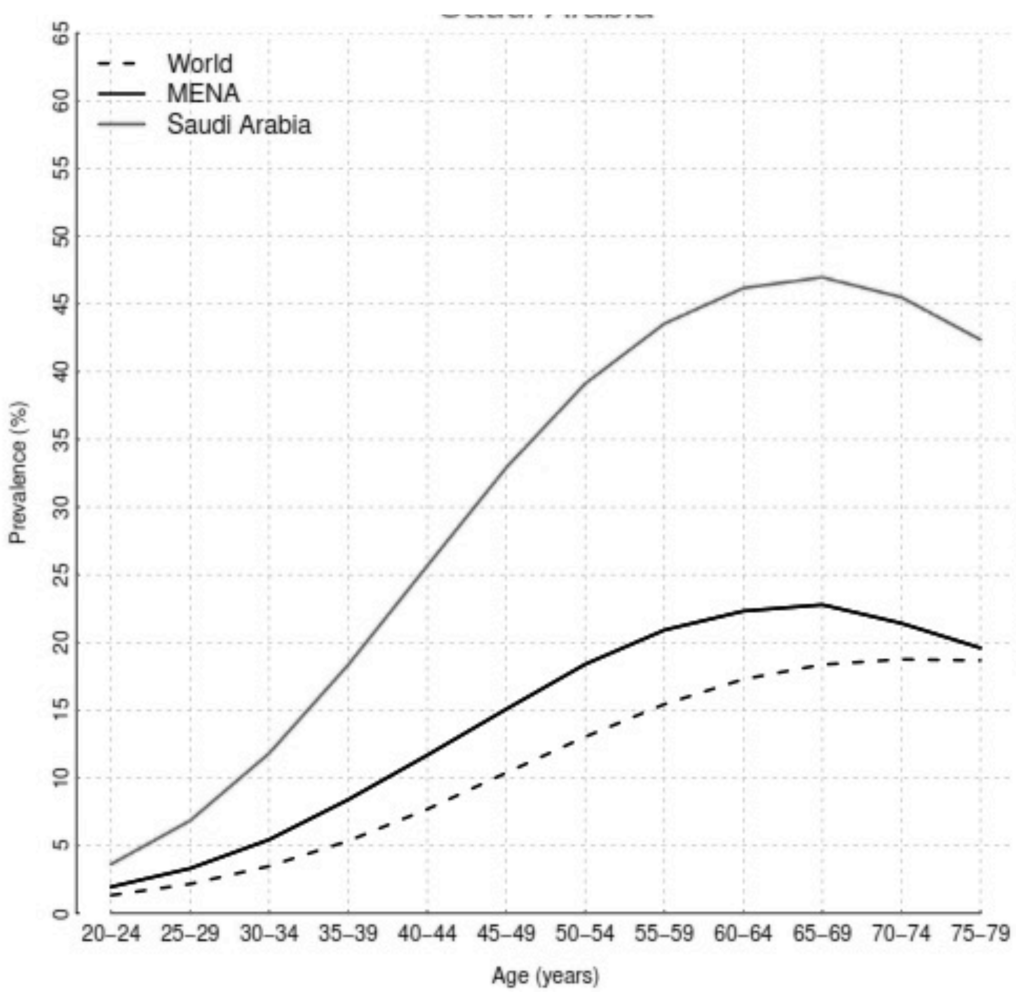

Figure 7. Line graph showing the prevalence of Diabetes in Adults by age, Saudi Arabia, MENA, and World. Reproduced from Diabetes Scorecard in Saudi Arabia, 2014. *International Diabetes Federation (IDF)*, accessed from http://www.idf.org/membership/mena/saudi-arabia. Reproduced with permission.

Saudi Aramco Health Status

Saudi Aramco, through Johns Hopkins Aramco Healthcare (JHAH), has the ability to collect continuous NCD risk factor profiles. Within JHAH the Preventive Medicine Division, Epidemiology Unit conduct monthly reporting for selected noncommunicable diseases. The major evaluated diseases include diabetes, hypertension, cholesterol, and obesity.

Diabetes. According to the JHAH epidemiology reports, the current prevalence of Type II Diabetes is 13.38% among JHAH eligible medical recipients (EMR) aged more than 20 years. This diabetes rate is slightly lower than the Saudi Arabia's national prevalence of 20.5% (International Diabetes Federation, 2014). Figure 7 shows the prevalence of diabetes by age, with Saudi Arabia consistently leading both MENA and worldwide totals. When compared to Saudi Aramco (Figure 8) the company demonstrates higher prevalence in all age groups.

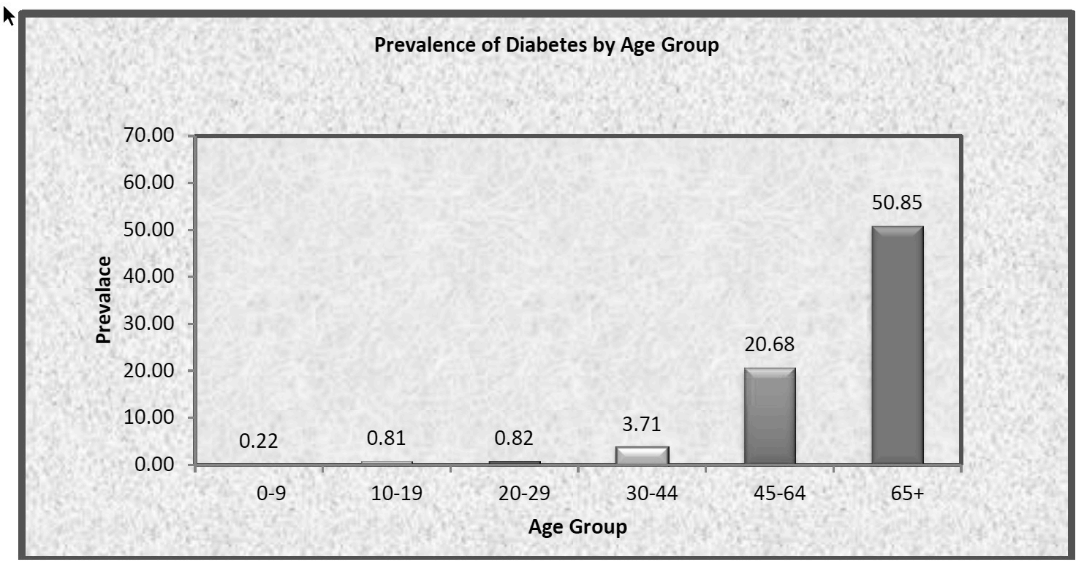

Figure 8. Bar graph showing the prevalence of Diabetes among JHAH EMR by Age Groups. Reproduced from " Epidemiological Statistics for JHAH eligible medical recipients (EMR)" by *Epidemiology Services Unit, Johns Hopkins Aramco Healthcare*, 2014. Reprinted with permission.

Blood pressure. Among the Saudi Aramco EMR, 52% have raised the systolic blood pressure of equal to or greater than 120 as depicted in Figure 9.

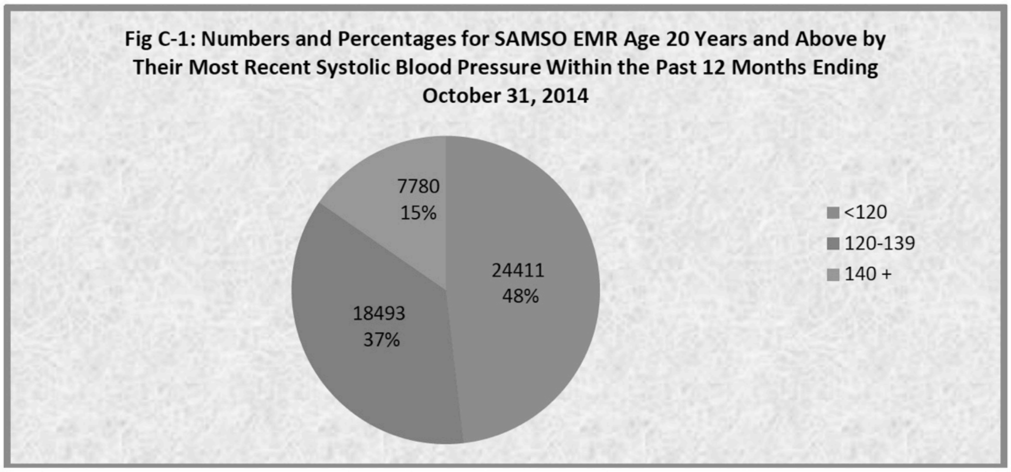

Figure 9. Bar graph showing the percentage distribution of EMR age by systolic blood pressure. Reproduced from " Epidemiological Statistics for JHAH eligible medical recipients (EMR)" by *Epidemiology Services Unit, Johns Hopkins Aramco Healthcare*, 2014. Reprinted with permission.

About 15 % have values of 140 and above and 37 % of 120-139. About 25% of EMR have a diastolic blood pressure reading from 80 mm Hg to 90 and 5% have values of diastolic blood pressure of 90 mm Hg (Figure 10). About 15% of EMR have high systolic pressure, and 37% have "pre-hypertension" levels. Around 48% have optimal systolic blood pressure less than 120 mm Hg. The other 52% have elevated systolic blood pressures levels, which increase the risk of cardiovascular disease (CVD) (Bull & Dvorak, 2013).

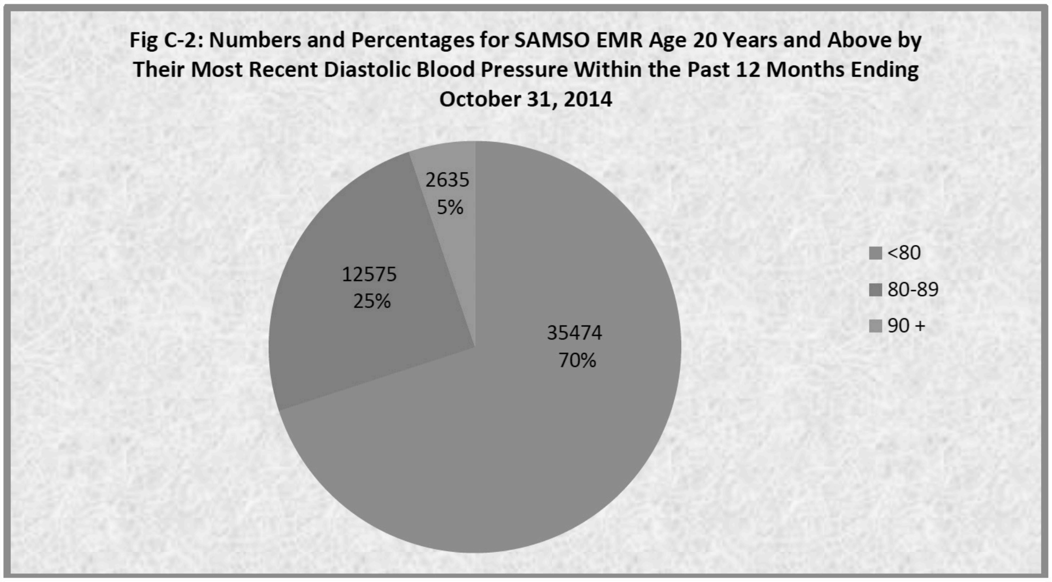

Figure 10. Pie chart showing the percentage distribution of EMR by diastolic blood pressure. Reproduced from "Epidemiological Statistics for JHAH eligible medical recipients (EMR)" by *Epidemiology Services Unit, Johns Hopkins Aramco Healthcare* 2014. Reprinted with permission.

Cholesterol. In 2014, Saudi Aramco data showed that 24% of the EMR have borderline high or high LDL cholesterol, 35% near optimal/above optimal values and 42% optimal level of LDL cholesterol (Figure 11). LDL cholesterol is considered one major risk factor for cardiovascular diseases (Mokdad et al., 2014). Heightened LDL levels are the primary target of cholesterol-reduction therapy in individuals with both high LDL and total cholesterol.

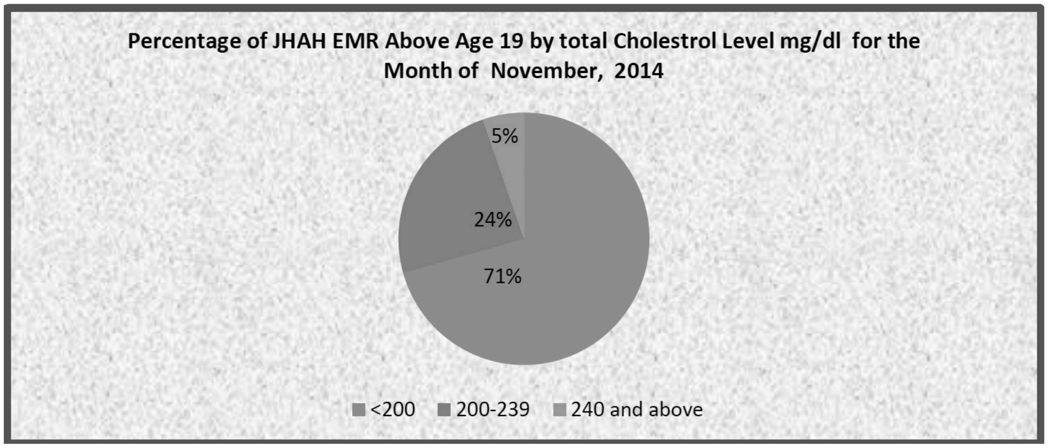

Figure 11. Pie chart showing the percentage distribution of EMR by total cholesterol levels. Reproduced from " Epidemiological Statistics for JHAH eligible medical recipients (EMR)" by *Epidemiology Services Unit, Johns Hopkins Aramco Healthcare*, 2014. Reprinted with permission.

Figure 11 shows that 5% of the EMR have high total cholesterol, 24% borderline high values, and 71% desirable level of total cholesterol.

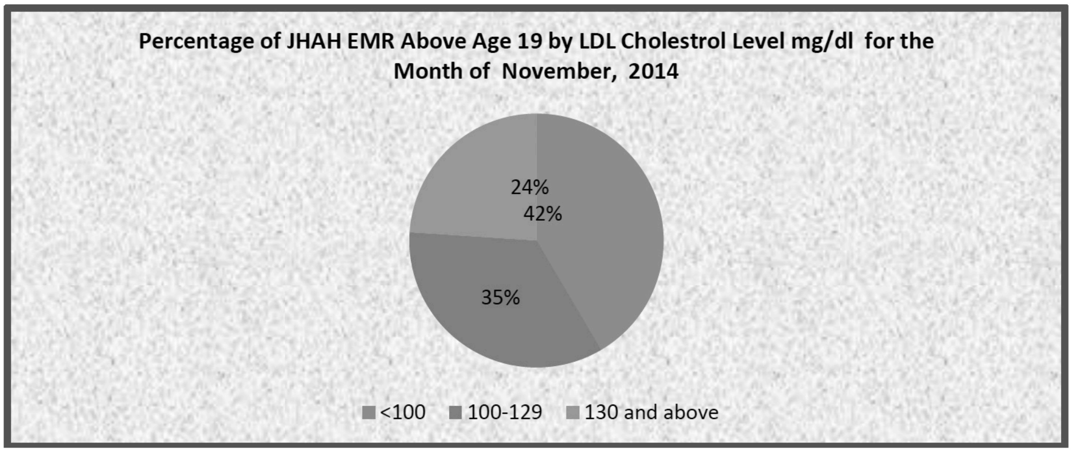

Figure 12. Pie chart showing the percentage distribution of EMR by LDL cholesterol level. Reproduced from " Epidemiological Statistics for JHAH eligible medical recipients (EMR)" *by Epidemiology Services Unit, Johns Hopkins Aramco Healthcare*, 2014. Reprinted with permission.

Figure 13 gives the percentage of males and females among the Saudi Aramco EMR who have HDL values below the levels considered to impart lower risk of coronary heart disease.

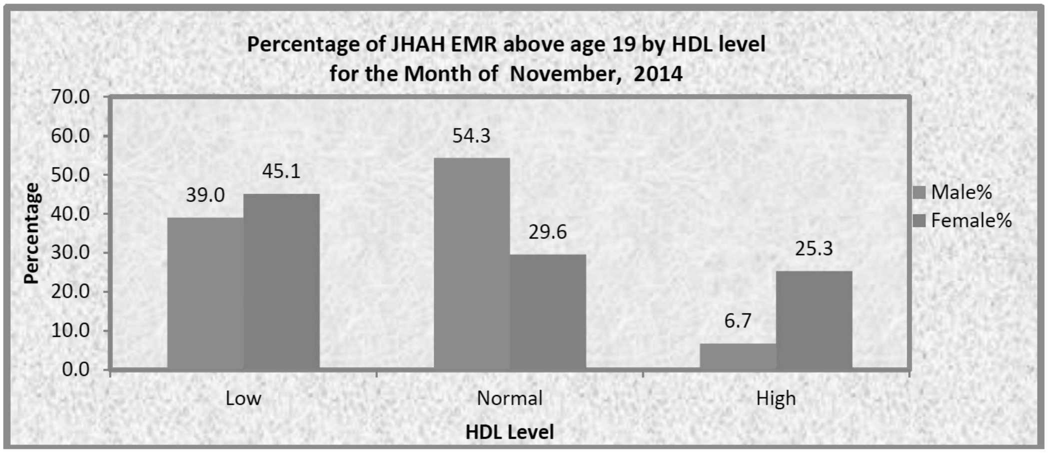

Figure 13. Bar graph showing the percentage of men and women's HDL cholesterol levels. Reproduced from " Epidemiological Statistics for JHAH eligible medical recipients (EMR)" by *Epidemiology Services Unit, Johns Hopkins Aramco Healthcare*, 2014. Reprinted with permission.

The percentage of males having low HDL cholesterol, implying a greater risk of cardiovascular disease, is lower than for females though the male sex itself imparts a higher risk. Higher HDL values above 60 mg/dL protect from heart disease. As per JHAH laboratory reference ranges, HDL below 40 is low for men and below 50 for women.

Obesity. Obesity is the most prevalent medical condition in the world. It is one of the risk factors that have led to a drastic change in Saudi Arabia's picture of health status. The WHO estimates that more than half of the adult population in Saudi Arabia is overweight or obese. These trends lead to an increase in chronic diseases such as diabetes, cardiovascular diseases, hypertension and certain types of cancer. Current reports have the JHAH EMRs of pediatric age groups captured by the BMI report, nearly 44% of the obese are 10-14 years old and about 40% are 5-9 years old.

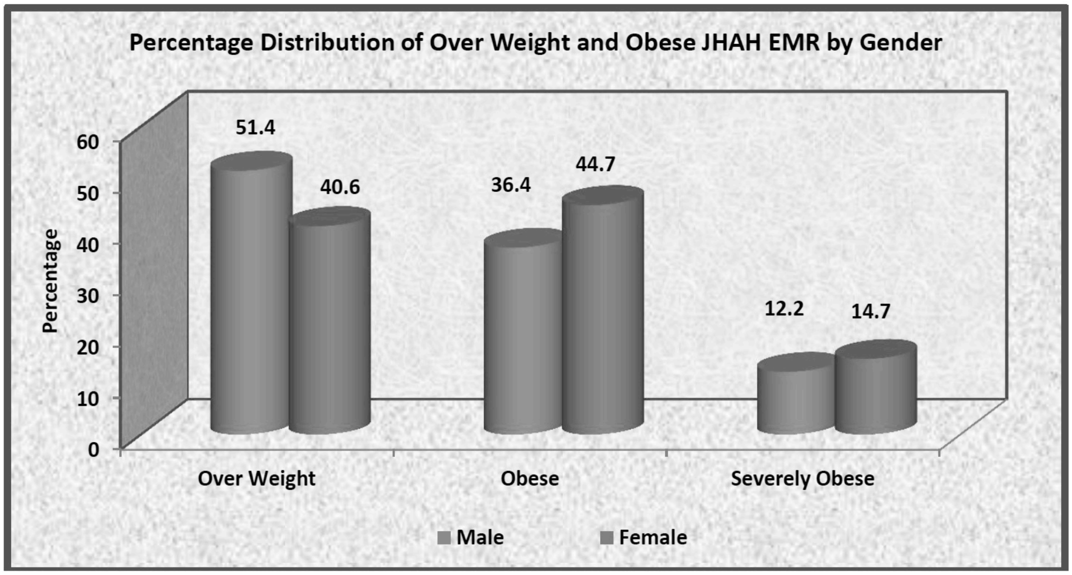

Figure 14. Bar graph showing the overweight and obese by gender among JHAH EMR. Reproduced from " Epidemiological Statistics for JHAH eligible medical recipients (EMR)" by *Epidemiology Services Unit, Johns Hopkins Aramco Healthcare,* 2014. Reprinted with permission.

Figure 14 shows that among adult women above ideal weight, greater percentages are in the obese (44.7%) and severely obese (14.7%) categories compared with males. In males above ideal weight, 36.4% are obese and 12.2% severely obese. The WHO estimates that men aged 15- 64 in Saudi Arabia, 28.3% and 66.2% had BMI above 30 and 25 kg/m2 respectively. Among females aged 15-64, 43.8% and 71.4% had BMI above 30 and 25 kg/m2 respectively. Thus, overweight and obesity are more widespread in females compared to males in Saudi Arabia.

The prevalence of diabetes, high blood pressure, cholesterol, and obesity in Saudi Aramco provide an importance context. Although Saudi Arabia has sketchy health information, JHAH tracks common NCD rates. Comparing these numbers to the North American allows us to understand the unique health concerns. Saudi Arabia is rapidly becoming one of the most disease-burdened countries and in need of settings based interventions (Bull & Dvorak, 2013).

Poor Health in the Workplace

Introduction

The first workplace employee programs developed after World War II, with services that focused on mental health and alcoholism (Owens, 2006). In the early 1970's, health-conscious executives began developing workplace fitness centers. From these fitness centers, the workplaces started to provide onsite health programs or wellness programs, with an emphasis on managing the diseases. The programs began to flourish, particularly to reduce health care expenditure in self-insured organizations (Iverson et al., 2010). These organizations found that providing essential health services reduced costs associated with sickness. This focus on direct medical expenses expanded to include controlling the increasing sick leave and restricted duties (absenteeism) rates.

As workplace wellness programs have expanded, so has their understanding of the components of holistic wellness. Initially, these programs were focused on reducing disability and direct medical costs. Programs have now evolved to include a higher-level wellness attention, adding programs targeted at awareness, education and growth. The sickness-wellness continuum displays the shifting paradigm (Figure 15). This model is in contrast to the WHO definition of health as being a complete absence of disease. The sickness-wellness continuum recognizes that health is not an end state, but rather a continuum (VanLeeuwen, Waltner-Toews, Abernathy, & Smit, 1999).

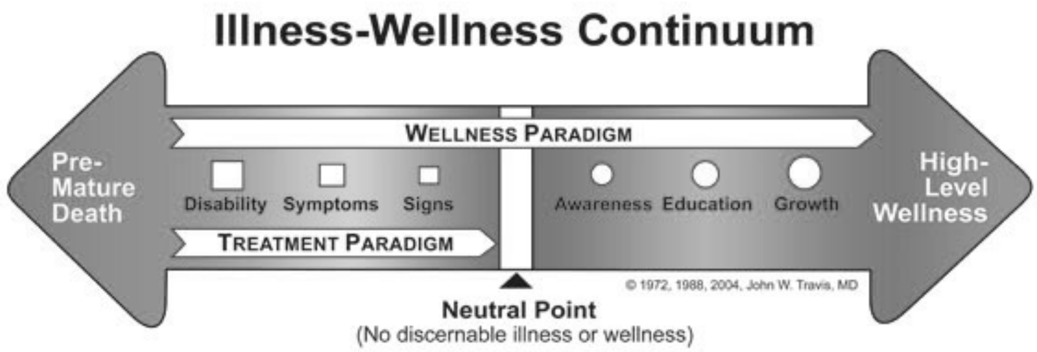

Figure 15. Image representing the Illness-Wellness continuum. Reproduced from "The illness-wellness continuum: The wellness workbook for health professionals" by Travis (1977). Mill Valley, CA: *Wellness Resource Center*. Reprinted with permission.

Within the business community, the emphasis on understanding the economic importance of employee health is termed human capital investment. Human capital investment has now evolved to include understanding how an employee's health impacts their workplace productivity – a concept referred to as presenteeism.

The health, productivity, and wellness fields are slowly emerging in the Middle East. Currently, only a minority of companies are offering employee health programs. In contrast, workplace wellness programs are well established in the United States, Australia, and New Zealand. Companies in these countries recognize the link between improved health and productivity. This literature review found limited information about the current productivity and presenteeism levels within the Middle East and specifically the Saudi Arabian workforce.

Health Risk Evaluations

Health risk assessments (HRAs) or HREs are designed to collect and analyze human health data. These data allows health providers and organization to evaluate an individual's health status or risk (Anderson, Serxner, & Terry, 2001). Health evaluations were part of early medical practice with Hippocrates emphasizing that the best physicians can prevent and predict (Katsambas & Marketos, 2007).

The Center for Disease Control (CDC) developed and released the first publically available HRA in 1980. The assessment was self-administered and involved 31 questions, which linked to software that calculated health risk. In addition to the self-administered questionnaires, HRAs include biometrics such as blood pressure, body composition, and blood sugar. Thirty-five years later, the HRA has evolved to become an interactive tool, which can include information on life expectancy, health age, modifiable risk profiles, and online behavioral coaching. The HRA is considered a foundation component of an employee wellness program.

Health Enhancement Research Organization. One of the first large-scale health risk reviews was conducted by the Health Enhancement Research Organization (HERO) (Anderson et al., 2000). The HERO team utilized the StayWell HRA to collect a retrospective database from multiple large United States companies. These were Chevron Corporation, Health Trust, Inc., Hoffmann La Roche, Marriott Corporation and the states of Michigan and Tennessee. The database collected over 47,500 employees HRAs, with 12,000 repeat evaluations. The HERO group also received information related to absenteeism and medical utilization. From this database, some promising studies have emerged comparing health risk with both absenteeism and presenteeism. The StayWell HRA summary data is presented in Table 3.

Table 3

StayWell Health-Path Definition of Health Risk

Health Risk	Criteria
Self-Reported	
Fitness	No vigorous exercise during a typical week
Alcohol consumption	Consumes five or more drinks two or more days each week
Nutrition	Composite score based on total fat and saturated fat intake; consumption of fruit, vegetables, and other complex carbohydrates; salt intake, use of low-fat dairy products; and consumption of lean meat
Current tobacco use	Pipe, cigar, snuff, or smokeless tobacco and cigarettes; high volume use (1+ pack cigarettes/day)
Former tobacco use	Pipe, cigar, snuff, or smokeless tobacco and cigarettes
Stress	Rated life as "quite or extremely stressful" and indicated not being effective in dealing with stress
Depression	Answered "most of the time" to the following question: "How often do you feel depressed?"
Biometric Measures	
Weight	30% or more about or 20% or more below the midpoint of the frame-adjusted desirable weight range for height
Blood glucose	115 mg/dl or higher
Cholesterol	240 mg/dl or higher
Blood pressure	Systolic equal to or greater than 160 mm Hg and/or diastolic equal to or greater than 100 mg Hg

Note: From "The relationship between modifiable health risks and group-level health care expenditures" (Anderson et al., 2000). *American Journal of Health Promotion*, 15(10), p 45. Reprinted with permission.

Integrated Health Management System. At the same time, the HERO database was beginning to generate health and productivity research, the Integrated Health Management System (IHMS) was operating from the University of Michigan (Edington, 2001). This database collected 7 to 18 years of health care, behavior and productivity information for over 2,000,000 individuals. The IHMS team collected data from both United States and Australian companies including General Motors, Steelcase, Honeywell, General Electric, Xerox, and the Australian Health Management Group.

When evaluating the health risk data, it is important to recognize the difference in risk classification between the HERO/StayWell database (Table 3) and the HMRC/University of Michigan group (Table 4). The StayWell team converted their HRA and biometrics into an overall binary high vs. low-risk classification for employees. The University of Michigan classified their employee overall health risk as low (0-2 risks), medium (3-4 risks) and high (5+) risks.

Table 4

University of Michigan Health Risks and Behaviors

Blood pressure	Systolic > 139mm Hg or Diastolic > 89 mmHg
Body mass index	27.8 (men), 27.3 (women)
Cholesterol	> 239 mg/dl
Existing medical problem	Heart problems, cancer, diabetes, stroke
HDL cholesterol	< 35mg/dl
Illness days	>5 days year
Job satisfaction	Partly or not satisfied
Life satisfaction	Partly or not satisfied
Perception of health	Fair or poor
Physical activity	Less than one time/week
Safety belt usage	Using safety belt less than 90% of time
Smoking	Current smoker
Stress	High
Use of drugs for relaxation	Few times a month or more
Overall risk levels	
Low risk	0-2 high risks
Medium risk	3-4 high risks
High risk	5 or more high risks

Note: From “Emerging Research: A View From One Research Center”, (Edington, 2001). *American Journal of Health Promotion*. 15(5), p 333. Reprinted with permission.

Early studies utilizing both the HERO and IHMS databases began to show a relationship between certain health risks and higher medical costs. (Goetzel et al., 1998) were one of the first research groups to use the HERO database. The authors examined 46,026 employees over three years to compare health risks and medical expenditures. The results found that high-risk employees also had higher health expenditures.

These same findings were supported in 1999, when (Ozminkowski et al., 1999)studied 22,838 Citibank employees conducting HRAs (StayWell Healthtrac). They compared HRA risks to direct medical expenses in those wellness program participants and non-participants. The authors found that employees with a low-risk profile had significantly lower health costs compared to non-participants. Also, they found that those employees with high health risk also had associated heightened medical expenses. The authors were able to generate return on investment (ROI) figures of between $4.56 and $4.73 saved per dollar spent on the program. Concurrently, (Anderson et al., 2000) were again using the HERO database to evaluate those 46,026 employees. In this study, the authors reviewed the relationship between health risks and medical expenses. Anderson et al. took it a step beyond the original Goetzel et al. (1998) study by ranking the health risks. They found that stress, tobacco use, overweight, and physical inactive were the most expensive factors.

Alongside the early HERO studies, Edington and his colleagues were working with the Health Management Research Center's HRA data. Edington (2001) reviewed 2,000,000 datasets to determine the relationship between health risk and medical costs. They found that for each increased health risk, medical costs increased by $350 per year.

Interestingly, when a risk reduced, only $150 was saved in medical costs. Edington concluded that investment in maintaining employees in low risk provided the best ROI.

Recently (Goetzel et al., 2012) revisited his 1998 study to examine if those same health risk findings held. The researchers found similar findings in that depression, high blood glucose, blood pressure, high BMI, and physical inactivity were strongly associated with increased medical expenditure (figure 16).

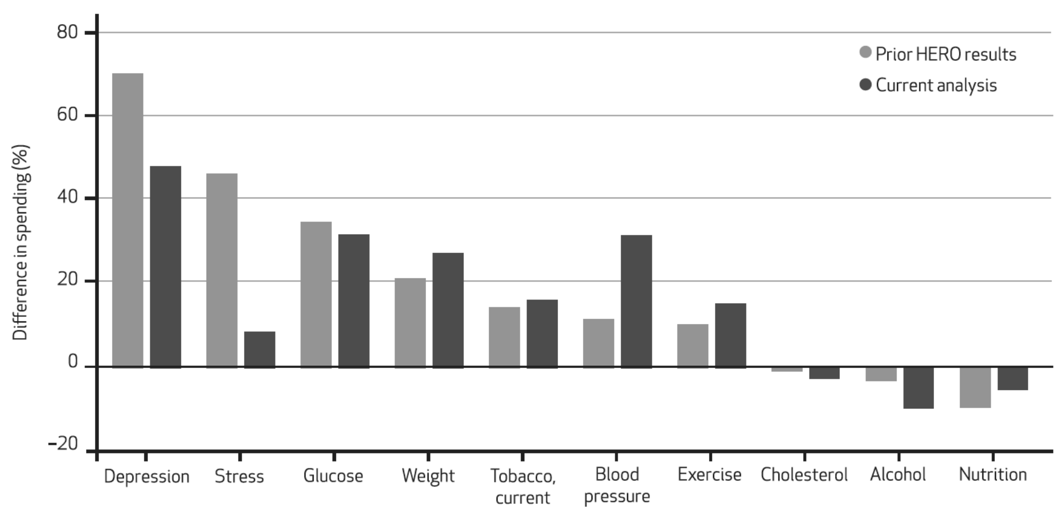

Figure 16. Difference in medical expenditure between high and low-risk employees: Prior HERO study results vs. current analysis. Reproduced From "Ten Modifiable Health Risk Factors Are Linked To More Than One-Fifth Of Employer-Employee Health Care Spending. Goetzel, 2012, *Health Affairs,* 31(11), p. 2475. Reprinted with permission

Serxner, Gold, and Bultman (2001) looked beyond direct medical expenses towards absenteeism. The authors reviewed 35,451 StayWell HRAs to compare health risks and absenteeism. They compared medical leave with the ten health risks and found a significant relationship in 8/10 risks. The relationship existed in back care, driving, eating, exercise, mental health, smoking, stress, and weight. Although these results were significant, they must be examined with caution as the leave was self-reported.

From the late 1990s and early 2000s authors agreed that the presence of health risks was associated with increased medical costs and absenteeism. Although studies did not comprehensively agree on exactly which health risk, there was some consistency. Particularly with physical activity, nutrition, stress management, smoking, and weight management.

Costs associated with health risks. With the connection between health risk and medical costs established, researchers continue to try and refine the exact relationship. In addition to the risk relationship, some medical conditions were also starting to show a relationship to costs. Edington's (2001) benchmark study found that each employee health risk costs an organization on average $350 in direct medical costs. Companies are now using health risks to build ROI figures for their wellness programs.

Another alternative to health risk is examining the costs associated with specific medical conditions. Loeppke et al. (2009) conducted the Health and Productivity as a Business Strategy study investigating health medical and pharmacy claims data. The authors also included productivity information from Health and Work Performance Questionnaire (HPQ). They were able to determine the top ten most costly health conditions when considering direct and indirect costs. Figure 17 shows that depression, obesity, and arthritis were the three most expensive medical conditions factoring in both direct and indirect costs. Interestingly, if only direct medical costs were considered cancer, back pain, and coronary heart disease were the top three most costly (Loeppke et al., 2007).

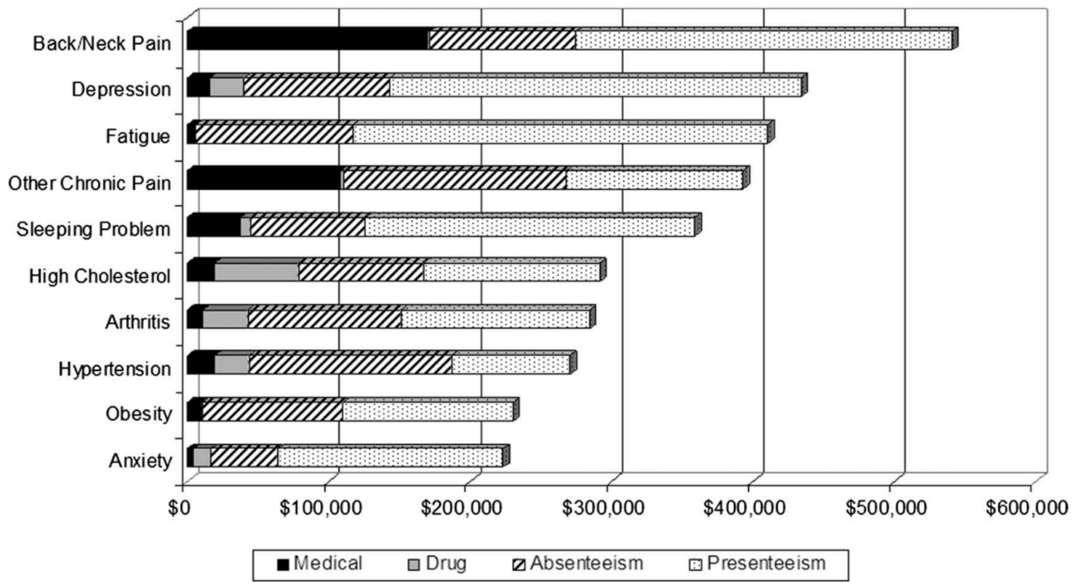

Figure 17. Bar graph showing Top 10 medical conditions by annual medical, drug, and productivity cost per 1000 FTEs. Reproduced from "Health and Productivity as a Business Strategy" Loeppke et al., 2007, *Journal of Occupational and Environmental Medicine* 49(7), p. 719. Reproduced with permission.

From these studies, the authors determined that for every dollar of direct medical costs there were 2.3 dollars of non-medical cost (absenteeism and presenteeism). This direct to non-direct cost ratio of 1: to 2.3 demonstrates the importance of considering both absenteeism and presenteeism associated with health conditions.

In addition to the HERO and IHMS databases, other researchers were starting to examine the link between health status and productivity. In 2005, the Midlife Development in the United States (MIDUS) study data was used to compare health care utilization. The authors collected 3019 health evaluations, including physical and mental indicators. They categorized the individuals as unhealthy, incompletely healthy, and completely healthy. These categorizes were compared to their productivity in the last 30 days. The authors found that completely healthy individuals had high rates of workplace productivity, and those unhealthy individuals had low productivity rates.

However, when reviewing these studies, care must be taken applying any results in Saudi Arabia. The HERO, University of Michigan and MIDUS studies drew their samples from United States companies and citizens. As both the prevalence of NCDs and the organization and social cultures vary, additional literature would need to corroborate these findings in Saudi Arabia.

Lifestyle Risk Factors

The majority of literature in the health and productivity field categorizes costly risk factors based on prevalent NCDs. As discussed, these NCDs are preventable and linked to lifestyle health behaviors. The WHO recognizes that nutrition, physical inactivity, alcohol, and smoking are considered the leading causes of chronic disease (WHO, 2013). Also, these four modifiable health behaviors lead to poor employee health (Aldana & Pronk, 2001; Goetzel et al., 2004). Although the WHO details the leading causes of chronic disease, there are additional contributing modifiable health behaviors. When examining common health risks profiles, some behavioral themes began to immerge. Comparing the HERO/StayWell and University of Michigan HRA data:

- Physical activity
- Body Mass Index (BMI)
- Alcohol consumption

- Nutrition
- Stress
- Tobacco use

In the majority of HPM literature, direct and indirect costs are based on the prevalence of health conditions. Few studies are solely examined the cost implications associated with the presence of a modifiable risk factor.

Modifiable Health Risks. A recent report in New Zealand examined the link between seven health risk factors on workplace productivity. These risk factors included; BMI, fruit and vegetable consumption, sleep, alcohol, smoking, and psychological distress (Williden, Schofield, & Duncan, 2012). The authors found that psychological distress and physical inactivity were negatively correlated with workplace productivity. In the United States, a study examining health risk and workplace presenteeism found similar results to the New Zealander group (Callen, Lindley, & Niederhauser, 2013). The authors reviewed blood pressure, cholesterol, blood glucose, weight, exercise, diet, and stress. In their findings, only stress was associated with reduced presenteeism. However, these results contrasted with the StayWell study examining risk and absenteeism. Serxner, Gold, and Bultman (2001) found that back care, driving, eating, exercise and activity, mental health, smoking, stress, and weight were linked to absenteeism. Although they had additional findings, they agreed that the strongest relationship to absenteeism was in the mental health domain.

Physical activity is a common modifiable health risk and is found at the forefront of all chronic disease management programs (Bull & Dvorak, 2013; Kirsten, 2010; Merrill et al., 2012). As the movement continuum displays (Figure 18) exercise as one end of the spectrum, with sedentary behavior at the other. Research in the last few years has started to question additional risk associated with sedentary behavior (Vashist, 2015). A recent meta-analysis found that sedentary behavior is related to all-cause mortality, cardiovascular disease, cancer, cardiovascular, and type 2 diabetes (Biswas et al., 2015). The study also suggested that the best returns for physical activity are the move away from sedentary behavior rather than toward intense exercise.

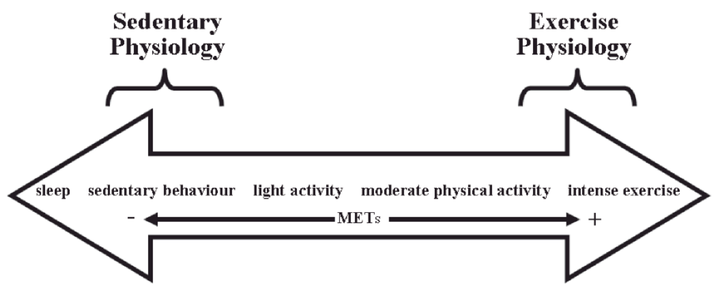

Figure 1: The movement continuum, illustrating the varying focus of sedentary physiology and exercise physiology [1]. METs are the metabolic equivalent tasks. Reproduced with permission from NRC Research Press.

Figure 18: The movement continuum. Reproduced from "Too much Sitting: A Potential Health Hazard and a Global Call to Action. (Vashist, 2015), *Journal of Basic and Applied Sciences*, 11. p. 133. Reprinted with permission

Modifiable Health Risks in Saudi Arabia. The WHOs STEPwise survey is one of the few publications to evaluated modifiable health risk prevalence within the Gulf region. The report targeted smoking, physical activity, nutrition and alcohol consumption. In 2007, the Saudi Arabian smoking prevalence was 11%, physical inactivity 67.7%, poor nutrition 93.5%, and alcohol use was 0% (Table 5). Unfortunately, beyond the WHO Stepwise survey, there is an absence of health risk rates in the literature.

Table 5.

Prevalence of noncommunicable disease risk factors in some countries Eastern Mediterranean

Country	Year	Smoking (%) Current daily smokers	Low physical activity (%) Daily activity ≤ 10 min	Low intake of fresh fruits and vegetables (%) ≤ 5 serving/day	Alcohol consumption/ current drinkers Drinking alcohol in the last 30 days
Bahrain	2007	17.9	57	44	
Egypt	2005/ 2006	18	70.4	79	2.1
Iran, Islamic Republic of	2005	13	67.5		
Iraq	2005	21.6	56.7	91.4	
Jordan	2007	29	51	57	0.9
Kuwait	2005	20.6	64.7	61	2.7
Oman	2006	9.3	69.9	33.2	
Saudi Arabia	2007	11	67.7	93.45	
Sudan	2005	12	86.8		1.8
Syrian Arab Republic	2003	24.7	31.15	95.7	6.36

Note: From STEPwise survey. WHO (2005) Retrieved from http://www.emro.who.int/noncommunicable-diseases/information-resources/ncd-risk-factors-prevalence.html. Reprinted with permission.

Health Risks Saudi Aramco

Saudi Aramco Medical services - through JHAH, have conducted a number of employee HRAs. In 2006, the company conducted the first employee health screen and risk survey (EHSS) examining modifiable health risks. At the time, the study found tobacco use; 25%, physical inactivity; 42%, and poor nutrition; 70%. The latest survey was in 2012, with investigators using the existing medical record system (ICD-9 codes) (Saudi Aramco, 2012). The data was used to assess overall risk levels – specifically the presence of

- Tobacco use
- Alcohol consumption
- Physical inactivity
- Safety belt usage
- High body mass index
- Systolic blood pressure
- Diastolic blood pressure
- Total cholesterol,
- HDL cholesterol
- Self-perceived health
- Life satisfaction
- Stress
- Medical leave days

These risk profiles were created to mirror the University of Michigan HRA standard measurements (Edington, 2001). Unfortunately, the data was combined to create risk profiles and individually risk prevalence data is unavailable. The analysis reveals that 54% of the workforce is at low risk (0-2 risk factors), 30% medium risk (3-4 risks) and 16% high (5+ risks).

The Saudi Aramco rates were compared to the United States benchmarks; 60% low risk, 25% medium risk and 15% high risk. This comparison identifies Saudi Aramco employees as having an increased percentage of high and medium risk employees, with a corresponding reduced low risk. The increased rates of high-risk employees has significant repercussions for the company, particularly given the workforce exceeds 56,000 employees. These implications could include:

- Higher prevalence of chronic health conditions
- Higher direct medical costs
- Higher absenteeism
- Higher disability and workers compensation costs
- Lower productivity due to higher presenteeism

As demonstrated in the socioecological health model, health outcomes are determined by the unique environmental and cultural context (Ettner & Grzywacz, 2001). The ecological health model identifies behavior change stemming from three dimensions; i) knowledge, ii) attitudes, and iii) beliefs (Booth et al., 2001). As previously discussed, Saudi Arabia is a unique culture with differences in health beliefs and behaviors when comparing to North America. Therefore, the intent of this research was to move beyond

NCDs to the lifestyle risks associated with those conditions. Understanding these lifestyle behaviors and their relationship, if any, on workplace productivity, provides necessary information on human capital management.

Presenteeism

Introduction

For an individual, our personal productivity can be affected by many factors (Chapman, 2005). Productivity in the workplace is an important concept, particularly when considering organization performance. In 1950, researchers began to notice employees being "here but not all there" in the workplace (Canfield & Stosh, 1955). This distracted state resulted in lost productivity and was termed presenteeism. Presenteeism refers to an employee who is present in their workplace but may not be functioning at their full capacity due to illness or other distraction (Koopman et al., 2002). Lost productivity associated with presenteeism is more difficult to measure than simple absenteeism. Presenteeism has been attributed to many factors including both direct and indirect. Direct factors could include lack of or inadequate on the job training or the workplace environment. Indirect factors could include the employee's health or behavior (Figure 19).

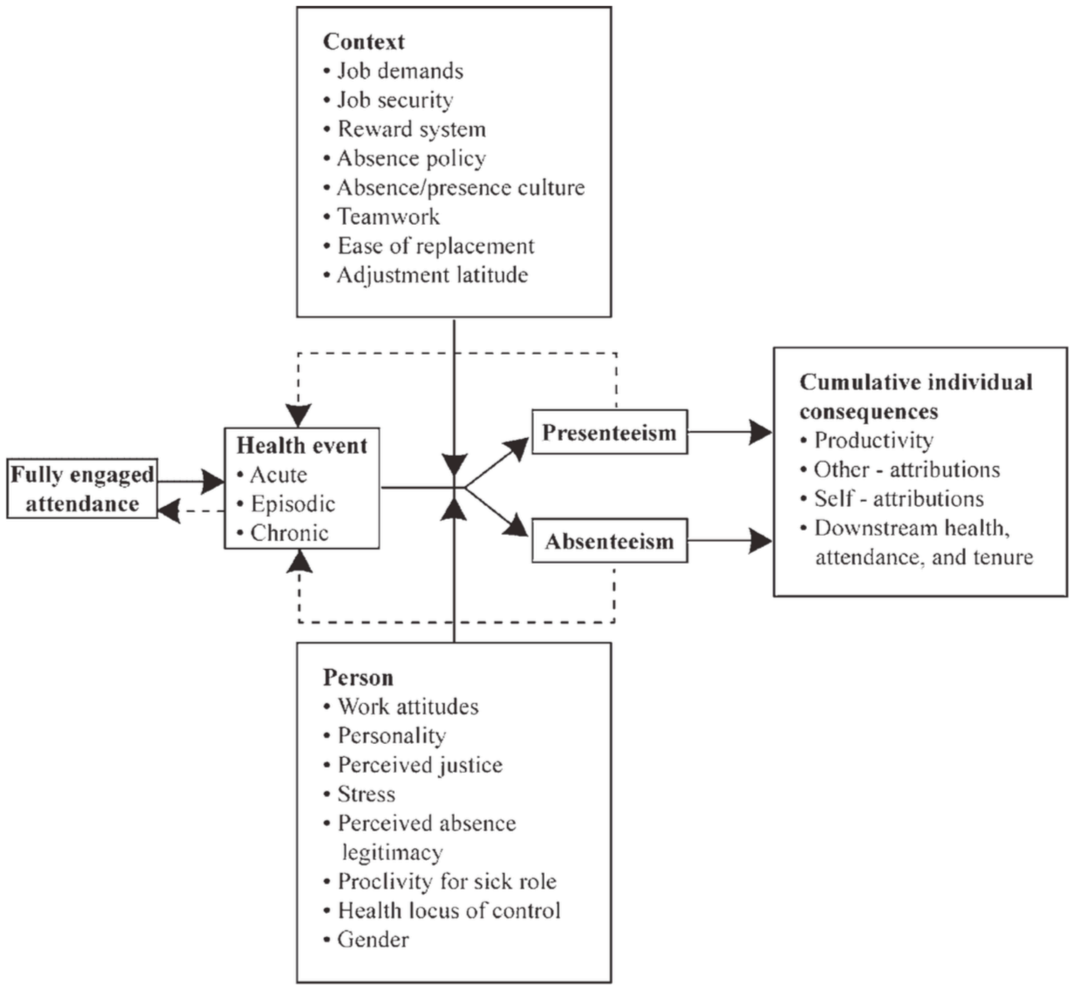

Figure 19: A dynamic model of presenteeism and absenteeism. Reproduced from "Presenteeism in the workplace; a review and research agenda". Johns, 2010. *Journal of Organizational Behavior*, 31(4). p. 532. Reprinted with permission.

Although it seems intuitive that unhealthy employees are less productive, the literature to support this assumption has only solidified in recent years. Currently, lost productivity (absenteeism and presenteeism) related to diminished health is estimated to cost US employers $230 billion annually (Mitchell, Ozminkowski, Serxner, 2013). These figures have allowed multiple researchers to value human capital beyond labor costs. As previously mentioned, many studies examined health risks and increased health costs and absenteeism. However, the literature regarding productivity developed more recently.

The Institute for Health and Productivity Management (IHPM) recognized this shift when it interviewed 60 large United States companies in 2000 (average employees 33,000). They concluded at that time that the majority of organization understood that health risks impact cost. Those organizations were starting to believe that health had an impact on productivity with 53% utilizing productivity information. The IHPM conducted the Cost of Presenteeism Study in 2001, where they measure the impact of health conditions on productivity (Queyrouze, 2003). The author found that the productivity cost of certain musculoskeletal conditions were five times higher than the direct medical expenses. In 2005, data from the Midlife Development in the United States (MIDUS) study was used to compare health care utilization. The authors collected 3019 health evaluations, including physical and mental indicators. They categorized the individuals as completely unhealthy, incomplete health, and completely healthy. The productivity levels of the three categories were compared over the last 30 days. The authors found that completely healthy individuals had high rates of workplace productivity and those unhealthy individuals had low productivity rates.

In the current study, I was particularly interested in measuring presenteeism related to employee health behaviors. Many studies have shown a correlation between decreased health status and both absenteeism and presenteeism. Terry and Xi (2010) found that 20-50% of employees might come to work despite poor health. However, this research focused on health behavior, rather than the impact of health conditions.

Measuring Presenteeism

Schultz, Chen, and Edington (2009) conducted a review of productivity measures in the United States. The authors found only 14% of organizations examined health-related productivity. Lack of health and productivity data could potentially impede an organization's effort to drive profit and growth. In the past decade, researchers have developed many tools to measure presenteeism. However, presenteeism is a relatively new concept, with researchers lacking consensus on the best measurement instrument. Terry and Xi (2009) also noted conflicting statements about which direction presenteeism is expressed concerning productivity. The University of Michigan Health Management Research Center compiled a list of presenteeism measures (Schultz, Chen & Edington, 2009).

Presenteeism tools are designed as general measures and those that target specific medical conditions. For this review, only the general presenteeism measures were considered. The three most common tools include the WHO's Health Work Performance Questionnaire (HPQ), the Work Limitation Questionnaire (WLQ), and the Stanford Presenteeism Scale (SPS).

HPQ. The WHO's, HPQ is an 89 question survey that was developed from the WHO's Disability Assessment Scale (Kessler, et. al., 2003). This lengthy questionnaire involves self-reported questions about sickness, presenteeism, and critical incidents.

WLQ. The WLQ is a 25 question survey examining four domains; time, output, mental/interpersonal, and physical.

SPS. The SPS is a six-item Likert scale measuring health and productivity. The SPS was selected for this dissertation due to its validity and reliability (Koopman et al., 2002).

Literature Review Summary

In this study, I focused on the relationship between modifiable health risks and their impact on workplace productivity. Research has shown the link between health risks and NCDs, and the importance of designing targeted risk reduction programs. Globally, the increasing presence of NCDs is a causing a financial crisis (WEF, 2012). Increasingly, organizations now understand that business performance is linked to the human factor. Organizations are spending between 40-60% of their income on employee salaries, in addition to training and development costs (WEF, 2012). These costs can continue to spiral particularly when considering any lost productivity related to reduced health. Understanding this relationship has been one of the catalysts for employee health and wellness programs.

Workplace wellness programs have developed from their roots in health promotion and public health. These workplace programs form to reduce the rates of communicable diseases. As programs expanded, there has been a shift away from public health/health promotion towards integrated HPM. The early workplace studies reviewed the relationship between poor health and medical costs. One of the original studies examining this link was the HERO health care expenditure study (Goetzel et al., 1998).

This research was considered an important step forward with the results indicating a relationship between increasing risk and costs. These findings were corroborated by additional studies over the next decade (Anderson et al., 2000; Edington, 2001; Ozminkowski et al., 1999). From these studies, researchers continued to explore the impact of health in the workplace.

With these new findings, came a focus on employee productivity and its contributing factors. The first wave of productivity-based research examined the relationship between chronic health conditions and productivity. Loeppke (2007/2009) developed the list of costly medical conditions by combing both medical and non-medical (absenteeism and presenteeism) costs. These were:

1. Depression
2. Obesity
3. Arthritis
4. Back/Neck Pain
5. Anxiety
6. GERD
7. Allergy
8. Cancer
9. Chronic Pain
10. Hypertension

Additional research has confirmed chronic health conditions cost an organization in both medical expenses and lost productivity (Dollard & Neser, 2013; Iverson et al., 2010;

Lenneman, Schwartz, Giuseffi, & Wang, 2011). Recognizing this link is only one part of developing a viable solution.

The WHO recognizes that nutrition, physical inactivity, alcohol, and smoking are considered the leading causes of chronic disease (WHO, 2013). These modifiable risk factors are the precursor to Loeppke's list of 10 costliest medical conditions. As demonstrated in Partnership for Prevention report (2005), 60% of a workforce has 0-2 health risk factors. With most employees having low rates of health risks, this suggests that the majority of a workforce does not have chronic health conditions, but rather a modifiable risk factor. Realizing that most of the workforce is healthy presents an opportunity for tailored interventions. As Edington coined in his Zero Trends book, we need to "keep the healthy healthy" (p. 12, Edington, 2009).

The Middle East is a region that has been particularly affected by chronic medical conditions (WHO, 2013). Saudi Arabia is leading the world with their prevalence of NCDs, with soaring rates of obesity and diabetes (WHO, 2014). Utilizing the existing WHO NCD profiles, Saudi Arabia, and the United States display distinct differences. One obvious factor is the difference in mortality associated with cardiovascular disease between the two countries, Saudi Arabia 46% vs. the United States 31%. Another difference is the probability of dying from the four main NCDs (cancer, diabetes, cardiovascular disease, respiratory disease) is 17% vs. 14%. Unfortunately, the country is also unable to maintain accurate disease profiles. Alongside these challenges, Saudi Arabia, and the region have been slow to adopt HPM practices. When examining the literature, there are only a handful of Saudi Arabian studies examining the impact of poor health on productivity. These studies include the authors evaluating the influence of depression, rheumatoid arthritis, and peptic ulcer disease on productivity (Luby & Al-Jahdaly, 2005).

As detailed in the literature review there is a serious gap in the literature regarding health and productivity in Saudi Arabia. The United States workforce has been well studied, determining the most expensive risk factors and their impact on productivity. In Saudi Arabia, are no studies reviewing the relationship between lifestyle health risks and productivity. This gap presents an opportunity to contribute to organizational HPM practices in the region.

With the emerging rates of noncommunicable diseases and the clear link between modifiable health risks, organizations must understand the productivity implications. This study examined the second largest company in Saudi Arabia – Saudi Aramco, to evaluate its health and productivity data. The purpose was to determine the relationship if any, of these modifiable risk factors and workplace productivity. The following chapter provides a description of the methodology, data collection, and the associated variables.

Chapter 3: Research Method

Introduction

The purpose of this quantitative, ex-post facto study was to examine baseline health and productivity data and determine the relationship between lifestyle risk and productivity in Saudi Arabia. The research questions for this study were

1. To what extent, if any, does physical inactivity relate to productivity among employees in Saudi Aramco?

2. To what extent, if any, does tobacco use relate to productivity among employees in Saudi Aramco?

3. To what extent, if any, does a BMI over 25 and 30 relate to productivity among employees in Saudi Aramco?

4. To what extent, if any, does a sedentary occupation relate to productivity among employees in Saudi Aramco?

5. To what extent, if any, does poor nutrition (my plate guidelines) relate to productivity among employees in Saudi Aramco?

In this chapter, I detail the study methodology with descriptions of the design and study variables and how this relates to the research problem. The method includes information on the study population, sampling procedure, and data analysis. A Likert scale was used to capture the dependent variable, and this was introduced and examined. In the final section, I discuss the challenges, ethical implications, and summary of the chapter.

Methodology

Descriptive studies are used to review a population at one point in time (Frankfort-Nachmias & Nachmias, 2008). A cross-sectional study can be used to describe prevalence or a pattern of relationship among variables. A cross-sectional design is considered the most predominant in the social sciences (Frankfort-Nachmias & Nachmias, 2008).

The dominant research approach in health and occupational wellness field involves quasi-experimental design. With the current research problem, the fundamental form of investigation was a cross-sectional design. The cross-sectional design allows a basic snapshot of the current prevalence of health risks.

The hypothesis was that with increasing health risks, workplace productivity reduced. In this research design, I did not consider productivity changes from an individual perspective. The design would need to include a temporal domain to allow individual comparison. To include the temporal domain would require the employee being followed longitudinally to determine if a change in risk made a difference to productivity. However, I only intended to provide a baseline trend in relationship between the health risks and productivity, again supporting a cross-sectional study.

The independent variables (IVs) mentioned in the research question were the behavioral health risks as measured in the Saudi Aramco HRE. The HRE is a tool designed to measure risks at one point in time, supporting a cross-sectional study. The SPS-6 was used to measure the dependent variable (DV) productivity. Both these variables are single point measures and may provide answers to the research question -

Do increasing health risks have an impact on productivity in an organization in Saudi Arabia?

The study was based on one large organization in Saudi Arabia. The design included six variables: five health risk factors and productivity. The HRE is one approach to collecting health information from individuals who identify risk factors. The HRE includes a simple discrete measure: yes or no to the condition. Productivity was measured using the SPS-6. The SPS is a 6-item Likert scale, which includes questions about the impact of health on workplace productivity. The design was a cross-sectional descriptive study. In descriptive studies, scholars examine a population at a single point in time, and this is relevant in the survey design (Frankfort-Nachmias & Nachmias, 2008). This study had five nondirectional null and alternate hypotheses:

Study Population

The sample came from Saudi Aramco employees. Saudi Aramco employed over 56,000 direct hire employees, in addition to over 100,000 contractors (Saudi Aramco, 2014). The general population consisted of over 156,000 employees (Saudi Aramco, 2014).

Saudi Aramco is unique in that the organization had offices in North America, Europe, Asia, and Saudi Arabia. The majority of employees were located at the company headquarters in Dhahran, Saudi Arabia. The study population consisted of those Saudi Aramco employees who had enrolled in the wellness program. At the time of the study, the program had 25,450 participants, which represented 16% of the total population of

SA employees. With such a large numbers, it was hard to include every employee in the study and necessitated sampling.

Sampling and Sampling Procedures

After defining the study population (wellness program participants), I selected the study sample. The objective of the sampling process was to generate a representative sample, with characteristics similar to the population. The best method to determine a representative sample is simple random sampling (Creswell, 2013). Random sampling is a process that involves drawing down a population of subjects with an equal chance of being selected (Creswell, 2009).

In this population, there was a demographic skew: 83% males and 17% female employees (Saudi Aramco, 2013). The intent of this study was not to look at the influence of gender on the relationship between health and productivity. Choosing a sampling method that ensures a representative population allowed for an accurate picture (Frankfort-Nachmias, & Nachmias, 2008).

Stratified random samples were selected as the method is considered as strong or even better than a random sample (Black, 1999). The process of stratification involves the following:

1. Stratifying the sample into males and females
2. Take a random sample from each group
3. Combine the male and female samples to form the study sample

The Saudi Aramco population had 87% men and 17% females. To determine the exact number required, I used a sample fraction calculation (Hulley, Cummings, Browner, Grady, & Newman, 2013). As per the determined sample size of 400 (X) then males (m) and females (f) then m + f = 400. To stratify these, I used the proportions in the current population, which were 87% males and 13% females.

Males: 400 * .87 = 348

Females: 400 * .13 = 52

Therefore, based on the stratified sampling technique, I required 348 males and 52 females.

Procedures

The sample was drawn from the existing SAWP database. The database was collected from SAWP participants using HRE data collected during their visit. A trained administrator entered the data into an Excel sheet, converting the responses into numeric codes. Once entered, the data did not contain any personal identifiers. The SPSS responses were totaled and entered, with a score from 6-30. The administrator stored the data on a secured intranet site, with limited general access.

Once I received international ethics board (IRB) approval, I requested the complete Excel spreadsheet from the program administrators. Once received, the data were divided into two strata, male and female. From these two data sets, a random number table was used to select the stratified sample. As previously calculated, I required 348 male samples and 52 females.

Sample Size

There are many methods to determine the correct sample size. First, I determined the effect, α error probability, and power. The effect size was set at 0.15, as a medium effect was deemed appropriate. An effect sizes of .02 is considered a small effect size, 0.15 a medium effect size, and 0.35 a large effect size (Keith, 2014). The α error probability was set at 0.05 as it was felt a 5% chance of error when detecting statistical significance was appropriate (Maxwell, 2000). The power was set at 0.95, which provided a 95% chance of finding a statistically significant difference. Power is usually set at 0.80 or an 80% chance of finding a difference if it does exist. Because of the desire to detect a statistically significant difference and the large potential population, a power of 0.95 was selected.

Using the G*Power calculator with an effect size of 0.15, α error probability 0.05, power 0.95, and five predictors the calculated minimum sample size is 138 (University of Düsseldorf, 2013). This sample size was compared with the Raosoft and (Krejecie & Morgan, 1970) reference tables, which suggested a sample size of 382 (Raosoft, 2004). The greater of the two sample sizes, 382, was selected for the study sample, and was rounded up to 400 to account for missing data.

Research Design

Data Access

To gain access to the data, I obtained two ethical approvals: internal IRB from JHAH, and Walden University (WU) IRB. The first approval was from JHAH and was gained from the ethics committee. The approval required an application, board meeting, and opportunity to query any details. As part of JHAH IRB approval, I required the National Institute of Health (NIH) - Protecting Human Research Participants certification. JHAH institutional IRB approval was granted on February 26, 2015, for 1 year until February 26, 2016 (Appendix B). The second ethics approval came from the WU IRB process. Again, this required an application, including evidence of institutional approval. The approval involves information on the following:

- Description of the proposed research
- Community research stakeholders and partners
- Potential risks and benefits
- Data integrity and confidentiality
- Potential conflicts of interest
- Data collection tools
- Description of the research participants
- Informed consent

WU IRB approval was granted following the completion of Chapters 1, 2, and 3 and the subsequent university review. Once I received both JHAH and WU IRB approvals, I requested the study data from the program administrator.

Instrumentation and Operationalization of Constructs

JHAH is Saudi Aramco's health care provider, and their team collects HREs on behalf of Saudi Aramco. The HREs were managed in the employee wellness clinics, located in multiple locations around the company facilities.

Dependent Variable

The SPS – 6 is one of many scales designed to measure lost productivity associated with health. As mentioned in Chapter 2, productivity is determined using both absenteeism and presenteeism. Presenteeism is defined as reduced productivity while at work (Lofland, Pizzi, & Frick, 2004). In this study, I focused on examining the relationship between health risks and presenteeism. Measuring presenteeism is a complex task, with varied approaches reported in the literature. The three primary measurements are perceived impairment, comparison of productivity with coworkers and a person's norms, and an estimate of unproductive work time (Mattke, Balakrishnan, Bergamo, & Newberry, 2007). Assessment of perceived impairment is the most common method with employees self-reporting how their health affects their performance. One of the standard presenteeism measures is the SPS.

Koopman et al. (2002) developed the SPS as a modification from the SPS-32. The SPS-32 was an instrument designed to measure various emotional, cognitive, and behavioral factors associated with work completion. The SPS-32 was constructed using a panel of experts and a literature review. The developers formed themes based on the two major dimensions of presenteeism, work focus, and psychological behaviors. This tool narrowed via an item reduction strategy to create the current tool SPS. The SPS-6 is a self-reported scale and is comprised of six questions measured on a 5-item Likert scale. The SPS generates a total by adding the scores of the six items, ranging from 6-30. The highest score is 30, and the SPS considers this peak performance (Koopman et al., 2002).

The SPS was selected for this study for many reasons. First, the scale's reliability and validity is well established. Secondly, the measure itself is simple and easy to understand. This property is important as many of the participants speak English as a second language. Finally, the scale only has six questions, and this was compared to some other tools that have up to 44 items (Mattke et al., 2007).

Reliability

To determine if the SPS was appropriate to include in the research, I considered the psychometric properties. The JHAH team administers the tool, and the results were captured via self-reporting. No scholars have examined the test-retest reliability of the SPS, although its exclusion is justified. Due to the variability associated with an individual's health status, consistency over time should not be expected (McClain, 2013). This variability could potentially have implications for using the measurement to compare data, but I did not consider a comparison.

A number of researchers have reviewed the reported reliability of the SPS-6. Turpin et al. (2004) evaluated 7,797 employee medical claims against productivity data and found the SPS to have a Cronbach's alpha score of 0.83. A smaller study of 126 Portuguese nurses included a reliability evaluation (Laranjeira, 2013). Laranjeira (2013) also found that the SPS reliability was adequate with a Cronbach's alpha of 0.83. Finally, in a study of 175 health employees, Koopman et al. (2002) reviewed the SPS internal consistency and found a Cronbach's alpha score of 0.80, again suggesting good consistency.

One of the concerns of any self-reported scale is factual reporting. However, there is no other viable method to measure presenteeism, leading to reliance on self-reporting. Goetzel, Ozminkowski, and Long (2003) proposed some guidelines to reduce the limitations of self-reporting. These guidelines include the tool should be brief and easily understandable, have exact and mutually exclusive responses, and the responses should be verifiable with objective measures. The SPS meets these criteria, as it is simple, clear, and easy to follow.

Validity

Koopman et al. (2002) studied the SPS scale to determine normative differences, internal consistency, and construct validity. The study involved a sample of 75 individuals from a United States-based company. Koopman et al. (2002) used a Cronbach's α to determine internal consistency and found a score of 0.80, indicating a high level of internal consistency. The construct validity measures the extent to which an instrument measures what is expected to gauge (McClain, 2013). Koopman et al. (2002) found good construct validity, with their analysis accounting for 71% of the total response variance. Koopman et al. (2002) examined three aspects of construct validity, concurrent, criterion, and discriminant validity.

Concurrent validity. Validity was determined by high correlations with the previous SPS-32 scale with total scores (r=.89, p<.001)

Criterion validity. This was determined by comparing presenteeism scores with disability measures. Those employees with high presenteeism scores showed higher disability scores compared with lower presenteeism scores and lower disability rates (t=3.54, p=.0001)

Discriminant validity. Was determined by scholars looking at positive associations with other medical conditions. Sanderson and Cocker (2013) found the SPS-6 was able to discriminate among employees with depression and anxiety. Sanderson and Cocker (2013) were also able to determine that the SPS showed good generalizability value for all work types. Turbin et al. (2004) examined the SPS for reliability and validity and agreed with Koopman et al.'s (2002) findings that the SPS has a high degree of validity. Turbin et al. (2004) concluded that the SPS is an ideal scale, which is appropriate to measure health-related employee productivity.

Independent Variables

Physical activity. Employees were asked if they performed 30 minutes of moderate-intensity physical activity 3 days per week. This guideline was based on the minimum physical activity standards (American Heart Association, 2014, UDSA, 2015,). If the employee reported physical activity, they are scored as having no risk from physical inactivity. If the employee did not perform 30 minutes of moderate intensity physical activity 3 days per week, then they have a risk score associated with physical inactivity.

Tobacco use. Employees were asked if they currently smoke, including cigarettes, chewing tobacco, shisha, or hookah. If they responded yes to currently using tobacco products, then they had a risk score associated with tobacco use. If they answered no to the tobacco use question, they were asked if they had quit within six months. If they answered yes, then they had a risk score associated with tobacco use. Smoking shisha and hookah is traditional in the Middle East so are specifically identified in the tobacco use question (Akl et al., 2011).

Body Mass Index. As part of the HRE, employees were weighed and using their height, the body BMI measure was calculated. The BMI was calculated using the metric formula:

$$BMI = weight (kg)/[height (m)]2$$

The BMI was reported using the following reference ranges (Table 6)

Table 6

Body mass index classifications

BMI	**Weight Status**	**SPSS coding**
Below 18.5	Underweight	1
18.5 – 24.9	Normal	2
25.0 – 29.9	Overweight	3
30.0 and above	Obese	4

Source: From U.S. Department of Health and Human Services (2015). Retrieved from http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/english_bmi_calculator/bmi_calculator.html. Reprinted with permission.

Sedentary Occupation. Sedentary occupation was characterized by any waking activity characterized by an energy expenditure ≤ 1.5 METs and in a sitting or reclined posture (Sedentary Behavior Research Network, 2012). The International Physical Activity Questionnaire is considered one valid and reliable measure of physical activity (Craig et al., 2003). One component asks about the time spent sitting on weekdays while at work, at home, while doing course work, and during leisure time. This question was modified to address the occupational component and its effect on presenteeism. The question was: Do you spend greater than 6 hours per day sitting at work? The answer was dichotomous– yes or no.

Nutrition. Nutrition status was measured through self-reported compliance with the United States Department of Agriculture (USDA) MyPlate guidelines (USDA, 2014) (Figure 18). The guidelines authors recommend 25% fruits, vegetables, lean sources of protein, whole grains with the addition of a serving of dairy each meal. Employees were asked if they followed the MyPlate guidelines for 80% of their meals. The answer was diacohotimus – either yes or no.

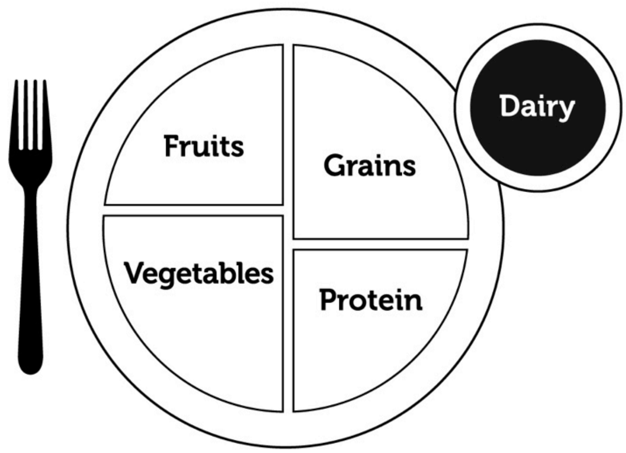

Figure 20: MyPlate nutritional guidelines. Reproduced from "My Plate Guidelines" by the *United States Department of Agriculture,* 2014. Accessed from http://www.fns.usda.gov. Reproduced with permission

Demographic Variables

The final three variables were age, gender, and ethnicity. These were used as baseline demographics and could have been utilized in a post hoc analysis.

- To what extent, if any, does age relate to productivity in Saudi Arabia?
- To what extent, if any, does gender relate to productivity in Saudi Arabia?
- To what extent, if any, does ethnicity relate to productivity in Saudi Arabia?

Age. Age was categorized into five groups:

Age	SPSS coding
30 and under	1
31-40	2
41-50	3
51-60	4
Above 60	5

Gender. This is entered as discrete variables, either male (1) or female (2)

Ethnicity. This is entered as discrete variables

Ethnicity	SPSS coding
Saudi Arab	1
Other Arab	2
Asian	3
European/North American	4
Other	5

Data Analysis

The SAWP administrator sent through the program database in an Excel spreadsheet. The document contained coded data that excluded employee identifiers. The statistical package for the social sciences (SPSS) software was used for data analysis. The first step in the analysis was data setup. Once the pre-coded data was received, it was transferred into SPSS. Once in SPSS, I labeled each variable (e.g.,. Gender 1 = Male, 2 = Female).

The second step was to clean and screen the data for any incomplete datasets. There were many reasons why data could be missing within the set. Firstly, the data could have been omitted in the original HRE procedure. Or secondly and least likely, it may not have been entered in the database. In the situation where there was missing data, I omitted those cases prior to sampling. In SPSS, I used "analyze - descriptive statistics – frequencies" that displayed a basic table with *n* valid and *n* missing for each variable. I then proceeded onto the correlation testing and multiple regression analysis. Correlation and regressions are utilized to analyze the relationship between variables.

Correlation

Correlation analysis is designed to measure the strength of the relationship between two variables. For the correlational analysis, I selected a classic bivariate correlation, the Pearson *R* test. The Pearson correlation was appropriate, as four of the independent variables were dichotomous *x* (yes/no) with one continuous measured variable *y*. This test statistic was selected since the *R*-value provides the strength and direction of any relationship. The value can range from 1.0 to - 1.0, with 0 indicating no relationship between the variables and 1.0 indicating perfect correlation (Lund Research Ltd, 2013)

In addition to Pearson correlations, one of the independent variables, BMI, was an ordinal variable with four categories. This variable included a one-way analysis of variance (ANOVA), to determine if there was a difference between the groups. As there was a significant difference between the groups, I also included Fishers Least Square Difference (LSD). The LSD helps to differentiate the difference between the group means as opposed to the all the groups together (Hayter, 1986). This statistic allowed for direct mean comparison between two BMI groups.

The research questions and hypotheses were:

1. To what extent, if any, does physical inactivity relate to productivity among employees in Saudi Aramco?

H_o1: There is no relationship between the level of physical activity and workplace productivity.

$H_1$1: Higher levels of physical activity are related to greater workplace productivity

2. To what extent, if any, does tobacco use relate to productivity in Saudi Aramco?

H_o2: There is no relationship between tobacco use and workplace productivity.

$H_1$2: Low levels of tobacco use are related to greater workplace productivity

3. To what extent, if any, does a BMI over 25 and 30 relate to productivity in Saudi Aramco?

H_o3: There is no relationship between BMI and workplace productivity.

$H_1$3: Lower BMI measures relate to greater workplace productivity

4. To what extent, if any, does a sedentary occupation relate to productivity in Saudi Aramco?

H_o4: There is no relationship between a sedentary occupation and workplace productivity.

$H_1$4: Low levels of sitting a work relate to greater workplace productivity

5. To what extent, if any, does poor nutrition (my plate guidelines) relate to productivity in Saudi Aramco?

H_o5: There is no relationship between consuming a healthy diet and workplace productivity.

H_15: Higher levels of consumption of a healthy diet are related to greater workplace productivity

The null hypothesis was that there was no significant relationship between physical activity, tobacco use, BMI, sedentary occupation, and nutrition as predictors of workplace productivity.

Multiple Regression

A multiple regression design involves attempting to predict an outcome from one or more independent variables (Coakes, 2005). The statistical analysis is conducted on the provided dataset. The independent variables include tobacco use, physical activity, sitting behavior, sleep, and nutrition. These are compared against the dependent variable SPS-6, with scores between 6 and 30.

Regression Procedure

After the data is screen and cleaned, a basic descriptive statistical analysis is conducted. I will conduct a multiple regression with; estimates, confidence intervals (95%), model fit, descriptive data, part and partial correlations, Collinearity diagnostics, Durbin-Watson, and case wise diagnostics (3 SDs). I will also generate histograms, normal probability plot, and produce all partial plots.

Once the outputs are generated, the first step in the multiple regressions analysis is to test the underlying assumptions. The underlying assumption in a multiple regression is that; 1) the variables are normally distributed, 2) an assumption of a linear relationship between the independent and dependent variables, and 3) variables are measured without error and there is an assumption of Homoscedasticity (Osborne & Waters, 2002).

Assumption Testing

Prior to examining the regression results, I must first analyze the underlying multiple regression assumptions (Keith, 2014). This is essential as any assumption violations could affect the regression results. In addition, there is an opportunity to correct the data if any of the assumptions are violated.

Normally Distributed. To review the distribution of the data, I selected the histogram function form the Plots menu. This will provide a visual representation of the DV (SPS) distribution. A second graph, P-P Plot, compares Expected Cumulative Probability vs. Observed Cumulative Probability. If the results were normally distributed, I would expect to see the line of best fit diagonally across the data points.

Linear Relationship. The second assumption is that the IV's collectively and independently are linearly related to the DV (Keith, 2014). To test for this, I compare the studentized residuals against the unstandardized predicted values. This needs to be generated by Graphs ➔Chart Builder. Once the scatterplot is produced, the residuals should form a horizontal line of best fit. Each individual IV can also be reviewed by comparing their residuals. Categorical data was ignored in the analysis.

Error. When evaluating the error in the variable, this is approached from three directions. The first is case wise diagnostics. This table is generated if any of your data points fall outside of SD + 3. In addition, reviewing the studentized deleted residuals will also detect significant outliers. Again, these need to be less than ± 3 to meet the assumption. The second component is checking for leverage points within the results. The LEV 1 numbers should be reviewed for values greater than 0.2. The third analysis is checking for influential points via the Cook's Distance Function. The results are found under COO_1 in the data set and should be scanned for values >1.

Interpreting the Output

Correlation Analysis

For each variable the R-value can range from 1.0 to -1.0, with 0 indicating no relationship between the variables and 1.0 indicating perfect correlation (Lund Research Ltd, 2013).

Multiple Regression

Once all the underlying assumptions have been met or corrected, it is time to interpret the output.

R, R^2, adjusted R^2, and F Ratio. The model summary table provides the multiple correlation coefficient (R) value. These values range from 0-1 with higher numbers indicating the independent variables are better able to predict the SPS-6 scores. The R^2 value represents the model fit, with the number reporting the prediction quality. A value above .30 is considered a good predictive level (Tabachnick & Fidell, 2007). The adjusted R^2 take sample generalizability into account, and I will place more weight on this value. The F Ratio is found within the ANOVA table and is another test for the fit of the model. This carries its own statistical significance score, and addresses if the IV's predict the DV.

Model Coefficients. The model coefficient table helps to examine each IV for its contribution to the model. The table provides the constant (a) and individual (b) values. Each IV has a statistical significant level and confidence intervals. These values all contribute to the multiple regression formula.

The multiple regression formula for the study will be as follows:

Y (Presenteeism)= $a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5$

Y = the value of the predicted score for the dependent variable (presenteeism)

x_1 = the value of the first independent variable

x_2 = the value of the second independent variable

x_3 = the value of the third independent variable

x_4 = the value of the fourth independent variable

x_5 = the value of the fifth independent variable

b = the regression weight for each variable

a = the constant

Threats to Validity

The major threat to internal validity comes from potential selection bias. Participation in the SAWP was voluntary; employees are invited to attend the drop in clinics in their work locations. Because the clinics and HRE process is voluntary, potentially only employees interested in their health and wellness may attend.

Fortunately, this threat is partially mitigated as even people interested in health and wellness demonstrate the entire spectrum of health behaviors.

The external validity threats could arise from a number of factors and impact the studies ability to be generalized. Selection bias could be a significant factor within this study design. The bias maybe partially mitigated by selecting a large sample size (n = 400) based on the power and sample size calculations. One major limitation is that the study population comes from Saudi Aramco employees enrolled in the wellness program. As enrollment in voluntary, these employees could be particularly engaged in their health behaviors and this may not accurately represent the Saudi Aramco population. The selection bias and generalizability will be addressed in more detail in the discussion.

Ethical Procedures

As described earlier, prior to obtaining the secondary source data, I required two IRB approvals – institutional and international. The institutional IRB approval, IRB #049 was gained from JHAH on February 26th, 2015 (Appendix B). The second approval is the international approval, which is required for university's ethical standards as well as the United States federal regulations.

Although I did not have direct access to participant information, it's important to review any ethical concerns in the original data collection process. Attendance at the SAWP clinics were entirely voluntary, there are no incentives or requirements for employees to attend. Although the HRE's was collected on the initial visit, this is not mandated and wellness services could be accessed regardless. On the HRE, employees are asked for consent to include their information in the program database. The consent statement reads as follow:

> **Consent statement**: I also consent to have my data applied in the latest research that investigates the health and well- being of the Saudi Aramco workforce as explained by the wellcare team

One potential ethical concern is that the study is conducted within my work environment. I am also a member of the wellcare team and am involved with the HRE and clinic procedure. Beyond distributing the HRE, I was not involved with collecting the data or entering it in the database. Also, with the random sampling process, the wellcare teams did not know which employee could be included in the study.

Summary

In this study, I explored the incidence of five major health behavioral risks; obesity, physical inactivity, tobacco use, sedentary occupation, and poor nutrition, and review their relationships, if any, with workplace productivity. Productivity was measured using the SPS. The SPS is regarded as a reliable and valid measure of workplace productivity (Koopman, et al, 2002). SPS data was available from existing employee HRE's. The HRE data was collected through the SAWPs employee screening clinics and available for analysis. The availability of this existing data enabled an ex-post facto study design. A quantitative, ex-post facto approach using multiple regression techniques was used to determine the relationship between health and workplace productivity. These data provides a benchmark for further health and productivity research in the Middle East, and provides the basis for developing a business case for improving health promotion programs in this region of the world.

In Chapter 4, I present the basic data demographics, statistical analysis, and includes results in tables and graphs. I also include a discussion of the findings about my five research questions.

Chapter 4: Results

Introduction

The purpose of the quantitative, ex-post facto study was to examine baseline health and productivity data and determine the relationship between lifestyle risk and productivity in Saudi Arabia. Based on a review of the literature, it appears this research is the first of its kind in the Middle East.

In Chapter 4, I begin by detailing the data collection methods, sampling strategy, and access to data. I provide a detailed and in-depth analysis of the data gathered from over 10,000 wellness program participants. These employees provided health risk information as they enrolled in the program. The wellness team continuously collected health risk and workplace productivity measures, and these data were a rich information source. I sampled a full year of data that allowed me to generate 400 datasets.

Descriptive statistics from this sample are presented including frequencies for the categorical variables. Calculations included Pearson R statistics to determine if there was a significant correlation between the five independent variables and the dependent variable. From these statistics, I ascertained the nature and significance of the relationship between physical activity, tobacco use, BMI, sedentary occupation, nutrition, and workplace productivity. Each research question had a parallel null hypothesis. The statistical analysis allowed me to either reject or fail to reject the null hypotheses. The final element of the analysis is multiple regressions. The regression equations allowed me to predict workplace productivity from the five independent variables.

Data Collection

Data were collected from a secondary source from the last year of the SAWP participants. As detailed in Chapter 3, Saudi Aramco had an employee wellness program that was available to all its employees. JHAH administered the SAWP. As a part of the initial contact, employees were asked to complete a HRE. The HRE contains questions about basic demographics, medical history, and lifestyle behaviors. The wellness professionals in the clinics collected the HREs and consolidate them in a central database. The program administrator is responsible for maintaining the database and ensuring its security. In this study, I used secondary source data, which were retrieved from the Saudi Aramco database.

As per JHAH guidelines, I required both institutions' ethics approval and IRB approval. Once these were received, I requested 1 full year of data to control for any seasonal lifestyle behavior. The data I received ranged from September 1, 2014 – August 31, 2015 and contained 4689 complete sets.

From this study population, a stratified random sample of 400 was selected. The sample size was determined using Raosoft and (Krejecie & Morgan, 1970) reference tables. Based on five independent variables, the tables suggested that researchers use a sample size of 382. The suggested value (382) was rounded this up to 400, to account for any missing data. To stratify the sample, I split the database into male and females. I then used random number tables to select 348 males and 52 females as determined in my stratification plan. The wellness team collected the data as per the IRB approval and JHAH ethical board standards.

The data I received consisted of the coded variables and included basic demographics, devoid of all unique identifiers. Table 7 summarized the independent and dependent variables, including their highest and lowest values.

Table 7

Variable Summary

	Type	**Low**		**High**	
Stanford Presenteeism Scale	Scale	6		30	
		No risk		Risk	
Physical Activity	Nominal	0		1	
Nutrition	Nominal	0		1	
Tobacco	Nominal	0		1	
Sedentary Occupation	Nominal	0		1	
BMI	Ordinal	BMI < 18.5 0	BMI 18.5-24.9 1	BMI 25-29.9 2	BMI 30 + 3

Stanford Presenteeism Scale

The HRE recorded employee SPS scores, and these were included as the dependent variable. The SPS is designed to measure employees' perceptions of their ability to work while handling a physical and/or psychological problem (McClain, 2013). The SPS-6 is a self-reported scale, comprised of six questions, measured on a 5-item Likert scale. An example of the question was "Because of my (health problem)" the stresses of my job were much harder to handle."

The SPS allows generation of a total by adding the scores of the six items, ranging from 6-30. The highest SPS score is 30, and researchers consider this peak performance (Koopman et al., 2002).

Physical Activity

Physical activity was an independent variable. The HRE included a question on physical activity, specifically if they performed 30 minutes of moderate-intensity physical activity 3 days per week. This question was based on the minimum physical activity standards (American Heart Association, 2014; UDSA, 2015). Employees who reported meeting the physical activity guidelines were considered to have no risk associated with that variable. Those employees who did not perform 30 minutes of moderate-intensity physical activity 3 days per week were assigned a risk score associated with physical inactivity. Upon receiving the data, the sample was recoded to those who exercise = 0, and those who do not exercise = 1.

Tobacco Use

Smoking or tobacco use was an independent variable. Employees were asked if they currently smoke, including cigarettes, chewing tobacco, shisha, and/or hookah. If the employee responded yes to currently using tobacco products, then they had a risk score associated with their tobacco use. If the employee answered no to the tobacco use question, they were asked if they had quit within the last 6 months. If they answered yes, they still had a risk score associated with tobacco use. Upon receiving the data, the sample was recoded to no tobacco use = 0, tobacco use = 1.

Body Mass Index

The wellness program reported the BMI in four categories: underweight, normal weight, overweight, and obese. The categories were coded 0, 1, 2, and 3, as indicated in Table 8.

Table 8

Body Mass Index Categories and SPSS coding

BMI	**Weight Status**	**SPSS coding**
Below 18.5	Underweight	0
18.5 – 24.9	Normal Weight	1
25.0 – 29.9	Overweight	2
30.0 and above	Obese	3

Sedentary Occupation

The wellness program reported sedentary occupation as any waking activity with an energy expenditure ≤ 1.5 METs and in a sitting or reclined posture (Sedentary Behavior Research Network, 2012). A MET is a Metabolic Equivalent of Task (MET) is considered a standard energy expenditure measure (Vashist, 2015). The International Physical Activity Questionnaire (IPQA) was modified to address the occupational component of sitting, and its effect on presenteeism. The question was "Do you spend greater than 6 hours per day sitting at work?" The answer was dichotomous (yes or no), and the data were coded nonsedentary = 0 and sedentary = 1.

Nutrition

The wellness program team measured nutrition status through self-reported compliance with the USDA MyPlate guidelines (USDA, 2014). The wellness program HRE asked employees if they consumed 50% or more fruits and vegetable 80% of the time. The answer was dichotomous (yes or no), and the data were coded yes = 0, no = 1.

Descriptive Statistics

In this section, I discuss the individual respondent's profile. The HRE was used to collect information on gender, nationality, age, and work location. Within the sample, 87% of the respondents were male and 13% female. Because I chose stratified random sampling, an 87/13 split was expected. This sampling method was appropriate as the Saudi Aramco workforce consisted of 87% males and 13% females. Stratified random sampling is preferred over simple random sampling as it improves the sample precision and guard against an unrepresentative sample (Lund Research Ltd, 2013).

The study involved many different nationalities: 68.3% were Saudi Arabs followed by 14.3% Asians. The highest number of respondents belonged to age group 30 and under. As for location, most respondents were from Dhahran, the company's headquarters in Saudi. Respondents' descriptive data are summarized and presented in Table 9.

Table 9

Descriptive Data for Respondents

	Frequency	Percent
Gender		
Male	348	87.0
Female	52	13.0
Nationality		
Saudi Arabia	273	68.3
Other Arab	9	2.3
Asian	57	14.3
European/North America	53	13.3
Others	8	2.0
Age		
30 and under	138	34.5
31-40	114	28.5
41-50	97	24.3
51-60	48	12.0
Above 60	3	.8
Location		
Dhahran	233	58.3
Ras Tanura	14	3.5
ABQ	50	12.5
UDH	4	1.0
Other	99	24.8

Correlational and Statistical Analysis

As mentioned in Chapter 3, there were five research questions within the statistical analysis. These questions stemmed from the core purpose of this study, to explore the relationship between health risks and workplace productivity. In the literature review in Chapter 2, physical inactivity, tobacco use, increasing BMI, sedentary occupation, and poor nutrition were highlighted as precursors to chronic health conditions (WEF, 2013). Beyond this direct relationship, organizations have also found that chronic health conditions have a negative influence on workplace productivity (Holden et al., 2011). These findings led to an interest in the precursors to chronic health conditions – lifestyle health risks and their relationship, if any, to workplace productivity (Burton, Chen, Conti, Schultz, & Edington, 2006).

The analysis was divided into two distinct parts: correlational and regression analyses. For the correlational analysis, I selected a classic bivariate correlation, the Pearson *R* test. The Pearson correlation was appropriate, as four of the independent variables were dichotomous *x* (yes/no) with one continuous measured variable *y*. This test statistic was selected because the *R*-value provides the strength and direction of any relationship. The value can range from 1.0 to -1.0, with 0 indicating no relationship between the variables and 1.0 indicating perfect correlation (Lund Research Ltd, 2013).

In addition to Pearson correlations, one of the independent variables, BMI, was an ordinal variable with four categories. For this variable, I used a one-way analysis of variance (ANOVA) to determine if there was a difference between the groups. As there was a significant difference between the groups, I also included Fishers Least Square Difference (LSD). The LSD helps to differentiate the difference between the group means as opposed to the all the groups together (Hayter, 1986). This statistic allowed for direct mean comparison between two BMI groups.

Research Question 1

RQ1: To what extent does physical inactivity relate to productivity in Saudi Arabia?

H_o1: There is no relationship between level of physical activity and workplace productivity.

$H_1$1: Higher levels of physical activity are related to greater workplace productivity

For *H*1, I evaluated if there was a significant relationship between physical activity and productivity in Saudi Arabia. Physical activity is considered one of the substantial lifestyle risk factors in the development of chronic health conditions (Bull & Dvorak, 2013). A Pearson *R* test was used to determine if physical activity had a significant influence on workplace productivity (SPS). Table 10 contains a summary of the correlation analysis for physical activity and workplace productivity.

Table 10

Summary Correlation Analysis between Physical Activity and Workplace Productivity

Model	*R*	R Square	*F*	t	Sig	Null
Exercise -> SPS	.30	.09	39.80	6.31	.00	Reject

Note: Exercise = Physical Activity, SPS = Workplace Productivity.

Table 10 contains the summarized correlation analysis results. The analysis revealed a significant correlation ($r = .30$, $p < .001$) between exercise and workplace productivity. As per Cohen (1988), a Pearson correlation coefficient of >.30 suggests a moderate strength correlation. There was a statistically significant relationship between exercise and workplace productivity. The null hypothesis of no relationship between the level of physical activity and workplace productivity (SPS) was rejected.

The correlation analysis revealed that the influence of exercise on productivity was found to be significant, $f(1, 398) = 39.80$, $p < .001$. The results revealed that a 9.1% change in the workplace productivity is attributed to exercise. The positive *R*-value reveals that those employees who exercise at the minimum 30 minutes, three days per week, had significantly higher productivity level in comparison to those who do not exercise. Therefore, workplace productivity was higher for physically active employees.

Research Question 2

RQ 2: To what extent does smoking relate to productivity in Saudi Arabia?

H_o2: There is no relationship between tobacco use and workplace productivity.

$H_1$2: Low levels of tobacco use are related to greater workplace productivity.

For *H*2 I evaluated if there was a significant relationship between tobacco use and productivity in Saudi Arabia. Tobacco use is considered one of the major lifestyle risk factors in the development of chronic health conditions. A Pearson *R* test was used to determine if tobacco use had a significant influence on workplace productivity (SPS). Table 11 contains a summary of the correlation analysis for tobacco use and workplace productivity.

Table 11

Summary Correlation Analysis between Tobacco Use and Workplace Productivity

Model	*R*	R Square	F	t	Sig	Null
Tobacco -> SPS	-.20	.04	15.94	-3.99	.00	Reject

Note: Tobacco = Smoking, SPS = Workplace Productivity.

The analysis revealed a significant correlation ($r = -.20$, $p < .001$) between tobacco use and workplace productivity. As per Cohen (1988), a Pearson correlation coefficient of 0.1 – 0.3 suggests a small strength correlation. There was a statistically significant relationship between tobacco use and workplace productivity. The null hypothesis of no relationship between tobacco use and workplace productivity (SPS) was rejected. Workplace productivity was higher for nonsmoking employees.

The correlation analysis also revealed that the influence of tobacco on productivity was found to be significant, $f(1, 40) = 15.94$, $p < .001$. The results reveal that 3.9% change in the workplace productivity was attributed to tobacco use. The negative *R*-value reveals that those employees who use tobacco products had a significantly lower productivity level in comparison to those who do not use tobacco products.

Research Question 3

RQ 3: To what extent does a BMI over 25 and 30 relate to productivity in Saudi Arabia?

H_o3: There is no relationship between BMI and workplace productivity.

H_13: Lower BMI measures relate to greater workplace productivity.

For *H*3 I evaluated if there was a significant relationship between BMI and workplace productivity. Being overweight is considered one of the important lifestyle risk factors in the development of chronic health conditions. A Pearson *R* test was used to determine if higher BMI levels had a significant influence on workplace productivity (SPS). Table 13 contains a summary of the correlation analysis for BMI and workplace productivity.

Table 12

Summary Correlation Analysis between BMI and Workplace Productivity

Model	*R*	R Square	F	t	Sig	Null
BMI -> SPS	-.14	.02	7.96	-2.82	.005	Yes

Note: BMI = Body Mass Index, SPS = Workplace Productivity.

The correlation analysis revealed a significant negative correlation ($r = -.14$, $p < .01$) between BMI and workplace productivity. As per Cohen (1988), a Pearson correlation coefficient of 0.1 – 0.3 suggest a small correlation. The negative R-value shows that with increased BMI, there was a decrease in workplace productivity. The null hypothesis of no relationship between the level of BMI and workplace productivity (SPS) was rejected. Therefore, workplace productivity was higher for employees with lower BMI.

To supplement the correlation analysis, a One-Way ANOVA was conducted to determine whether there was a significant difference in workplace productivity across the four BMI levels. The four levels are: underweight, normal weight, overweight, and obese.

Table 13

Descriptive Statistics BMI

Weight Categories	N	Mean	Std. Deviation	Minimum	Maximum
Underweight	9	24.22	6.18	13	30
Normal Weight	120	21.32	5.44	6	30
Overweight	178	21.33	5.00	9	30
Obese	93	19.56	5.30	9	30

From the descriptives presented in Table 13, workplace productivity (SPS) decreased from underweight (*n* = 9, M = 24.22, SD = 6.18), to overweight (*n* = 178, M = 21.33, SD = 5), to normal weight (*n* = 120, M = 21.32, SD = 5.44), to obese (*n* = 93, M = 19.56, SD = 5.29) BMI groups, in that order.

These descriptive statistics further reveal that productivity was highest for employees who were underweight, while normal weight and overweight employees had similar workplace productivity (21.32 vs. 21.33). Also, it is important to note that obese participants had the lowest level of workplace productivity (in comparison to the underweight, normal and overweight people). This trend is visually depicted in Figure 21, a box plot of productivity over BMI ranges.

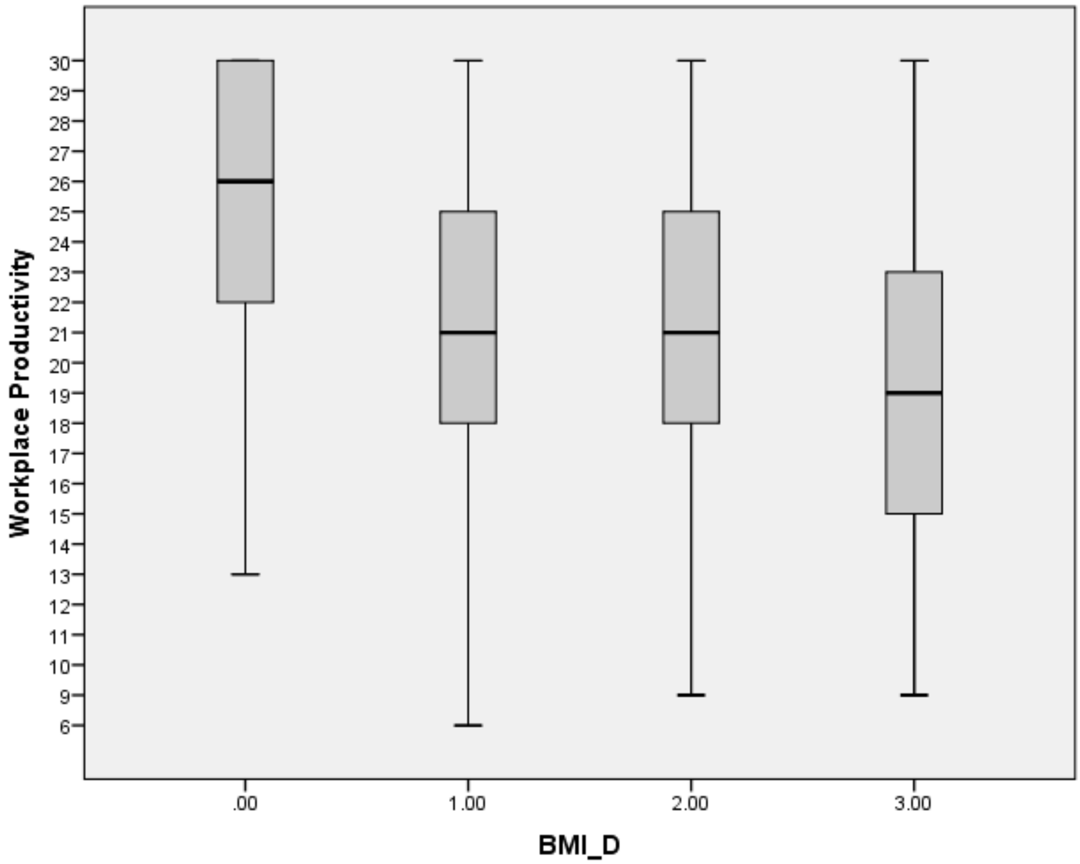

Figure 21: Boxplot of workplace productivity vs. the four BMI ranges

Figure 21 is a boxplot of BMI levels against workplace productivity. The figure reveals a trend of decreasing productivity with increasing BMI. Participants who were normal weight (1) or overweight (2) appear to have similar productivity levels. There also seems to be a significant difference between underweight (0) and obese (3), with those who are underweight having higher workplace productivity. Although there appeared to be a trend in decreasing productivity with higher BMI, the significance of these differences was not known. The following set of tables present the results of comparative analysis between different weight categories.

Table 14

Levene Statistics and ANOVA Results

Levene Statistic	Sig.	F	Sig (2 Tailed)
.32	.81	3.88	.009

An ANOVA was selected to understand the significance of any differences between the BMI levels. The first step in the ANOVA was to test the assumption of homogeneity of variance. I chose to use Levene's test of equality of variances to determine if the variances between the groups for productivity were equal (Field, 2013). As the Levene Statistic was not significant, the assumption of homogeneity of variances maintained (p = .81). As this assumption was maintained, I was able to use standard ANOVA analysis.

Table 14 also contains the results of the one-way ANOVA. The results revealed a significant difference in workplace productivity across the four different levels of BMI (f = 3.88, p < .01). Post hoc analysis is required to determine any significant differences that may exist between the BMI levels.

Table 15

Multiple Comparisons

(I) BMI	(J) BMI	Mean Difference (I-J)	Sig.
Underweight	Normal weight	2.90	.11
	Overweight	2.89	.11
	Obese	4.66*	.01
Normal Weight	Underweight	-2.91	.11
	Overweight	-.02	.98
	Obese	1.76*	.02
Overweight	Underweight	-2.89	.11
	Normal Weight	.015	.98
	Obese	1.77*	.01

Note. *. The mean difference between BMI levels is significant at the 0.05 level

As part of the assessment, Fisher LSD post hoc analysis was included for multiple comparisons between each BMI levels and productivity (Hayter, 1986). Fisher's LSD post hoc analysis revealed a significant difference in workplace productivity between underweight and obese (24.22 ± 6.18 vs. 19.56 ± 5.30), normal and obese (21.32 ± 5.44 vs. 19.56 ± 5.30), and overweight and obese (21.33 ± 5.00 vs. 19.56 ± 5.30).

In summary, the one-way ANOVA was conducted to determine workplace productivity (SPS) was different for groups with different BMI levels (Table 14).

Participants were classified into four groups: underweight (*n* = 9), normal (*n* = 120), overweight (*n* = 178), and overweight (*n* = 93). There were no outliers, as assessed by boxplot; there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ($p = .81$). Workplace productivity scores (SPS) decreased from underweight (1) (*n* = 9, 24.44 ± 6.18), to overweight (3) (*n* = 178, 21.33 ± 5.00), to normal (2) (*n* = 120, 21.32 ± 5.44), to obese (4) (*n* = 93, 19.56 ± 5.30) BMI, in that order.

Workplace productivity was statistically significantly different for different levels of BMI groups $F=3.88$ $p < .001$. LSD post hoc analysis revealed that the mean decrease in productivity between underweight and obese BMI (24.22 ± 6.18 vs. 19.56 ± 5.30), normal and obese (21.32 ± 5.44 vs. 19.56 ± 5.30), and overweight and obese (21.33 ± 5.00 vs. 19.56 ± 5.30), but no other group differences were statistically significant. With the addition of the ANOVA results, with post hoc analysis, I accepted the alternative hypothesis that lower BMI measures relate to greater workplace productivity.

Research Question 4

RQ 4: To what extent does a sedentary occupation relate to productivity in Saudi Arabia?

H_o4: There is no relationship between a sedentary occupation and workplace productivity.

H_14: Low levels of sitting a work relate to greater workplace productivity.

For *H*4 I evaluated if there was significant relationship between sedentary occupation (sitting greater than 6 hours at work) and workplace productivity. Sedentary occupation was included in the analysis as it was considered one of the lifestyle risk factors in the development of chronic health conditions. A Pearson *R* test was used to determine if a sedentary occupation had a significant influence on workplace productivity (SPS).

Correlation analysis revealed an insignificant correlation ($r = .08$, $p > .05$) between sitting at work and workplace productivity. As per Cohen (1988), a Pearson correlation coefficient of < 0.1 is not significant. These results suggest that sitting at work was not associated with a change in workplace productivity. The null hypothesis of no relationship between sedentary occupation and workplace productivity (SPS) was accepted.

Research Question 5

RQ 5: To what extent does poor nutrition (my plate guidelines) relate to productivity in Saudi Arabia?

H_o5: There is no relationship between consuming a healthy and workplace productivity.

H_15: Consuming a healthy diet is related to greater workplace productivity.

For *H*5 I evaluated if consumption of healthy diet influenced workplace productivity. A poor diet is considered one of the important lifestyle risk factors in the development of chronic health conditions. A Pearson *R* test was used to determine if nutrition had a significant influence on workplace productivity (SPS). Table 16 contains a summary of the correlation analysis for diet and workplace productivity.

Table 16

Summary Correlation Analysis Between Nutrition and Workplace Productivity

Model	R	R Square	F	t	Sig	Null
Nutrition -> SPS	.32	.10	45.54	6.75	.00	Reject

Note: Nutrition = Healthy Diet, SPS = Workplace Productivity.

The first analysis revealed a significant correlation ($R = .32$, $p < .001$) between nutrition and workplace productivity. As per Cohen (1988), a Pearson correlation coefficient of > 0.3 suggests a moderate strength correlation. Therefore, the null hypothesis of no relationship between healthy nutrition and workplace productivity (SPS) was rejected.

Further correlation analysis revealed that the influence of a healthy diet had on productivity was found to be positively significant, $f(1, 39) = 45.54$, $p < .001$. The results reveal that 10.3% change in the workplace productivity can be attributed to nutrition. The positive *R*-value reveals that those employees who are conscious of their diet had a significantly higher productivity level in comparison to those who did not meet the MyPlate guidelines.

Hypothesis Results Summary

Hypotheses tests were performed to ascertain the nature and significance of the relationship between physical activity, smoking, BMI, sedentary occupation, nutrition and workplace productivity.

The results of the correlation analysis revealed that exercise, tobacco use, BMI, and nutrition significantly influenced workplace productivity. Exercise and nutrition had a significantly positive influence on workplace productivity while tobacco use and increasing BMI had a negative influence on workplace productivity. The influence of sedentary occupation on productivity was found to be insignificant. The results of hypotheses testing are summarized in Table 17.

Table 17

Summaries of Hypotheses Testing

Model	R	R Square	F	t	Sig	Null
Exercise -> SPS	.30	.09	39.80	6.31	.00	Reject
Tobacco -> SPS	-.20	.04	15.94	-3.99	.00	Reject
BMI -> SPS	-.14	.02	7.96	-2.82	.01	Reject
Sedentary-> SPS	.08	-	-	-	.13	Fail to reject
Nutrition -> SPS	.32	.10	45.54	6.75	.00	Reject

Multiple Regression Analysis

Under each research question, I examined the influence of each independent variable on the dependent (productivity). Multiple regression analysis provides an additional layer of investigation, examining the relationship between these variables and productivity (Cohen, Cohen, West, & Aiken, 2013). The role of the multiple regressions was for practical prediction, where I attempted to forecast an outcome based on collected data. In this study, I evaluated the collective influence of each of the independent variables, nutrition, BMI, sedentary occupation, tobacco use and exercise on workplace productivity. The regression model was also used to determine how much of the variation in productivity was explained by each of the five independent variables.

Table 18

Model Summary

R	R Square	f	Sig
.47[a]	.22	21.79	.000

Table 18 displays the model summary analysis that shows that exercise, BMI, tobacco use, sedentary occupation and nutrition statistically significantly predict workplace productivity $F = 21.79$, $p < .001$.The regression analysis results reveal that 21.7% change in the workplace productivity can be accounted to the five independent variables. These results should be viewed with caution until I test the underlying assumptions for a multiple regression. In the next section I explored two assumptions; multicollinearity and homoscedasticity.

Assumption Testing

The first assumption I reviewed was multicollinearity, the assumption that the independent variables are not highly correlated (Cohen et al., 2013). Table 19 displays the VIF measures, which were used to test for multicollinearity. The VIF values are all between the acceptable range of 1 to 10. Therefore, these results reveal that there are no multicollinearity symptoms. By further analyzing the coefficients, the results revealed that apart from sedentary occupation ($p > .05$) all other variables namely exercise, BMI, tobacco use, and nutrition all had a significant influence on workplace productivity.

Table 19

Multiple Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
(Constant)	21.09	1.06		19.90	.00	
Exercise	2.62	.48	.247	5.46	.00	1.01
BMI	-1.07	.30	-.158	-3.53	.00	1.03
Smoke	-1.81	.54	-.152	-3.36	.00	1.03
Sit	.67	.58	.052	1.15	.25	1.02
Nutrition	2.85	.48	.270	5.95	.00	1.04

An additional underlying assumption in a multiple regression is homoscedasticity (Cohen et al., 2013). Having homoscedasticity within the sample suggest that the variance of each sample distribution is equal. Homoscedasticity can be measured using a number of methods. I chose the Breusch-Pagan-Godfrey test for Heteroscedasticity as the first assumption (multicollinearity) held (Osborne & Waters, 2002).

Table 20

Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.93	Prob. F(5,394)	0.46
Obs*R-squared	4.66	Prob. Chi-Square(5)	0.46
Scaled explained SS	3.50	Prob. Chi-Square(5)	0.62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.55	6.13	2.21	0.03
BMI	2.027	1.75	1.16	0.25
Tobacco Use	2.80	3.12	0.90	0.37
Exercise	-2.09	2.78	-0.75	0.45
Sedentary Occupation	4.32	3.36	1.29	0.20
Nutrition	-1.06	2.77	-0.38	0.70

Table 20 displays the Breusch Pagan Godfrey. In this statistic, the null hypothesis was that there is homoscedasticity within the sample (alternate hypothesis - heteroscedasticity). As the Breusch Pagan Godfrey test revealed an insignificant Obs*R-Squared value of 4.66, this indicates the null hypothesis was accepted and no heteroscedasticity is present. As both multicollinearity and homoscedasticity were present in the sample, I can interpret the multiple regression results in their current form with confidence.

Table 21

Summary of Multiple Regression Analysis

Variable	***B***	**SE*B***	**β**
Intercept	21.09	1.06	
Exercise	2.62	.48	.25*
BMI	-1.07	.30	-.16*
Tobacco Use	-1.81	.54	-.15*
Nutrition	2.85	.48	.27*

Note. * p < .05; *B* = unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient

Regression coefficients and standard errors can be found in Table 21. The multiple regression was run to predict workplace productivity from exercise, BMI, tobacco use, and nutrition. These four variables statistically significantly predicted workplace productivity, $F = 21.80$, $p < .0005$, adj. $R^2 = .21$. All variables, except sedentary occupation, added statistically significantly to the prediction, $p < .05$.

Multiple Regression Equation

The regression analysis can be expressed in regression equation as follows. It can help predict the value of workplace productivity based on the presence or absence of the significant lifestyle risk factors.

$$\mathbf{SPS = \beta_0 + \beta_1 (Exercise) + \beta_2 (Smoking) + \beta_3 (BMI) + \beta_5 (Nutrition) + e_i}$$

SPS = Workplace Productivity (Outcome Variable)

β_0 = Coefficient for the Intercept

β_1 = Coefficient for the Slope

Exercise = 1 if Employees take up exercise

0 if Employees do not take up exercise

Smoking = 1 if Employees Smoke

0 if Employees do not Smoke

BMI = 1 (underweight), 2 (normal weight), 3 (overweight), 4 (obese).

Nutrition = 1 if Employees have healthy diet

0 if Employees do not have healthy diet

e_i = Residual

Summary

In Chapter 4, I conducted an analysis of 400 datasets of SAWP attendees. These data was collected as part of the companies wellness program and was received as secondary source from the programs administrator. The chapter also included an outline of the sample demographics, the data collection and data analysis methods, and the results. The analysis included correlations between the five independent variables and workplace productivity. Of the five research questions, I rejected the null hypothesis of no difference for four of the predictor variables. In addition to the correlational analyses, I also conducted a multiple regression analyses to determine the collective influence of these variables as a whole on workplace productivity. Tables 15 and 18 summarize the results and indicate that overall, four of the five-predictor variables investigated in the regression model explained 21% of the variance in the dependent variable

In Chapter 5, I summarize the research problem, literature review, methodology, and results. I also discuss the social implications of this research and opportunities for ongoing research.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

Worldwide, the rates of NCDs continue to rise at alarming rates. In an attempt to curb this trend, the WHO (2014) recommended a settings approach to health promotion. These settings can include schools, prisons, and workplaces. Recently, various organizations have begun to implement this settings approach in the form of workplace wellness programs. The programs have formed with a focus on targeting lifestyles, specifically NCD precursors. However, the Middle East, including Saudi Arabia, has been slow to adopt comprehensive workplace programs, with only a handful of organizations with formal plans. As these programs have evolved, so have establishments come to recognize that the impact of these diseases extend beyond direct medical costs and can have an impact on workplace productivity

Saudi Aramco is a large oil company with its company headquarters in Dhahran, Saudi Arabia. The company offers a formal wellness program targeting lifestyle health risks, including physical activity, tobacco use, nutrition, and weight management. The wellness program administrator collects data on NCDs, lifestyle choices, and workplace productivity. The availability of these data, combined with the absence of culturally relevant literature on wellness, led to the research problem: What is the relationship between lifestyle and productivity?

In Chapter 5, I include a discussion of the results of the study within the context of the purpose, problem, and available literature. I also include a discussion of the findings for each research questions, recommendations, limitations, and suggestions for future studies. The intent of Chapter 5 is to compare and critically evaluate the findings against the existing literature and identify potential implications.

Purpose of the Study

The purpose of this quantitative, ex-post facto study was to examine baseline health and productivity data and determine the relationship between lifestyle risk and productivity in Saudi Arabia. The results of this study may allow other researchers to determine which health variables relate to workplace productivity, regarding both absenteeism and presenteeism. The results may also point researchers towards areas for future research. Finally, this study contributed to the limited body of literature on workplace health and productivity in the Middle East, a region of the world that has rarely been investigated for occupational health.

Interpretation of the Findings

The research problem has been studied using five key research questions, each with a directional hypothesis. Defining the hypotheses helped to determine whether or not there was a relationship between lifestyle health risks (the independent variables) and productivity (the dependent variable).

Demographic Characteristics of the Sample

This section contains a review and discussion of the basic demographics collected alongside the primary variables. The study included information on gender, nationality, age, and location.

Gender. The majority of the wellness program participants were male; females only comprised of 13% of the total sample. The stratified random sampling procedure determined the sample size: 348 males and 52 females. Saudi Aramco's workforce was skewed towards males in the workplace, as were most Saudi Arabian companies.

Nationality. As mentioned in Table 9, most participants were Saudi Arabs (68.3 %). Given that the company was located in Saudi Arabia, this percentage was expected. As mentioned in Chapter 2, the employee population was comprised of 83% Saudi Arabs and 17% expatriates. The "other" nationalities (Other Arab, Asian, European, and others) combined were 31.3%, which is almost twice the employee population. The higher expatriate percentage may suggest that the Saudi Arabs do not access the program as frequently.

Age. Table 9 also contained information on the respondents' age. The majority of participants were 30 and under (34.5%), followed by 31-40 (28.5%). As expected, only three of the 400 employees were over 60 (0.8%), as Saudi Aramco's retirement age is 60 years. The need for their skills likely meant those three employees were likely extended.

Location. Most employees in the sample were working in Dhahran (58.3%). Dhahran is the companies' headquarters and the home of the majority of nonoperations employees.

The Research Questions

As introduced in Chapter 2, the reasons behind an individual's health behavior can be complex. The socioecological health model presents five key health influences: individual, interpersonal, institutional, community, and social. The decision to engage in healthy lifestyle choices can be affected at each level of the socioecological health model.

These levels can be evident in Saudi Arabia, with cultural barriers restricted women's access to exercise facilities.

The socioecological health model includes both the internal and external factors that influence health decisions. These decisions become important when considering that up to 80% of the health conditions present today are noncommunicable (WEF, 2013). Most organizations adopt a simplistic model that educating employees on the effects of lifestyle risks avoids health costs (Riedel, Lynch, Baase, Hymel, & Peterson, 2001). These lifestyle choices include exercise, healthy food choices, avoiding tobacco products, and maintaining a healthy body weight. Maintaining these healthy choices have been shown to reduce the risk for some NCDs (Edington, Pitts, & Schultz, 2014; Leutzinger et al., 2000). The absence or reduction of these NCDs within a workplace can reduce direct medical costs and those costs associated with absenteeism. Therefore, healthy employees have fewer NCDs and health-related expenses.

In addition to the socioecological health model, in Chapter 2 I introduced the human capital model (Berger, Howell, Nicholson, & Sharda, 2003). This model was used to describe the relationship between employee capital and company performance. According to the model, the author proposed prosperity, health, well-being, and skills boost employee productivity. The focus of this study was on the health component of the human capital model. Scholars have examined the most costly (direct and indirect) health conditions that organizations face (Dollard & Neser, 2013).

The two most comprehensive HRA databases, the HERO/StayWell and the University of Michigan HRA listed these variables (Anderson et al., 2000; Edington, 2001):

- Physical activity
- BMI
- Alcohol consumption
- Nutrition
- Stress
- Tobacco use

When integrating these risk factors into the human capital model, from a health standpoint, a picture start to form of what it looks like to be healthy within the workplace. Inherent within the human capital model is the argument that organizations have a part to play in influencing employee health (Robertson, Leach, Doerner, & Smeed, 2012). Integrating these relationships with those in the socioecological health model starts to frame the importance of employee health behaviors.

Research Question 1

To what extent does physical inactivity relate to productivity in Saudi Arabia?

In Research Question 1, I aimed to determine if the physical activity had any influence on productivity in Saudi Arabia. The correlational analysis indicated a significant difference in presenteeism between those who engaged in 30 minutes of physical activity 3 days per week, vs. those who did not ($r = .30$, $p < .001$)

Employees who were physically active had reduced presenteeism. There are a few possible explanations for these results. (Pronk et al., 2004) studied work performance and physical activity levels and found that employees who are physically active had improved on the job performance. Pronk et al. attributed this to improved muscular strength, endurance, and aerobic capacity. Riedel, Lynch, Baase, Hymel, and Peterson (2001) proposed that reduction in other NCDs and back pain could be associated with increased physical activity and flow onto productivity. Riedel et al. found that physical activity reduced the incidence of back pain, a major influence on workplace presenteeism.

In the current study, 55.5% of employees reported they were physically inactive. Fifty-five percent of the study population could represent 33,000 Saudi Aramco employees who are physically inactive and may have reduced productivity. The findings from both the HERO/StayWell and the University of Michigan HRAs were consistent with the results in the present (Saudi Aramco) study. Physical activity is not only a risk factor for chronic health conditions, it has an influence on workplace productivity. From these findings, managers in Saudi Aramco should recognize that there was a productivity difference between physically active employees. Saudi Aramco employees who meet the minimum physical activity standards are more productive than those who do not.

Comparing related literature, Williden, Schofield, and Duncan (2012) found that New Zealand employees who were physically inactive also had lower rates of workplace productivity (3.5%). Serxner, Gold, and Bultman (2001) supported these findings by examining absenteeism and presenteeism rates with lifestyle factors and found a negative correlation between physical inactivity and presenteeism. However, Callen, Lindley, and

Niederhauser (2013) also reviewed multiple lifestyle risk factors, including exercise, and their impact on productivity and found that physical activity was not significantly different, and only stress was correlated to productivity. Although, in Callen et al.'s (2013) study, the insignificant finding could be contributed to the lower threshold for inactivity.

When reviewing the literature, consideration should be given to the methodology used to measure physical activity when evaluating work performance. In this study, moderate intensity physical activity 30 minutes, three times per week was defined as physically active. Compared to other studies, physical activity guidelines can range from 20 minutes per week to 30 minutes daily (Callen et al., 2013; Tsai, Wendt, Ahmed, Donnelly, & Strawmyer, 2005; Williden et al., 2012).

Beyond the day-to-day productivity improvements, existing literature also indicates the long-term impact of physical activity on health. The combination of both short-term productivity gains and long-term health benefits, support the notion that physically active employees are healthy human capital. The decision to reject the null hypothesis that there is no difference between productivity levels in physical active employees appears to have the international literature's support.

Research Question 2

To what extent, if any, does tobacco use relate to productivity among employees in Saudi Aramco?

In research question 2, I aimed at determining if tobacco use had any influence on productivity in Saudi Arabia. The correlation analysis showed a significant difference in presenteeism between those who used tobacco than those who did not. ($r = -.196$, $p < .001$).

These results indicated that employees who did not use tobacco products had reduced workplace presenteeism. In the literature review I identified some proposed reasons. The first, and most common, was that smokers take more breaks than their non-smoking colleagues (Burton et al., 2005). Other studies offer the physical health sequelae as the reason behind increased presenteeism (Bunn III, Stave, Downs, Alvir, & Dirani, 2006). The physical health sequelae include effects such as irritability, decreased cognitive function, cardiorespiratory irritation, and reduced aerobic capacity. Williden, Schofield, and Duncan (2012) suggested that musculoskeletal pain, poor physical function, lower vitality, and a general perception of poor health may be behind reduced presenteeism.

The finding that tobacco use had an influence on workplace productivity, is a first for Saudi Arabia. Although a first for this country, some international studies found that tobacco-influenced presenteeism. (Stewart, Ricci, Chee, & Morganstein, 2003) surveyed a random sample of 28,902 United States workers to determine the influence of health conditions on work performance. They found that employees who consumed a pack a day had twice the presenteeism rates of non-smokers. Another large organization used the WLQ to review 28,375 employees (Burton et al., 2005). The authors found a 2.8% reduction in workplace productivity in tobacco users. In another United States study, the authors found similar productivity reductions in a regional airline (Halpern, Shikiar, Rentz, & Khan, 2001). The authors studied 300 airline workers and found a 4.5% productivity loss in those who used tobacco.

Kowlessar, Goetzel, Carls, Tabrizi, and Guindon (2011) reviewed 11 health risks and their influence on productivity. They found that tobacco use had a significant influence on presenteeism, and attributed to a cost of $1,628 annually per employee who smoked. A smaller scale study in New Zealand also supported these results. The authors investigated 747 adults to review health risk and productivity (Williden et al., 2012). They found that tobacco use had a significant impact on productivity, accounting for 16.8 additional hours over the previous 4 weeks.

The relationship between tobacco use and productivity is of particular importance considering the high rates of use (22%) in the Middle East (WHO, 2014). In this study, 26.5% Saudi Aramco's employees were using tobacco. If these rates held for the entire organization, reduced productivity associated with tobacco use could be a significant problem. Saudi Aramco has approximately 60,000 employees, and using the sample's data, 16,000 employees may not be working at their full potential. Interestingly, when comparing to Saudi Arabia as a whole, Saudi Aramco employees had lower rates of tobacco use (38 vs. 26.5 %) (WHO, 2014). Compared to other Middle Eastern countries, Saudi Aramco still had slightly lower rates of tobacco use. The current smoking rates in the United States is 16.8%, lower than that of the Middle East (Jamal et al., 2015).

In light of these findings, the question remains, would researchers expect Saudi Aramco's productivity levels to differ, and if so, why? To answer this, I considered the underlying theories; the human capital concept and the socioecological health model. As the human capital theory proposes, health and wellbeing are two key components of workplace productivity. Also, Saudi Aramco's tobacco use rates are lower than Saudi Arabia, but higher than the Middle Eastern average and the United States. Integrating these findings in the human capital model suggests that decreased health status would reduce workplace productivity.

Saudi Aramco's unique organizational context also is apparent in the socioecological health model. As mentioned in Chapter 2, Saudi Arabia has distinct individual and interpersonal values and beliefs that drive health behaviors. These attitudes can be particularly evident stemming from a trend towards an external locus of control driving health behaviors (Al-Eisa & Al-Sobayel, 2012). This trend could present as employees with a solid internal locus of control are more likely to engage in health-supporting behaviors. Again, these factors support the notion that Saudi Arabia and Saudi Aramco is unique enough to warrant a review of their productivity patterns.

Of course, only considering productivity does not address the potential long-term health complications associated with tobacco use. The WHO (2014) identifies tobacco use as the leading preventable cause of NCDs worldwide. The attributed NCDs include cardiorespiratory disease, cancer, stroke, and diabetes (Beaglehole et al., 2011). The HERO research group found that employees who used tobacco had 16.3% higher direct health costs than those who did not (Goetzel et al., 2004, 2014). Williden et al. (2012) investigated individual health behaviors and their impact on productivity. They found that smoking had no significant impact on presenteeism, but a significant influence on absenteeism. Tsai et al. (2005) compared absenteeism days for smokers in a petrochemical facility. They found smoking status was the second most influential factor in explaining days absent.

The combination of increased presenteeism and direct medical costs suggest that tobacco use in the workplace has a substantive negative affect on healthy humans and human capital.

Research Question 3

To what extent, if any, does a BMI over 25 and 30 relate to productivity among employees in Saudi Aramco?

In research Question 3, I aimed at determining if BMI levels had any influence on productivity in Saudi Arabia. The data analysis, specifically correlational analysis, showed a significant difference (r = -.140, p < .01) in presenteeism between those employee BMIs that were underweight, and those who were overweight and obese. Further to the correlation analysis, a One-Way ANOVA was conducted to evaluate whether there are significant differences in workplace productivity across the four levels of BMI. The ANOVA revealed a significant difference (f = 3.875, p < .01) between the four BMI levels. The Tukey LSD post hoc analysis indicated a significant difference in workplace productivity between underweight and obese (24.22±6.180 vs. 19.56±5.299), normal and obese (21.32±5.437 vs. 19.56±5.299), and overweight and obese (21.33±5.000 vs. 19.56±5.299).

These results indicated that obese people had the lowest workplace productivity in comparison to the underweight, normal and overweight people. There were some possible explanations for these results. Gates, Succop, Brehm, Gillespie, and Sommers

(2008) found that obese people could have difficulty moving in the workplace because of the additional weight. Also, obesity was often associated with pain from musculoskeletal conditions. Pain conditions that impact an individuals ability to move on the job can impact productivity (Iverson et al., 2010).

Berrigan, Simoneau, Tremblay, Hue, & Teasdale (2006) suggested that as BMI increased, balance and coordination decreased, potentially influencing on job performance. Another interesting theory was that obesity impacts interpersonal relationships. Pronk et al. (2004) researched the association between work performance and physical activity, cardiorespiratory fitness, and obesity. The authors found that obese workers had reduced interpersonal relationships, potentially impacting their workplace motivation.

In the HERO study, the researchers found that obese workers were 27.4% more costly (regarding direct medical expenditures) than normal or overweight employees. These results support those that Loeppke et al. (2007) found in their Health and Productivity as a Business Strategy study. The authors concluded that obese employees have twice the direct medical expenses from lost productivity. In their study, obesity was considered the 8th most expensive NCD. A later study found that obesity was the 2nd most costly NCD (Loeppke et al., 2009). Also, in a United States study specifically investigating obesity and presenteeism, the authers found that moderately or extremely obese workers (BMI ≥ 35) had the highest rates of work impairment (Gates et al., 2008). The workers had a 4.2% reduction in productivity, which in that study, equated to $506 annually per employee.

In another study based in Australia, the authors agreed with these findings and Loeppke (Holden et al., 2011). Holden et al. (2011) found that the health risk factors; stress, drug and alcohol problems, and obesity were strongly related to presenteeism. These authors primarily focused on NCDs, rather than lifestyle risk factors, so didn't include any other variables in I included in this study.

Again, with Saudi Arabia's high rates of obesity (48.6% males, 59.4% females), these present alarming trends. In the study population, 23.4% were obese – representing up to 14,000 employees who have increased presenteeism and direct medical costs (Saudi Aramco, 2014). Interestingly, I found that employees who are underweight (2.3%) had the lowest presenteeism rates. The decision to reject the null hypothesis that there is no difference between employee BMI and productivity in Saudi Arabia appears to align with international literature. However, there are no comparable local (Middle Eastern or Saudi Arabian) studies to include in this discussion. The present study is the first presenteeism research effort in Saudi Arabia.

Research Question 4

To what extent, if any, does a sedentary occupation relate to productivity among employees in Saudi Aramco?

In research question 4, I aimed at determining if physical activity levels had any influence on productivity in Saudi Arabia. In the analysis, I found that 78.8% of employees were sedentary during the day, the vast majority. The data analysis showed no significant difference in presenteeism between those who were sedentary at work and those who were not.

As office-bound workers are a relatively new phenomenon, little is known about the risk associated with continuous or excessive sitting. In 2013, the *Los Angeles Times* published an article titled “Don’t just sit there. Really” (Ravn, 2013). The article quoted Dr. Levine, from the Mayo Clinic “the chair is out to kill us”, comparing sitting to smoking. Dr. Levine coined the term; Non-exercise Activity Thermogenesis (NEAT) to describe the energy expenditure of all exercise other than sport (Levine, Vander Weg, Hill, & Klesges, 2006). Levine et al. (2006) found that obese individuals were more likely to be seated 2.5 hours longer than those with normal body weight. These findings have been supported by a recent comprehensive review demonstrating increased productivity in employees by adopting standing workstations (Buckley et al., 2015).

When examining the impact of prolonged sitting on presenteeism, I discovered two theories in the literature, Cumulative Trauma Disorder (CTD) and fatigue from static postures (Dainoff, 2002). CTD tend to appear in productivity literature as musculoskeletal pain and is easy to track. In comparison, fatigue can be difficult to quantify. Static posture fatigue is a result of holding a loaded position for prolonged periods of time (Dunstan et al., 2013). These positions are proposed to cause micro traumas, resulting in muscular discomfort.

Karakolis and Callaghan (2014) described sedentary occupation as prolonged seated work. Along with this seated work, employees are expected to perform repetitive tasks under some loading. (Karakolis & Callaghan, 2014) found that worker discomfort increased during the day, and that adjusting posture was an effective strategy. Dainoff

(2002) found that employees who sat took 47% more breaks and those breaks were 56% longer than standers.

Some studies have found similar results to this one, i.e., no significant difference between productivity in standing vs. sitting. Husemann, Von Mach, Borsotto, Zepf, & Scharnbacher, 2009) studied a small sample of male workers (n = 60) to explore musculoskeletal complaints and data entry efficiency. They found that musculoskeletal complaints were reduced, but there was no change in efficiency. Another small study (n = 35) investigating ergonomic interventions supported these findings (Davis, Kotowski, Sharma, Herrmann, & Krishnan, 2009). The authors found a decrease in musculoskeletal complaints and no difference in productivity. In that study, the authors had a directional hypothesis that standing reduced workplace productivity.

The decision to accept the null hypothesis that there was no difference between occupational activity and productivity in Saudi Arabia appears to be supported by some literature. However, as research around sedentary occupation is a relatively new field, there are few comprehensive studies available. Ongoing studies in this area presents a significant opportunity both in Saudi Aramco and globally.

To determine comprehensively if standing at work improved productivity, future research could be designed to detail actual occupational activity. Including occupational activity would further distinguish if physical activity throughout the day influenced productivity. For example, those employees that stood during the day using a standing workstation, vs. those who were occupationally active (e.g., janitors, maintenance team). To gain further granularity, including a question on using standing and/or sit to stand workstations may have been useful. All these additional details could be studied both here in Saudi Arabia and/or globally.

Research Question 5

To what extent, if any, does poor nutrition (My Plate guidelines) relate to productivity among employees in Saudi Aramco?

In research question 5, I aimed to determine if nutrition had any influence on workplace productivity in Saudi Arabia. From the correlational analysis, I found a significant difference ($R = .32$, $p < .001$) in presenteeism between those who ate as per the USDA "MyPlate" guidelines and those who did not. In Saudi Aramco, 51.7% or study participants had a poor diet, which could represent up to 31,000 Saudi Aramco employees (Saudi Aramco, 2014).

When reviewing the literature, I found a limited number of authors who proposed rationale as to how nutritional directly impacts presenteeism. Jensen (2011) suggests that healthy nutrition improved worker concentration, engagement, and reduced worker turnover. Also, he found that workers might also take those healthy habits into the home environment, improving morale.

Schultz, Chen, and Edington (2009) found that a healthy diet influenced workplace presenteeism. In another study of 1628 employees, the authors found that worker productivity improved with changes to nutrition (S. Serxner, Gold, Anderson, & Williams, 2001). These findings were part of a longitudinal study designed to measure the impact of a health-promoting program. By contrast, in a separate study investigating fruit and vegetable consumption in New Zealand, the authors found no significant relationship with productivity (Williden et al., 2012). However, the authors chose to categorize healthy diet as consuming 5+ fruit or vegetables. This definition varies slightly from the USDA MyPlate guidelines, which makes a number of recommendations in addition to fruit and vegetable consumption. Callen et al. (2013) conducted a cross-sectional study of 1728 employees examining health risks and presenteeism. The authors found no significant difference in nutrition status and productivity. When considering this study, it is important to mention the diet measures – salt use and fat consumption. This definition varied from that in the Williden et al. (2012) study and that was applied in this research.

Most studies identified in the literature review focused on the role of diet in direct costs. There have been some studies examining the influence of diet on absenteeism and direct medical expenses. In one of these, Goetzel et al. (2014) found those employees who ate a healthy diet had 5.4% less direct medical expenses. The trends towards poor diet and increased absenteeism and medical expenses are consistent.

In the next section, I introduce the Multiple Regression analysis; a tool used to predict presenteeism based on the five independent variables. These results also provide additional information on the relative weighting of each predictor variable as they aggregate.

Multiple Regression

Beyond bivariate correlations, the results included the combined influence of the five independent variables, a multiple regression. The purpose of including the multiple regression analysis was to provide additional information examining the relationship between these variables and productivity (Cohen et al., 2013). Beyond that, multiple regression provides analysis of the shared variance across the factors to get an overall understanding of how these risks affect productivity.

The regression included five independent variables (exercise, BMI, tobacco use, sedentary occupation, and nutrition) and only sedentary occupation failed to be a significant predictor of productivity. As part of the regression analysis, I examined the assumption test and found both multicollinearity and homoscedasticity were present in the sample. The multiple regression was statistically significant in predicting workplace productivity, F= 21.80, $p < .0005$, adj. $R^2 = 0.21$. That is, the model predicted 22% of the variance in workplace productivity. Of the four predictor variables, nutrition contributed the greatest influence, followed closely by physical activity. This significant finding suggests potential productivity gains if all these four factors were addressed in the workplace. One question that forms from this result is; what contributes to the other 78% of productivity variance? This gap could form the foundation for additional research within the Saudi Aramco workplace.

Assumptions

In designing methodology this study, it was important to recognize and consider all assumptions. As the data primarily came from self-reported surveys, an important consideration was that employees respond honestly. Honest responses are difficult to ensure, but employees were reminded that the HRE is confidential and required consent.

When collecting the data, efforts were made to reassure employees that their answers did not affect their performance review. As part of the primary data collection, employees were asked for consent for their information to be used in ongoing studies. Employees could still receive wellness services associated with the HRE, but could opt out of sharing their information. As part of the internal organizational standards, the HRE data were collected under IRB approval. As the data was secondary source, I had to assume that these original considerations held, as I was unable to verify.

The reliability and validity of the SPS scale were also considered as an assumption. The SPS was formulated from the Koopman et al. (2002) study where author evaluated the productivity of 675 employees from a United States company based in California. The demographic breakdown was 4.9% Black/African-American, 10.5% Asian Americans, 14.2% Hispanic/Latino, 63.6% White/European American and 6.8% other. As mentioned, these baseline demographics vary from the Saudi Aramco population. The employee population is comprised of 83% Saudi Arabs and 17% expatriates. I made an assumption that the SPS-6 would be appropriate to use in Saudi Arabia with employees who had English as a second language. I was unable to find any studies that reviewed the SPS-6 in Saudi Arabia or any of the Middle East. Therefore, I chose to include the SPS-6 and accept the results are valid and reliable in this population.

The combination of unique factors created a question about the productivity of the Saudi Arabian workforce. As this results indicated, the influence of health factors on productivity appeared consistent with those found in western countries.

Delimitations

As previously mentioned, I limited this study to employees based in Saudi Arabia to capture the unique cultural influences. Delimiting this group of employees limited the generalizability of the study, and the results may not be applicable to other countries or settings. Nonetheless, the results of this study are suggestive for regional organizations like Saudi Aramco, and may be relevant as well for other countries in the region.

In an attempt to focus on presenteeism, employees were not asked to report their absenteeism levels (i.e., medical leave or restricted duties), but rather only productivity via the SPS-6 This delimitation was included in an attempt to reduce any concerns around reporting bias and consent. As these were assumptions, it is difficult to determine their impact on the results. Although from previous research, I know that employees who are on medical leave have reduced productivity (Kowlessar et al., 2011).

Limitations of the Study

Several limitations should be acknowledged that might impact the study results. One of the study limitations was the data collection method. All information was collected using Health Risk Assessments (HRAs), which were administered at wellness clinics companywide. Firstly, these clinics were voluntary, potentially leading to selection bias. As I mentioned in Chapter 1, only 20% of the employee population uses these clinics. This potential bias could include attracting those employees who are interested in their health, therefore having heightened positive health behaviors and productivity. A counter argument may also be made, that the clinics were only attracting those who had significant health concerns. Further research could identify those individuals who are more or less concerned about their health and productivity across demographic indicators.

Some studies have reviewed workplace wellness participation trends to determine which employees are most likely to attend a clinic. A United States based organization reviewed 310 employees to determine employee attitude and attendance patterns (Bright et al., 2012). The authors found no significant difference between attendance and health status. These findings were contradicted with a study examining stress and wellness program participation (Clark et al., 2011). The researchers studied 2147 employees who reported high stress levels and reviewed their wellness program participation. They found these employees were less likely to attend the clinic than those reporting lower stress levels. These findings were partially supported by one of the first employee wellness program reviews. (Conrad, 1987) found that there were some suggestions that wellness program participants were healthier and more concerned with fitness than non-participants. Unfortunately, there are no studies in the Middle East that report on wellness program participation trends.

A second potential factor was language; the HRA was only available in English. Although the official language of Saudi Aramco is English, there may have been comprehension problems with some medical terms. One area of concern was the SPS. The scale itself was a simple Likert-type instrument, but included potentially confusing distinctions e.g.,. “because of my (health condition) the stressors of my job are much harder to handle.” In Chapter 3, the literature review indicated no prior studies examining the validity of an Arabic HRE or SPS-6. In 2013 and 2014, Portuguese and Dutch researchers were able to translate the SPS and found both measures maintained good validity and reliability (Laranjeira, 2013; Hutting, 2014). As mentioned in chapter one, the reliability and validity of the SPS scale must also be considered.

When the SPS was developed, the authors used a productivity study of 675 employees, from a United States company based in California (Koopman et al., 2002). The questionnaire was based on United States employee data and hasn't been validated for use in Saudi Arabia, or the Middle East. In addition to the language/translation concern, understanding of what a health condition constitutes could vary. If that were persistent, employees could be under or over reporting health conditions and the influence of conditions on workplace performance.

Another limiting factor was the study design for research question 4, the relationship to a sedentary occupation. The intent of the question: "Do you sit less than 6 hours as work?" was intended to distinguish those who were sitting for prolonged periods from those who were physically active. The question design was too broad and may have missed subtle differences in activity. This particular question presents many opportunities for future research.

Another factor that I considered was the cross-sectional nature of this study. Because this was a snapshot in time, deeper analysis including time series analysis could not be included. Therefore, it would be false to assume that by improving health behaviors, this would have an impact on productivity.

Recommendations

In this section I include a description of the recommendations for further research, both within Saudi Aramco and Saudi Arabia. The recommendations are grounded in the strengths and limitations of the current study as well as the literature reviewed in Chapter 2.

Theory

Workplace wellness programs have grown from some underlying theories. In Chapter 2, I introduced the socioecological, health pyramid, and human capital models. The socioecological model posits that health was determined through some unique factors, one of which is the environmental context. Saudi Arabia's unique environment raises potential questions on the applicability of international research in this field. Interestingly, the results of the present study aligned with those in developed or western organizations, suggesting that context may not be as significant a predictor as commonly believed. Of course, the significance of this relationship is difficult to quantify, as the study was not designed to determine the strength of the relationship, but rather the presence of a difference in productivity.

The human capital model predicts that employees who are healthy are also more productive. These assumptions were supported in four of the five research questions. We know from the findings that from a healthy human capital perspective, employees who exercise, maintain an ideal body weight, eat well, and do not use tobacco are the most productive. Assuming that leaders value their human capital, these findings present some significant opportunities for further intervention at the corporate level, and for additional research within the organization.

Leadership

The real value of these findings lies in what an organization chooses to do with them. As lifestyle factors influence workplace productivity, leaders should consider this when establishing employee health programs. Company leaders are ultimately responsible for supporting setting priorities and these could be targeting employee health behaviors. Programs that attempt to reduce tobacco use, improve diet, exercise, and body weight would be the first start. Integrating the human capital model, we would expect healthier employees would have an impact on the financial performance of an organization. To fully understand this influence, scholars would need to consider the cost of each employee, building the start of some return on investment information.

Another potential implication of this research is within the human resource (HR) field, particularly around hiring decisions. Understanding employees who engage in unhealthy behaviors have an increased risk of presenteeism; this could question hiring them at all. In a study investigating this issue, the authors found that an employee who smokes can cost a workplace $4000 annually in direct and indirect expenses (Schmidt, Voigt, & Emanuel, 2013). Choosing to eliminate employees raises significant ethical and moral issues, something that would need to be considered carefully.

Needs for Further Research

One of the first recommendations arising from the results of this study would be to conduct research that equally includes all employees within Saudi Aramco. As mentioned in the delimitations section, this study only included employees who attended the workplace wellness program. Although it is hard to quantify, this selection bias could have influenced the validity of the results. A company-wide HRE, including productivity measures, provide a more comprehensive overview. Company-wide HRE's have allowed researchers such as the HERO and IHMS groups to generate large databases and understand health trends. In addition to companywide HREs, these research groups have studied multiple organization types, providing diverse data (Edington et al., 2014; Goetzel et al., 2014; Sullivan, 2004). These data could be a future direction for some leading organization within Saudi Arabia.

A second recommendation is to study sedentary occupation and workplace productivity in greater detail. The question: "do you sit less than 6 hours at work?" could have been designed to tease out any difference in sitting behaviors. One recommendation would be to study a population of chair-bound office workers against those who stand greater than six hours daily at a standing station. In my study, there was no way to differentiate why an employee is more or less physically active. This additional clarifier would be difficult to research but could add valuable insight.

Also, including only office-bound employees could reduce any further variables. This new delimitation could drill down on any differences that may exist. Another option is to survey employees on hours spent sitting or standing by office-bound employees.

Implications

The scope and potential for positive social change from this study occur in many layers. With the results of four out of five research questions indicating that physical activity, tobacco use, BMI, and nutrition influence workplace productivity. Study results suggest that employees, who are physically active, maintain healthy body weight, eat well, and not using tobacco, have higher workplace productivity. Further to these findings, the literature review also suggests that in addition to improving productivity, eliminating these risk factors can also reduce the risk of more costly NCDs.

As outlined in Chapter 2, one of the underlying theoretical foundations was the socioecological health model. The model introduces five key health influences: individual, interpersonal, institutional, community, and social and presents a framework for discussing the potential implications. The socioecological model promotes self-responsibility (Sallis et al., 2008). This aspect is depicted with the core component representing the individual, with the other dimensions growing from the middle.

As this study was based in the workplace, most social implications will also fall within this dimension. Organization must recognize employees engaging in high-risk health behaviors cost in both a direct and indirect manner. Identifying these costs could trigger comprehensive workplace lifestyle behavioral programs. If we were to take the socioecological model and overlay that with the work environment, it provides a framework for positive change.

Individuals/Interpersonal

Although the current study focused on the institutional implications of poor health, some findings can be applied at an individual level. The results found that physical activity, tobacco use, BMI, and nutrition all have an impact on workplace productivity. In addition to the productivity we also know from previous international research, lifestyle risks contribute to NCDs (Jensen, 2011; Schultz et al., 2009). As the workplace provides one setting for health promotion, leaders could apply these findings to construct wellness programs (Chu et al., 2000). If employees were to adopt these positive health behaviors, they could potentially become healthier, more productive, and ultimately less expensive employees. As the socioecological health model demonstrates, these healthy behaviors are adopted and sustained by the individuals. The major challenge is providing an optimal environment that fosters these behaviors (Merrill et al., 2012).

In addition to an individual employee, positive health behaviors could be transferred from employees to another, or even family members. Any behavior change can be a catalyst for those around (Khalil, Nadrah, Al-Yahia, & Al-Segul, 2005). This influence may be particularly relevant in Saudi Arabia due to the strong family relationships (Winter et al., 2011).

Institutional

The institutional implications of these results could be significant. If organizations were able to recognize the cost – both direct and indirect, associated with poor health choices, they would unlock potential cost savings (Mills et al., 2007; Sullivan, 2004). As the Human Capital model identified; prosperity, health, well-being, and skills all contribute to determining employee productivity. As health behaviors influence workplace productivity in Saudi Aramco, this supports the notion that well-being has an influence on business performance.

In combining these results, the authors suggest a need to build the business case for investing in employee wellness. Institutions have a captive audience, providing resources that support healthy lifestyle choices seem like a logical step.

Community

Saudi Aramco is a unique organization, in addition to the core business buildings; they also own the surrounding community and medical services. This control presents an opportunity for unprecedented influence with the community. Saudi Aramco could develop targeted lifestyle programs that provided a common thread between the community and the workplace. Starting with health promotion programs that address lifestyle condition within the schools and medical services can extend into the workplace. Saudi Aramco is considered an employer of choice and their programs can be used as the gold standard within The Middle East (Horseman et al., 2010; Saudi Aramco, 2013).

The challenge for other organizations within Saudi Arabia is how do they apply this research? Building a comprehensive business case for employee wellness can be challenging, but health promoters' do not need to wait for this to make small changes (Sullivan, 2004). As this research presents, employees who do not use tobacco, are physically active, eat well, and maintain a healthy body-weight are more productive in the workplace. Organizations could start small and select one health behavior to deploy targeted health promotion interventions. These interventions could be a simple (and cost free) smokefree policy (Halpern et al., 2001).

Social

The social domain has overlap with the individual/community components. One of the greatest challenges of changing health behavior is making the behavior fun and sustainable (Clark et al., 2011). Providing beneficial social outlets for employees and their family's that target physical activity, health food, tobacco use, and maintaining a healthy body weight presents a tremendous opportunity.

Applying the socioecological model to health behavior change may present an overwhelming and complex plan. When reviewing this research and the potential implications, it is important to adopt a conservative approach (Merrill et al., 2012; Sallis et al., 2008). We now know that simple lifestyle decisions have an influence on workplace productivity. Our goal should be to influence health decision that leads to long term NCDs. We now have a body of research that supports the short-term benefits (productivity) that contribute to long-term cost savings (medical expenses). Without overreaching the bounds of the current study, it appears that focusing on simple sustained health behavior change seems reasonable.

Conclusion

This study began with a complex problem, the rising worldwide rates of NCDs. From this problem, I recognized that the Middle East, particularly Saudi Arabia were particularly vulnerable, leading these trends. As these NCD rates continue to rise, there is an increasing load on health systems and employers. Worldwide, some organizations have recognized the potential economic relationship between health risks, poor health, and workplace productivity. As previously stated, Middle Eastern organizations are slow to develop targeted health management programs, which include an emphasis on employee productivity.

The present study was designed to gain additional insight into the health and productivity behaviors of an organization based in Saudi Arabia. The research problem was “What is the relationship between lifestyle and productivity”? The underlying theoretical foundations were the socio-ecology health model and the human capital model. These were consistent with the research problem and also helped to build the context for research in the Middle East. When reviewing the health and productivity literature, there is a gap in locally relevant studies. This gap presented a question regarding the generalizability of the international literature to the local context. As Saudi Arabia has a unique cultural, environmental, and religious context, anything outside of the region would need to be applied with caution.

The research proposal gained both institutional ethics board approval and IRB approval. The research method was a quantitative ex-post facto study design using secondary source data from the Saudi Aramco wellness clinics. The study population was Saudi Aramco employees who had attended the wellness clinic. The study was a stratified random sample of 400 from the 25,450 wellness program attendees. As the employee population was 87% males and 13% females, this ratio was stratified within the 400, requiring 352 males and 48 females.

The data analysis had two distinct methods; the Pearson’s correlations and multiple regression. From the analysis, the null hypothesis of no difference for four of the predictor variables was rejected. The results of the correlation analysis revealed that exercise, tobacco use, BMI, and nutrition significantly influenced workplace productivity. Exercise and nutrition had a significantly positive influence on workplace productivity while tobacco use and increasing BMI had an adverse influence on workplace productivity. The influence of sedentary occupation on productivity was found to be insignificant. In addition to the correlation, multiple regression analysis found the five predictor variables included in the regression model, explained 21% of the variance in the dependent variable.

Although, instinctively we may believe that a healthy employee is a productive one, this research was one of the first in Saudi Arabia to find that relationship. The implications and social change implications can be presented through the lens of the socioecological model. Addressing behavior change from an individual/interpersonal, institutional, community, and social perspective can provide the framework for significant change. However, with any behavior change, the challenge is building a healthy culture that will nurture those changes. This research adds to the global body of evidence that suggests we are moving in the right direction.

The implications of this research should resonate with organization leaders in the Middle East, particularly Saudi Aramco. This study has clearly shown the influence of poor health choices on employee productivity. This dissertation was the first study in this unique cultural context to draw attention to the increasing NCD burden. Taken at face value, this suggests that employees are slowed by their poor health behaviors, and something could be done to improve this situation.

Organizations that believe that human capital is their greatest asset should explore opportunities to fine-tune this deficit. The challenge now is to start to build programs that tackle health decisions, targeted at each behavioral leverage point. Workplaces that can do that will not only improve their human capital, but also start to build sustainable, happy, and well organizations.

References

Akl, E. A., Gunukula, S. K., Aleem, S., Obeid, R., Jaoude, P. A., Honeine, R., & Irani, J. (2011). The prevalence of waterpipe tobacco smoking among the general and specific populations: a systematic review. *BMC Public Health*, *11*(1), 244. http://doi.org/10.1186/1471-2458-11-244

Aldana, S. G., & Pronk, N. P. (2001). Health promotion programs, modifiable health risks, and employee absenteeism. *Journal of Occupational and Environmental Medicine*, *43*(1), 36–46. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Al-Eisa, E. S., & Al-Sobayel, H. I. (2012). Physical activity and health beliefs among saudi women. *Journal of Nutrition and Metabolism*, *2012*. http://doi.org/10.1155/2012/642187

Alkabba, A., Hussein, G., Albar, A., Bahnassy, A., & Qadi, M. (2012). *The major medical ethical challenges facing the public and healthcare providers in Saudi Arabia* (Vol. 19). Retrieved from http://www.jfcmonline.com/article.asp

Almalki, M., FitzGerald, G., & Clark, M. (2011). Health care system in Saudi Arabia: an overview. *Eastern Mediterranean Health Journal*, *17*(10), 784–93. Retrieved from http://www.emro.who.int/emh-journal/eastern-mediterranean-health-journal/home.html

Anderson, D. R., Serxner, S., & Terry, P. (2001). *Health assessment* (Vol. 3rd). New York, United States: Delmar, Thomson Learning.

Anderson, D. R., Whitmer, R. W., Goetzel, R. Z., Ozminkowski, R. J., Wasserman, J., & Serxner, S. (2000). The relationship between modifiable health risks and group-level health care expenditures. *American Journal of Health Promotion*, *15*(1), 45–52. http://doi.org/10.4278/0890-1171-15.1.45

Beaglehole, R., Bonita, R., Horton, R., Adams, C., Alleyne, G., Asaria, P., … Casswell, S. (2011). Priority actions for the non-communicable disease crisis. *The Lancet*, *377*(9775), 1438–1447. http://doi.org/10.1016/S0140-6736(11)60393-0

Becker, G. S. (2007). Health as human capital: synthesis and extensions. *Oxford Economic Papers*, *59*(3), 379–410. http://doi.org/10.1093/oep/gpm020

Berger, M. L., Howell, R., Nicholson, S., & Sharda, C. (2003). Investing in healthy human capital. *Journal of Occupational and Environmental Medicine*, *45*(12), 1213–1225. http://doi.org/10.1097/01.jom.0000102503.33729.88

Berrigan, F., Simoneau, M., Tremblay, A., Hue, O., & Teasdale, N. (2006). Influence of obesity on accurate and rapid arm movement performed from a standing posture. *International Journal of Obesity*, *30*(12), 1750–1757. http://doi.org/10.1038/sj.ijo.0803342

Biswas, A., Oh, P. I., Faulkner, G. E., Bajaj, R. R., Silver, M. A., Mitchell, M. S., & Alter, D. A. (2015). Sedentary Time and Its Association With Risk for Disease Incidence, Mortality, and Hospitalization in Adults: A Systematic Review and Meta-analysis. *Annals of Internal Medicine*, *162*(2), 123–132. http://doi.org/10.7326/M14-1651

Black, T. R. (1999). *Doing quantitative research in the social sciences: An integrated approach to research design, measurement and statistics*. London, England: Sage Publications.

Booth, S. L., Sallis, J. F., Ritenbaugh, C., Hill, J. O., Birch, L. L., Frank, L. D., … Popkin, B. M. (2001). Environmental and societal factors affect food choice and physical activity: rationale, influences, and leverage points. *Nutrition Reviews*, *59*(3), S21–S36. Retrieved from http://nutritionreviews.oxfordjournals.org

Bright, D. R., Terrell, S. L., Rush, M. J., Kroustos, K. R., Stockert, A. L., Swanson, S. C., & DiPietro, N. A. (2012). Employee attitudes toward participation in a work site-based health and wellness clinic. *Journal of Pharmacy Practice*, *25*(5), 530–536. http://doi.org/10.1177/0897190012442719

Buckley, J. P., Hedge, A., Yates, T., Copeland, R. J., Loosemore, M., Hamer, M., … Dunstan, D. W. (2015). The sedentary office: an expert statement on the growing case for change towards better health and productivity. *British Journal of Sports Medicine*, bjsports–2015. http://doi.org/10.1136/bjsports-2015-094618

Bull, F., & Dvorak, J. (2013). Tackling chronic disease through increased physical activity in the Arab World and the Middle East: challenge and opportunity. *British Journal of Sports Medicine*, 600–602. http://doi.org/10.1136/bjsports-2012-092109

Bunn III, W. B., Stave, G. M., Downs, K. E., Alvir, J. M. J., & Dirani, R. (2006). Effect of smoking status on productivity loss. *Journal of Occupational and*

Environmental Medicine, *48*(10), 1099–1108. http://doi.org/10.1097/01.jom.0000243406.08419.74

Burton, W. N., Chen, C.-Y., Conti, D. J., Schultz, A. B., & Edington, D. W. (2006). The Association Between Health Risk Change and Presenteeism Change. *Journal of Occupational and Environmental Medicine*, *48*(3), 252–263. http://doi.org/0.1097/01.jom.0000201563.18108.af

Burton, W. N., Chen, C.-Y., Conti, D. J., Schultz, A. B., Pransky, G., & Edington, D. W. (2005). The Association of Health Risks With On-the-Job Productivity. *Journal of Occupational and Environmental Medicine*, *47*(8), 769–777. Retrieved from http://www.joem.org

Callen, B. L., Lindley, L. C., & Niederhauser, V. P. (2013). Health risk factors associated with presenteeism in the workplace. *Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine*, *55*(11), 1312–1317. http://doi.org/10.1097/JOM.0b013e3182a200f4

Centers for Disease Control and Prevention. (2010). Health Risk Evaluations. Retrieved from http://www.cdc.gov/nccdphp/dnpao/hwi/programdesign/health_risk_appraisals.htm

Central Department of Statistics & Information. (2012). *Statistics Yearbook*. Central Department of Statistics & Information(CDSI), Ministry of Economy and Planning. Retrieved from http://www.stats.gov.sa/en/1154

Chapman, L. S. (2012). Meta-evaluation of worksite health promotion economic return studies: 2012 update. *American Journal of Health Promotion*, *26*(4), TAHP–1. http://doi.org/10.4278/ajhp.26.4.tahp

Chu, C., Breucker, G., Harris, N., Stitzel, A., Gan, X., Gu, X., & Dwyer, S. (2000). Health-promoting workplaces—international settings development. *Health Promotion International*, *15*(2), 155–167. http://doi.org/10.1093/heapro/15.2.155

Clark, M. M., Warren, B. A., Hagen, P. T., Johnson, B. D., Jenkins, S. M., Werneburg, B. L., & Olsen, K. D. (2011). Stress level, health behaviors, and quality of life in employees joining a wellness center. *American Journal of Health Promotion*, *26*(1), 21–25. http://doi.org/10.4278/ajhp.090821-QUAN-272

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah, NJ: Routledge.

Conrad, P. (1987). Who comes to work-site wellness programs? A preliminary review. *Journal of Occupational and Environmental Medicine*, *29*(4), 317–320. http://doi.org/10.1207/s15327558ijbm0504_6

Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., … Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise*, *35*(8), 1381–1395. http://doi.org/10.1249/01.MSS.0000078924.61453.FB

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oak, CA: Sage publications.

Dainoff, D. M. J. (2002). The Effect of Ergonomic Worktools on Productivity In Today's Automated Workstation Design. *Center for Ergonomic Research, Miami University: Oxford, Ohio*. Retrieved from https://www.researchgate.net/profile/Marvin_Dainoff3/publication/241817662_The_Effect_of_Ergonomic_Worktools_on_Productivity_In_Today's_Automated_Workstation_Design/links/557819e908ae75363753e9ea.pdf

Davis, K. G., Kotowski, S. E., Sharma, B., Herrmann, D., & Krishnan, A. P. (2009). Combating the effects of sedentary Work: postural Variability reduces musculoskeletal discomfort, *53*, 884–886. http://doi.org/10.1177/154193120905301406

Dollard, M. F., & Neser, D. Y. (2013). Worker health is good for the economy: Union density and psychosocial safety climate as determinants of country differences in worker health and productivity in 31 European countries. *Social Science & Medicine*, *92*, 114–123. http://doi.org/10.1016/j.socscimed.2013.04.028

Dooris, M. (2006). Healthy settings: challenges to generating evidence of effectiveness. *Health Promotion International*, *21*(1), 55–65. http://doi.org/10.1093/heapro/dai030

Dunstan, D. W., Wiesner, G., Eakin, E. G., Neuhaus, M., Owen, N., LaMontagne, A. D., … Healy, G. N. (2013). Reducing office workers' sitting time: rationale and study design for the Stand Up Victoria cluster randomized trial. *BMC Public Health*, *13*. http://doi.org/10.1186/1471-2458-13-1057

Edington, D. W. (2001). Emerging Research: A View From One Research Center. *American Journal of Health Promotion*, *15*(5), 341–349. http://doi.org/10.4278/0890-1171-15.5.341

Edington, D. W. (2009a). Zero trends. *Health as a Serious Economic Strategy. Detroit: Health Management Research Center/University of Michigan*.

Edington, D. W. (2009b). *Zero trends: Health as a serious economic strategy*. UM-HMRC.

Edington, D. W., Pitts, J. S., & Schultz, A. B. (2014). Health as an Economic Strategy Special Emphasis on the Workplace. *American Journal of Lifestyle Medicine*, *8*(5), 330–335. http://doi.org/10.1177/1559827614529066

Ettner, S. L., & Grzywacz, J. G. (2001). Workers' perceptions of how jobs affect health: A social ecological perspective. *Journal of Occupational Health Psychology*, *6*(2), 101. http://doi.org/10.1037//1076-8998.6.2.101

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Thousand Oak, CA: Sage Publications.

Frieden, T. R. (2010). A framework for public health action: the health impact pyramid. *American Journal of Public Health*, *100*(4), 590–595. http://doi.org/10.2105/AJPH.2009.185652

Gates, D. M., Succop, P., Brehm, B. J., Gillespie, G. L., & Sommers, B. D. (2008). Obesity and presenteeism: The impact of body mass index on workplace productivity. *Journal of Occupational and Environmental Medicine*, *50*(1), 39–45. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Goetzel, R. Z., Anderson, D. R., Whitmer, R. W., Ozminkowski, R. J., Dunn, R. L., Wasserman, J., & Health Enhancement Research Organization (HERO) Research Committee. (1998). The relationship between modifiable health risks and health care expenditures: an analysis of the multi-employer HERO health risk and cost database. *Journal of Occupational and Environmental Medicine*, *40*(10), 843–854. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Goetzel, R. Z., Hawkins, K., Ozminkowski, R. J., & Wang, S. (2003). The health and productivity cost burden of the "top 10" physical and mental health conditions affecting six large US employers in 1999. *Journal of Occupational and Environmental Medicine*, *45*(1), 5–14. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Goetzel, R. Z., Henke, R. M., Benevent, R., Tabrizi, M. J., Kent, K. B., Smith, K. J., … Gold, D. B. (2014). The Predictive Validity of the HERO Scorecard in Determining Future Health Care Cost and Risk Trends. *Journal of Occupational and Environmental Medicine*, *56*(2), 136–144. http://doi.org/10.1097/JOM.0000000000000081

Goetzel, R. Z., Long, S. R., Ozminkowski, R. J., Hawkins, K., Wang, S., & Lynch, W. (2004). Health, absence, disability, and presenteeism cost estimates of certain physical and mental health conditions affecting US employers. *Journal of Occupational and Environmental Medicine*, *46*(4), 398–412. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Goetzel, R. Z., & Ozminkowski, R. J. (2008). The Health and Cost Benefits of Work Site Health-Promotion Programs. *Annual Review of Public Health*, *29*(1), 303–323. http://doi.org/10.1146/annurev.publhealth.29.020907.090930

Goetzel, R. Z., Pei, X., Tabrizi, M. J., Henke, R. M., Kowlessar, N., Nelson, C. F., & Metz, R. D. (2012). Ten modifiable health risk factors are linked to more than one-fifth of employer-employee health care spending. *Health Affairs*, *31*(11), 2474–2484. http://doi.org/10.1377/hlthaff.2011.0819

Grossman, M., & National Bureau of Economic Research. (1999). *The Human Capital Model of the Demand for Health*. Cambridge, Mass: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w7078

Halpern, M. T., Shikiar, R., Rentz, A. M., & Khan, Z. M. (2001). Impact of smoking status on workplace absenteeism and productivity. *Tobacco Control*, *10*(3), 233–238. http://doi.org/10.1136/tc.10.3.233

Hayter, A. J. (1986). The Maximum Familywise Error Rate of Fisher's Least Significant Difference Test. *Journal of the American Statistical Association*, *81*(396), 1000–1004. http://doi.org/10.1080/01621459.1986.10478364

Holden, L., Scuffham, P. A., Hilton, M. F., Ware, R. S., Vecchio, N., & Whiteford, H. A. (2011). Which health conditions impact on productivity in working Australians? *Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine*, *53*(3), 253–257. http://doi.org/10.1097/JOM.0b013e31820d1007

Horseman, S., Freeland, W., & Guidotti, T. (2010). Healthy Human Capital as a Business Strategy: The Saudi Aramco Wellness Program (SAWP) (pp. 178–185). Presented at the American Society of Safety Engineers (ME Chapter),(9) Conference Proceedings. Bahrain. Retrieved from http://www.asse-mec.org/events/2010-chapter-symposium

Hulley, S. B., Cummings, S. R., Browner, W. S., Grady, D. G., & Newman, T. B. (2013). *Designing clinical research*. Philadelphia, PA: Lippincott Williams & Wilkins.

Husemann, B., Von Mach, C. Y., Borsotto, D., Zepf, K. I., & Scharnbacher, J. (2009). Comparisons of musculoskeletal complaints and data entry between a sitting and a sit-stand workstation paradigm. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *51*(3), 310–320. Retrieved from http://hfs.sagepub.com

International Diabetes Federation. (2014). Diabetes scorecard Saudi Arabia. Retrieved from http://www.idf.org/membership/mena/saudi-arabia

Iverson, D., Lewis, K. L., Caputi, P., & Knospe, S. (2010). The cumulative impact and associated costs of multiple health conditions on employee productivity. *Journal of Occupational and Environmental Medicine*, *52*(12), 1206–1211. http://doi.org/10.1097/JOM.0b013e3181fd276a

Jamal, A., Homa, D. M., O'Connor, E., Babb, S. D., Caraballo, R. S., Singh, T., … King, B. A. (2015). Current Cigarette Smoking Among Adults-United States, 2005–2014. *Morbidity and Mortality Weekly Report*, *64*(44), 1233–1240. Retrieved from www.cdc.gov/mmwr

Jensen, J. D. (2011). Can worksite nutritional interventions improve productivity and firm profitability? A literature review. *Perspectives in Public Health*, *131*(4), 184–192. http://doi.org/10.1177/1757913911408263

Karakolis, T., & Callaghan, J. P. (2014). The impact of sit–stand office workstations on worker discomfort and productivity: a review. *Applied Ergonomics*, *45*(3), 799–806. http://doi.org/10.1016/j.apergo.2013.10.001

Katsambas, A., & Marketos, S. G. (2007). Hippocratic messages for modern medicine (the vindication of Hippocrates). *Journal Of The European Academy Of Dermatology And Venereology: JEADV*, *21*(6), 859–861. Retrieved from http://www.eadv.org

Keith, T. Z. (2014). *Multiple Regression and Beyond: An Introduction to Multiple Regression and Structural Equation Modeling*. New York, NY: Routledge.

Khalil, M., Nadrah, H. M., Al-Yahia, O. A., & Al-Segul, A. (2005). Upstream investment in health care: national and regional perspectives. *Journal Of Family & Community Medicine*, *12*(1), 55–57. Retrieved from http://www.jfcmonline.com

Kilpi, F., Webber, L., Musaigner, A., Aitsi-Selmi, A., Marsh, T., Rtveladze, K., … Brown, M. (2014). Alarming predictions for obesity and non-communicable diseases in the Middle East. *Public Health Nutrition*, *17*(5), 1078–1086.

Kirsten, W. (2010). Promoting physical activity at the workplace: a global view. *British Journal of Sports Medicine*, *44*(S1), i73–i74. http://doi.org/10.1136/bjsm.2010.078725.242

Koopman, C., Pelletier, K. R., Murray, J. F., Sharda, C. E., Berger, M. L., Turpin, R. S., … Bendel, T. (2002). Stanford presenteeism scale: health status and employee productivity. *Journal of Occupational and Environmental Medicine*, *44*(1), 14–20. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Kowlessar, N. M., Goetzel, R. Z., Carls, G. S., Tabrizi, M. J., & Guindon, A. (2011). The relationship between 11 health risks and medical and productivity costs for a large employer. *Journal of Occupational and Environmental Medicine*, *53*(5), 468–477. http://doi.org/10.1097/JOM.0b013e31821586b8

Krejecie, R., & Morgan, D. (1970). Tables for determining sample size for research activities. *Education and Psychological Measurement (30)*, *608*. Retrieved from http://home.kku.ac.th

Laranjeira, C. A. (2013). Validation of the Portuguese version of the Stanford Presenteeism Scale in nurses. *International Journal of Nursing Practice*, *19*(6), 644–650. http://doi.org/10.1111/ijn.12117

Lenneman, J., Schwartz, S., Giuseffi, D. L., & Wang, C. (2011). Productivity and health: an application of three perspectives to measuring productivity. *Journal of Occupational and Environmental Medicine*, *53*(1), 55–61.

Leutzinger, J. A., Ozminkowski, R. J., Dunn, R. L., Goetzel, R. Z., Richling, D. E., Stewart, M., & Whitmer, R. W. (2000). Projecting Future Medical Care Costs Using Four Scenarios of Lifestyle Risk Rates. *American Journal of Health Promotion*, *15*(1), 35–44. http://doi.org/10.4278/0890-1171-15.1.35

Levine, J. A., Vander Weg, M. W., Hill, J. O., & Klesges, R. C. (2006). Non-exercise activity thermogenesis the crouching tiger hidden dragon of societal weight gain. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *26*(4), 729–736. http://doi.org/10.1161/01.ATV.0000205848.83210.73

Loeppke, R., Taitel, M., Haufle, V., Parry, T., Kessler, R. C., & Jinnett, K. (2009). Health and productivity as a business strategy: A multiemployer study. *Journal of Occupational and Environmental Medicine*, *51*(4), 411–428. http://doi.org/10.1097/JOM.0b013e3181a39180

Loeppke, R., Taitel, M., Richling, D., Parry, T., Kessler, R. C., Hymel, P., & Konicki, D. (2007). Health and productivity as a business strategy. *Journal of Occupational and Environmental Medicine*, *49*(7), 712–721. http://doi.org/10.1097/JOM.0b013e318133a4be

Lofland, J. H., Pizzi, L., & Frick, K. D. (2004). A review of health-related workplace productivity loss instruments. *Pharmacoeconomics*, *22*(3), 165–184. http://doi.org/10.2165/00019053-200422030-00003

Luby, J., & Al-Jahdaly, E. (2005). An Integrated Approach to Healthcare and Health Promotion in Both the Workplace and the Community. Presented at the SPE Asia Pacific Health Safety and Environment Conference and Exhibition, Society of Petroleum Engineers. Retrieved from toc.proceedings.com/00152webtoc.pdf

Lund Research Ltd. (2013). *Laerd Statistics*. Retrieved from www.statistics.laerd.com

Mattke, S., Balakrishnan, A., Bergamo, G., & Newberry, S. J. (2007). A review of methods to measure health-related productivity loss. *American Journal of Managed Care*, *13*(4), 211.

Maxwell, S. E. (2000). Sample size and multiple regression analysis. *Psychological Methods*, *5*(4), 434–458. http://doi.org/10.1037/1082-989X.5.4.434

McClain, E. (2013). Critical Synethesis Package: Stanford Presenteeism Scale (SPS-6). *MedEdPORTAL Publications*. http://doi.org/10.15766/mep_2374-8265.9602

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education & Behavior*, *15*(4), 351–377. http://doi.org/10.1177/109019818801500401

Merrill, R. M., Aldana, S. G., Pope, J. E., Anderson, D. R., Coberley, C. R., & Whitmer, R. W. (2012). Presenteeism according to healthy behaviors, physical health, and work environment. *Population Health Management*, *15*(5), 293–301. http://doi.org/10.1089/pop.2012.0003.

Mills, P. R., Kessler, R. C., Cooper, J., & Sullivan, S. (2007). Impact of a health promotion program on employee health risks and work productivity. *American Journal of Health Promotion*, *22*(1), 45–53. Retrieved from http://www.healthpromotionjournal.com

Mokdad, A. H., Jaber, S., Aziz, M. I. A., AlBuhairan, F., AlGhaithi, A., AlHamad, N. M., … Murray, C. J. L. (2014). Articles: The state of health in the Arab world, 1990–2010: an analysis of the burden of diseases, injuries, and risk factors. *The Lancet*, *383*, 309–320. http://doi.org/10.5888/pcd11.140176

Novick, L. F., & Mays, G. P. (2005). *Public health administration: principles for population-based management*. Sudbury, MA: Jones & Bartlett Learning.

Osborne, J., & Waters, E. (2002). Four assumptions of multiple regression that researchers should always test. *Practical Assessment, Research & Evaluation*, *8*(2), 1–9.

Ozminkowski, R. J., Dunn, R. L., Goetzel, R. Z., Cantor, R. I., Murnane, J., & Harrison, M. (1999). A return on investment evaluation of the Citibank, NA, Health Management Program. *American Journal of Health Promotion*, *14*(1), 31–43. Retrieved from http://www.healthpromotionjournal.com

Pronk, N. P., Martinson, B., Kessler, R. C., Beck, A. L., Simon, G. E., & Wang, P. (2004). The association between work performance and physical activity, cardiorespiratory fitness, and obesity. *Journal of Occupational and Environmental Medicine*, *46*(1), 19–25. http://doi.org/10.1097/01.jom.0000105910.69449.b7

Queyrouze, B. (2003). The invisible costs of presenteeism. *Health and Productivity Management*, *2*(1), 10–13. Retrieved from http://www.ihpm.org

Raosoft. (2004). Sample Size Calculator. Retrieved June 1, 2015, from http://www.raosoft.com/samplesize.html

Ravn, K. (2013, May 25). Don’t just sit there. Really. *Los Angeles Times*. Retrieved from http://articles.latimes.com/2013/may/25/health/la-he-dont-sit-20130525

Richard, L., Gauvin, L., & Raine, K. (2011). Ecological models revisited: their uses and evolution in health promotion over two decades. *Annual Review of Public Health*, *32*, 307–326. http://doi.org/10.1146/annurev-publhealth-031210-101141

Riedel, J. E., Lynch, W., Baase, C., Hymel, P., & Peterson, K. W. (2001). The effect of disease prevention and health promotion on workplace productivity: a literature review. *American Journal of Health Promotion*, *15*(3), 167–190. http://doi.org/10.4278/0890-1171-15.3.167

Robertson, I., Leach, D., Doerner, N., & Smeed, M. (2012). Poor health but not absent: Prevalence, predictors, and outcomes of presenteeism. *Journal of Occupational and Environmental Medicine*, *54*(11), 1344–1349. http://doi.org/10.1097/JOM.0b013e31825dff4b

Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behavior, *4*, 465–486. Retrieved from www.unc.edu

Sanderson, K., & Cocker, F. (2013). Presenteeism--implications and health risks. *Australian Family Physician*, *42*(4), 172–175. Retrieved from http://www.racgp.org.au/publications/

Saudi Aramco. (2013). Saudi Aramco Annual Report. Retrieved from www.aramco.com

Schmidt, H., Voigt, K., & Emanuel, E. J. (2013). The ethics of not hiring smokers. *New England Journal of Medicine*, *368*(15), 1369–1371. Retrieved from www.nejm.org

Schultz, A. B., Chen, C.-Y., & Edington, D. W. (2009). The cost and impact of health conditions on presenteeism to employers. *Pharmacoeconomics*, *27*(5), 365–378. http://doi.org/10.2165/ 00019053-200927050000002

Schultz, A. B., & Edington, D. W. (2007). Employee health and presenteeism: a systematic review. *Journal of Occupational Rehabilitation*, *17*(3), 547–579. http://doi.org/10.1007/s10926-007-9096-x

Serxner, S. A., Gold, D. B., & Bultman, K. K. (2001). The impact of behavioral health risks on worker absenteeism. *Journal of Occupational and Environmental Medicine*, *43*(4), 347–354. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Serxner, S., Gold, D., Anderson, D., & Williams, D. (2001). The impact of a worksite health promotion program on short-term disability usage. *Journal of Occupational and Environmental Medicine*, *43*(1), 25–29. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Stewart, W. F., Ricci, J. A., Chee, E., & Morganstein, D. (2003). Lost productive work time costs from health conditions in the United States: results from the American Productivity Audit. *Journal of Occupational and Environmental Medicine*, *45*(12), 1234–1246. http://doi.org/10.1097/01.jom.0000099999.27348.78

Sullivan, S. (2004). Making the business case for health and productivity management. *Journal of Occupational and Environmental Medicine*, *46*(6), S56–S61. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Szinovacz, M. E. (2011). Introduction: The aging workforce: Challenges for societies, employers, and older workers. *Journal of Aging & Social Policy*, *23*(2), 95–100. http://doi.org/10.1080/08959420.2011.555185

Tabachnick, B., & Fidell, L. (2007). *Multilevel linear modeling*. Boston, MA: Pearson/Allyn & Bacon.

Teutsch, S. (2010). A framework for public health in the United States. *Public Health Reviews*, *32*(1), 174–189. Retrieved from http://www.publichealthreviews.eu

Tsai, S. P., Wendt, J. K., Ahmed, F. S., Donnelly, R. P., & Strawmyer, T. R. (2005). Illness absence patterns among employees in a petrochemical facility: impact of selected health risk factors. *Journal of Occupational and Environmental Medicine*, *47*(8), 838–846. Retrieved from http://journals.lww.com/joem/pages/default.aspx

Turpin, R. S., Ozminkowski, R. J., Sharda, C. E., Collins, J. J., Berger, M. L., Billotti, G. M., … Nicholson, S. (2004). Reliability and validity of the Stanford Presenteeism Scale. *Journal of Occupational and Environmental Medicine*, *46*(11), 1123–1133. Retrieved from http://journals.lww.com/joem/pages/default.aspx

United States. Office of the Assistant Secretary for Health, & Surgeon General. (1979). *Healthy people: The Surgeon General's report on health promotion and disease prevention*. US Dept. of Health, Education, and Welfare, Public Health Service, Office of the Assistant Secretary for Health and Surgeon General: for sale by the Supt. of Docs., US Govt. Print. Off. Retrieved from http://profiles.nlm.nih.gov/ps/access/NNBBGK.pdf

Van den Heuvel, S. G., Geuskens, G. A., Hooftman, W. E., Koppes, L. L., & Van den Bossche, S. N. (2010). Productivity loss at work; health-related and work-related factors. *Journal of Occupational Rehabilitation*, *20*(3), 331–339. http://doi.org/10.1007/s10926-009-9219-7

VanLeeuwen, J. A., Waltner-Toews, D., Abernathy, T., & Smit, B. (1999). Evolving models of human health toward an ecosystem context. *Ecosystem Health*, *5*(3), 204–219. http://doi.org/0.1046/j.1526-0992.1999.09931.x

Vashist, S. K. (2015). EDITORIAL: Too much Sitting: A Potential Health Hazard and a Global Call to Action. *Journal of Basic and Applied Sciences*, *11*, 131–135. Retrieved from http://www.lifescienceglobal.com/independent-journals/journal-of-basic-and-applied-sciences

Williden, M., Schofield, G., & Duncan, S. (2012). Establishing links between health and productivity in the New Zealand workforce. *Journal of Occupational and Environmental Medicine*, *54*(5), 545–550. http://doi.org/10.1097/JOM.0b013e31824fe0c8

Winter, S. J., King, A. C., Stafford, R. S., Winkleby, M. A., Haskell, W. L., & Farquhar, J. W. (2011). Promoting culturally targeted chronic disease prevention research through an adapted participatory research approach: The Qassim-Stanford Universities project. *Translational Behavioral Medicine*, *1*(2), 289–298. http://doi.org/10.1007/s13142-011-0033-3

World Economic Forum. (2012). The workplace wellness alliance: Investing in a sustainable workforce. Retrieved from http://www3.weforum.org/docs/WEF_HE_WorkplaceWellnessAlliance_IndustryAgenda_2012.pdf

World Economic Forum. (2013). The workplace wellness alliance: Making the right investment – Employee health and the power of metrics. Retrieved from http://www3.weforum.org/docs/ WEF_HE_WorkplaceWellnessAlliance_Report_2013.pdf

World Health Organization. (1946, June 19). Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference. New York.

World Health Organization. (1986). *Ottawa Charter for Health Promotion: First International Conference on Health Promotion: Ottawa, 21 November 1986: WHO/HPR/HEP/95.1*. World Health Organization.

World Health Organization. (2005). STEPwise approach to surveillance (STEPS). Retrieved September 17, 2016, from http://www.who.int/chp/steps/en/

World Health Organization. (2013). Country cooperation strategy at a glance: Saudi Arabia.

World Health Organization. (2014). Saudi Arabia NCD profile. World Health Organization.

Appendix A: Health Risk Evaluation

مركز جونز هوبكنز
أرامكو الطبي
Johns Hopkins
Aramco Healthcare

Health Risk Evaluation

Name: ______________________________

Badge No.: ____________ Date: ____________

Gender: ☐ M ☐ F Nationality: ____________

Age: ____ Height (m): ____ Phone: ____________

Department/Business Line: ____________________

Location: ______________________________

Logon ID: ____________ Shift Work? ☐ Y ☐ N

OFFICIAL USE ONLY	
BP	
RHR	
Blood Glucose	
Co Reading	
Lung Age	

Lifestyle Indicators

Do you smoke (cigarettes/shisha)? or have you quit smoking within the past 6 months?	☐ YES	☐ NO
Do you participate in a physical activity for at least 30 minutes at least 3 times a week?	☐ YES	☐ NO
Overall do you feel that you are able to manage your stress levels well?	☐ YES	☐ NO
Do you get 7-9 hours of sleep most days of the week?	☐ YES	☐ NO
Do you sit more than 6 hours per day at work?	☐ YES	☐ NO
Do you eat a well-balanced, healthy diet at least **80%** of the time? According to the key points image below.	☐ YES	☐ NO

KEY POINTS:

- 50% of your plate is fruit and/or vegetables.
- Less than 50% grains are whole grains.
- Limit grains to 25% of plate (rice, bread, pasta etc.)
- Limit protien to 25% of plate (lean meat, beans, nuts etc.)

Your Healthy Behaviors

Small everyday changes can have a big impact on your health. Think about the changes you would be most interested in making over the next year. Look at the list below and **CHOOSE ONE** or **MORE**

☐ Exercise regularly
☐ Lose Weight
☐ Eat better
☐ Commit to keep up my current healthy behaviors
☐ Cut back or quit smoking/tobacco
☐ Others: ____________

Now that you have selected your health behaviors above, do you want to make some small lifestyle changes in this area to improve your health?

☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I don't want to make changes now		I want to learn about changes I can make		Yes I want to start making changes

Please check all that apply to you:		Do you have chronic pain in:
☐ Heart disease	☐ Cancer	☐ Shoulder(s)
☐ Chest pain brought on by physical activity	☐ COPD	☐ Back
☐ Chest pain without physical activity	☐ Asthma	☐ Knee(s)
☐ High blood pressure confirmed by a doctor	☐ Diabetes	☐ Neck
☐ Faint and/or dizzy spells	☐ Epilepsy	
☐ High cholesterol	☐ Arthritis	
☐ History of stroke	☐ Hernia	

Females only

Are you pregnant or have you recently had a baby?	☐ YES	☐ NO
Do you have a bone or joint problem that could be made worse by an increase in your physical activity?	☐ YES	☐ NO
Are you a male 45+ or female 55+ **AND** not used to vigorous exercise?	☐ YES	☐ NO
Has a doctor ever advised that you do ***only*** medically supervised physical activity?	☐ YES	☐ NO

Health and Productivity Management Scale

Please describe your work experiences in the *past month*. Note that the words "health problem" can be substituted with "back pain," "cardiovascular problem," "illness," "stomach problem," or other personal health issues.

If you don't have a health problem don't answer below and check this box: ☐

Questions:	**Strongly Disagree**	**Disagree**	**Uncertain**	**Agree**	**Strongly Agree**
1. Because of my (health problem), the stresses of my job are much harder to handle.					
2. Despite having my (health problem), I am still able to finish hard tasks in my work.					
3. My (health problem) often distracts me from taking pleasure in my work.					
4. I feel hopeless about finishing certain work tasks, due to my (health problem).					
5. At work, I am able to focus on achieving my goals, despite my (health problem).					
6. Despite having my (health problem), I feel energetic enough to complete all my work.					

To the best of my knowledge I have answered the above questions and agree to inform the wellcare program coach/instructor if there are any changes.

I also consent to have my data applied in the latest research that investigates the health and well-being of the Saudi Aramco workforce as explained by the wellcare team.

Signature: ____________________ **Date:** ____________________

Appendix B: Ethics Community Approval

Jhon Hopkins Aramco Healthcare
Office of Clinical Affairs
Dhahran Health Center, B-554, Room G11

Tel: 877 8268/3239 Fax: 877 8706

National Committee of the Bio Ethics #H-05-DH-044

February 26, 2015

Sarah Hayman
P.O. Box. 5256
Dhahran 31311
Phone: +966 13 877-8718
Email: Sarah.hayman@aramco.com

Re: ***IRB# 049: The Relationship between Health Risk and Productivity in Saudi Arabia.***

Dear Ms. Hayman

Thank you for submitting your proposal to Institutional Review Board (IRB).
The IRB determined that the proposed activity is a questioner to be filled by staff about routine practice. The research doesn't involve any patients or patienty data therefore, it falls under the following exempted criteria:

> *Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:*
>
> *i. Research on regular and special education instructional strategies, or*
>
> *ii. Research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods*

This research is to be terminated on February 26,2016. To extend the research, you need to submit Continuing Review Progress Report by Januray 2016.

Sincerely,

Dr. Salwa S. Sheikh MD, FCAP, ACPE
Chairperson, Institutional Review Board

cc:
Dr. Ramzi W Banda, Chief Medical Officer (CMO)
Dr. Amir Abdul Razack, Chief, Office of Clinical Affairs

Appendix C: Data Use Agreement

مركز جونز هوبكنز أرامكو الطبي
Johns Hopkins Aramco Healthcare

Johns Hopkins Aramco Healthcare Company
Medical & Technical Support Services Department
Preventive Medicine Services Division
Bldg 553, Rm 222, P.O. Box 76, Dhahran 31311, Saudi Arabia
☎: 877 8916 ℻: 877 8841

April 8, 2015

Samantha Horseman
Supervisor
Wellcare
Bldg 553
DHC

Dear Samantha

Re: Health Promotion Unit Data Access

At your request, this letter confirms that I have read and approved Sarah Hayman's (169751) Institutional Review Board (IRB) application for the study "The Relationship between Health Risk and Productivity in Saudi Arabia". Sarah received full IRB approval (IRB# 049) on February 26nd, 2015.

Sarah is authorized to have access to the Health Risk Evaluation database and employee hardcopies for the duration of her data collection. A reminder that this Saudi Aramco/JHAH data should be kept in a secure location and removal of employee names and/or badge numbers to maintain confidentiality.

If you have any further queries please do not hesitate to contact me.

Dr M Behisi
Chief(A)
Preventive Medicine Services Division

Appendix D: The Stanford Presenteeism Scale

The Stanford Presenteeism Scale (SPS – 6)

Directions: Please describe your work experiences in the past month. These experiences may be affected by many environmental as well as personal factors, and may change from time to time. For each of the following statements, please check one of the following responses to show your agreement or disagreement with this statement in describing your work experiences in the past month.

Please use the following scale:

. . . I strongly disagree with the statement

. . . I somewhat disagree with the statement

. . . I am uncertain about my agreement with the statement . . . I somewhat agree with the statement

. . . I strongly agree with the statement

	Strongly disagree	Somewhat disagree	Uncertain	Somewhat agree	Strongly agree
Because of my (health problem)*, the stresses of my job were much harder to handle					
Despite having my (health					

problem)*, I was able to finish hard tasks in my work.					
My (health problem)* distracted me from taking pleasure in my work.					
I felt hopeless about finishing certain work tasks, due to my (health problem)*.					
At work, I was able to focus on achieving my goals despite my (health problem)*					
Despite having my (health problem)*, I felt energetic enough to complete all my work.					

Scoring Instructions for the Stanford Presenteeism Scale (SPS-6)

For items #2, 5, and 6, score as following: “strongly disagree” = 1; “somewhat disagree” = 2; “uncertain” = 3; “somewhat agree” = 4; and “strongly agree” = 5. For items #1, 3, and 4, score as following: “strongly disagree” = 5; “somewhat disagree” = 4; “uncertain”

= 3; “somewhat agree” = 2; and “strongly agree” = 1. Then sum these scores for the SPS-6 total score. Scores can range from 6-30, with lower scores indicting lower Presenteeism, and higher scores indicating higher Presenteeism.