# A Gradient Analysis of Economic Development and Chronic Diseases. Case of Diabetes and Life expectancy in United Arab Emirates

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*This paper assessed the relationship between economic development and chronic diseases in United Arab Emirates (UAE), where a change in lifestyle has resulted in increases in non-communicable diseases for example diabetes. Diabetes is threatening to reverse previous gains in health status in the oil rich Middle East country. Though there is adequate literature on the status of diabetes in UAE, there is limited discussion on the intervention methods that can be used to control diabetes especially in the Gulf region. Faith and community-based participatory approaches show promise in engaging population and promote healthy lifestyles, while integration of technology in the healthcare sector has great potential to improve health outcomes in UAE and other emerging technology savvy economies.*

## INTRODUCTION

A healthy nation is considered as a major building block for economic development. In 2008, the World Health Organization (WHO) forewarned, "Non-communicable diseases (NCDs), mainly cardiovascular diseases, cancers, chronic respiratory diseases and diabetes will represent a major threat to global health and economic development' (WHO, 2008). Chronic diseases or non-communicable diseases (NCD) are costly and require specialist treatment that emerging economies can ill afford. Combating NCD's, therefore remains a major economic challenge to countries celebrating increase in life expectancy rates as a result of improved economic status, but are also bemoaning increases in the so called lifestyle diseases. Recent oil discoveries and tourism boom have seen United Arab Emirates propel itself into a major economic powerhouse. This economic progress has brought undoubted social benefits and opportunities for UAE citizens, including an increased life expectancy. Despite an increase in number of years not all of that time is spent in good health, where there is rising levels of obesity and an increase non-communicable diseases, for example diabetes.

A multi-faced solution consisting of epidemiological surveillance, primary prevention and secondary prevention is needed as many of the health sectors in emerging economies are feeling the pressures of increased economic burden of chronic diseases. These interventions need to be implemented through 'multifaceted multi-institutional' strategies that make efficient use of limited economic and human resources. Recent data on the global non communicable diseases (NCD) presents a depressing picture; NCD's are expected to be leading causes of deaths in all countries surpassing the so called infectious disease of AIDS, malaria and tuberculosis.

By 2012 the mortality incidences of non- communicable diseases increased from 38 million representing to 56 million deaths as predicated by the WHO. The increase in NCD's has presented a new global health challenge; whereas in the past the disease were confined to the relatively wealthy countries, there is shift to the low and middle - income countries (LMIC) accounting for 80% of the adult mortality

rates. It is estimated that between 2011 -2025 cumulative economic losses as a result of NCD's in LMIC will be at USD 7 trillion an economic burden that emerging economies can ill afford (WHO, 2014).

Chronic diseases require long term, costly and specialist treatment. Combating NCD's remains a major economic challenge to countries celebrating increase in life expectancy rates as a result of improved economic status, but are bemoaning increases in the so called lifestyle diseases. Approximately 300 million people in the world have diabetes, with the number predicted to rise above 435 million by the year 2030. In 2013 about two-thirds of all individuals with diabetes lived in LMICs where rapid urbanization, nutrition transition and increasingly sedentary lifestyles is fueling the epidemic. The figures are expected to rise unless drastic policies and programs are enacted (WHO, 2014).

In the Gulf Corporation Council region (GCC) investments made in healthcare since the first oil boom have started paying dividends. GCC nationals are enjoying much longer lives where average life expectancy across the region has increased from 60 years in the late 70's to 75 years in 2012 (IDF, 2013; Hu, 2011). However, the same GCC nationals are likely to suffer from health complications where western lifestyle has replaced the traditional lives and traditional eating habits. Urbanization and rising personal wealth, for example, has prompted many a local population to reject active outside activities and instead embraced fondness of processed foods and detestation of physical exercises. Chronic diseases and obesity related illness, previously uncommon in this region are on the rise. US management consultant McKinsey & Company forecasts that the total cost of healthcare delivery in the Gulf will increase to nearly $60bn by 2025, up from $12bn in 2007 (Rahim, Sibai, Khader etal, 2014).

In the United Arab Emirates (UAE) - a major economic powerhouse in the Gulf region- recent data suggest that 20% of the population has been diagnosed with diabetes and another 18% are at risk of developing it. Diabetes rates in UAE and the gulf region are forecast to triple by 2030, from 1.5 million cases in 2000 to 4 million in 2030 representing the second highest prevalence rates in the world (Ibid). The health cost of diabetes management is likely to rise to 43 billion dollars imposing a substantial financial burden not only to the UAE economy, but also to many households in the country. The financial costs of obtaining care also impose insurmountable barriers to access for some people, which illustrate the urgency of improving financial risk protection in health in LMIC settings and ensuring that NCDs are taken into account in these systems. Whereas in the past NCD's were considered to be health issues, recent data suggests that non-communicable diseases pose a serious economic development issue with severe financial burdens.

**Background**

In 1971 seven emirates (Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al Khaimah, Sharjah, and Umm Al-Quwain), united to form the United Arab Emirates (UAE). The United Arab Emirates (UAE) is a small, relatively young country, located in the Arabian Peninsula (Al-Maskari etal, 2013; Ibid). The discovery and development of oil and petroleum, construction and health care industries has transformed the past nomadic communities into a major industrial and commercial hub in the Gulf region (Grivn etal, 2012). The last ten years after independence has seen construction of the world tallest building- a major tourist attraction, the largest shopping complex (Dubai Mall) , Palm Dubai a man-made wonder exemplifying Dubai stronghold as major tourist attraction in the region. Earnings from the tourism and hospitality industries are in billions of dollars annually (Aw TC, 2010).

UAE's tremendous economic and industrial development has resulted in an increase in the affluence of the Emirati population. This economic progress has brought undoubted social benefits and opportunities for UAE citizens, including an increased life expectancy from 56 years in 1980 to 79 in 2009 (Blair and Sharif, 2012).

**PEARSON CORRELATION**
**BETWEEN GNI AND LIFE-EXPECTANCY IN UAE**
**Correlations**

| | | GNI per capita, PPP (current international $) | Life expectancy at birth, total (years) |
|---|---|---|---|
| GNI per capita, PPP (current international $) | Pearson Correlation | 1 | .995** |
| | Sig. (2-tailed) | | .000 |
| | N | 11 | 11 |
| Life expectancy at birth, total (years) | Pearson Correlation | .995** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 11 | 11 |

**. Correlation is significant at the 0.01 level (2-tailed).

Using data from the World Bank database- a score of 0.995 indicates that there is a highly positive correlation between economic development and life expectancy in UAE.

Meanwhile, a shift from a traditional semi-nomadic lifestyle to a modern, urbanized, and technology-driven lifestyle (increased purchasing power) has seen reduction in physical inactivity, overconsumption of energy-dense convenience foods with poor nutritional content- make UAE a perfect candidate for chronic diseases outbreak. Chronic diseases, for example, diabetes account for 66% of all deaths in UAE (Saadi etal, 2007). 20 per cent of the population has been diagnosed with the disease and another 18 per cent at high risk of developing it making UAE to have the second highest diabetes prevalence rates in the world (Saadi, et al., 2007; Barr, Robinson, Marin-Link, Underhill, Dotts, Ravensdale, & Salivaras, 2003).

**Table 1 Diabetes in UAE (2015)**

| | | | |
|---|---|---|---|
| Total adult population (1000s) (20-79 years) | 7,442 | Number of deaths in adults due to diabetes | 1,384 |
| Prevalence of diabetes in adults (%) (20-79 years) | 14.6 | Cost per person with diabetes (USD) | 2,155.9 |
| Total cases of adults (20-79 years) with diabetes (1000s) | 1,086.3 | Number of cases of diabetes in adults that are undiagnosed (1000s) | 387.2 |

*Source : International Diabetes Federation*

From the table it can be seen, in 2015, out of a population of 7.442 million in the United Arab Emirates, close to one million people had diabetes and another 387,000 number of cases that were undiagnosed.

**Table 2**
**BASELINE DIABETES PROJECTION (ADULT POPULATION 20 TO 79)**
**Type 2 diabetes**

| **YEAR** | **2010** | **2020** |
|---|---|---|
| Total Population (000) | 3,563 | 4,320 |
| Disease Cases (000) | 288 | 440 |
| Disease Prevalence (%) | 8.1% | 10.2% |
| Medical costs (US $ Millions) | $353 (AED 1.30 billion) | $563 (AED 2.07 billion) |
| Medical cost per case (US $) | $1,227 (AED 4507) | $1,281 (AED 4705) |

**Undiagnosed Type 2 Diabetes**

| YEAR | 2010 | 2020 | 2011-2020 |
|---|---|---|---|
| Total Population (000) | 3,563 | 4,320 | |
| Disease Cases (000) | 155 | 237 | **1,973** |
| Disease Prevalence (%) | 4% | 5% | **5.0%** |
| **Medical costs (US $ Millions)** | $190 (AED 697.8 million) | $303 (AED 1.11 billion | **$2,481 (AED 9.11 billion** |

**Prediabetes**

| YEAR | 2010 | 2020 | 2011-2020 |
|---|---|---|---|
| Total Population (000) | 3,563 | 4,320 | |
| Disease Cases (000) | 508 | 671 | **5,915** |
| Disease Prevalence (%) | 14.3% | 15.5% | 15.5% |
| Medical costs (US $ Millions) | $60 (AED 220.4 million) | $84 (AED 308.5 million) | **$721 (AED 2.65 billion)** |

*Source: UnitedHealth Group Modeling, 2010*

From the table it can be seen that the medical cost of type 2 diabetes is expected to rise from $353 (AED 1.30 billion) to $563(AED 2.07 billion) in 2020 unless health interventions are implemented within this period. According to the international Diabetes Federation report of 2013, the annual medical costs attributable to diabetes was $60 million (AED 220 million) for people with prediabetes and $597 million (AED 2.2 billion) for those with diagnosed and undiagnosed diabetes.

**Discussion: Eco- Social Gradient of Health and Research Outcomes**

Eco-social of health is a general term that is used to discuss determinants of health in a population. The idea of a "social gradient of health" has become an accepted part in the field of social determinants while gradient analysis refers to an individual's position in a socioeconomic hierarchy. For example, individuals with less income are at greater risk for poorer health than individuals with greater income (Braveman, Gerter and Williams, 2011).

Dasgupta and Weale (1992) argue by virtue of being a gradient, this principle applies to all income levels with not only the poorest being at greater risk of ill health than the richest, but also with the well-off being at risk of poorer health than the richest. In the context of international trends, the gradient demonstrates that poorer countries have worse health outcomes than wealthier counties. There is however debate on how the social gradient determines health outcomes. According to the "social inequality argument" in reference to the steepness of the gradient line: the greater the income inequality, the steeper the social gradient of health. Wilkinson (2006) concludes that the wealthiest nations do not necessarily have the best health. This is the unfolding reality in many of the emerging economies.

Recent studies, on gradient of health show that poor control of diabetes and hypertension contributes to significant cardiovascular morbidity and mortality, improving control of both has been found very effective in reducing overall outcomes and incidences of the major chronic diseases. In diversified and dynamic societies (Hajat, Harrison and Shather, 2012) posit that there are numerous factors that interact, to include both social and economic factors, research in control and management of diabetes and hypertension in these communities is however limited.

**Management of Diabetes**

Diabetes mellitus is a chronic disease that occurs when the pancreas is no longer able to make insulin, or when the body cannot make good use of the insulin it produces. Insulin is a hormone made by the pancreas, that acts like a key to let glucose from the food we eat pass from the blood stream into the cells in the body to produce energy. All carbohydrate foods are broken down into glucose in the blood. Insulin helps glucose get into the cells. There are three main types of diabetes: Type 1 diabetes used to be called juvenile-onset diabetes is usually caused by an auto-immune reaction where the body's defense system attacks the cells that produce insulin. People with type 1 diabetes produce very little or no insulin.

Due to the complex nature of diabetes, it is not only important to prevent but to improve the entire continuum of care from prevention to treatment and self-management. Several self-management strategies have therefore been implemented to manage illnesses and minimize the impact on patients, families and the health system. Katterl (2009) states that these strategies have been organized into models, which have produced some favorable outcomes including improvement of the physiological measures of disease, adherence to treatment, health service and self-reported health measures such as health-related quality of life.

While some are centered on patient education, motivational interviewing and health coaching, others follow a much broader approach of the way the patient relates to health providers and the community. However, the effectiveness of these models in the management of people with diabetes and other non-communicable disease has not been established. Self-management behavior: self-management (SM) can be defined as the "active management by individuals of their treatment, symptoms and lifestyle, physical and psychological consequences inherent with living with a chronic condition (Lorig and Holam, 2003). To achieve adequate self-management (SM) skills, individuals may require a series of SM interventions addressing their area of need. Effectiveness of SM models will be determined by evaluation of at least two key areas, such as, but not limited to whether people developed the skills to manage their own health and secondly, whether this has resulted in better health.

Norris, Engelgau and Narayan (2001), argue that the management of diabetes mellitus (DM) largely depends on patients' ability to self-care in their daily lives, and therefore, patient education is always considered an essential element of DM management. Studies have consistently shown that improved glycemic control reduces the rate of complications and evidence suggests that patients, who are knowledgeable about DM self-care, have better long-term glycemic control.

Although the prevalence of DM is high among populations in the Middle East and Gulf countries, patients often lack the knowledge and skills to self-manage their condition and although the International Diabetes Federation (IDF) in 2011 ranked the UAE's prevalence for type 2 DM as the tenth highest in the world (19.2%) Kamel, Badawy, El-zeiny and Merdan, (1999). Little is known about the knowledge, attitudes and practices of DM patients in the UAE. In 2006 a study by Alkaabi et al (2009) demonstrated poor levels of compliance and knowledge among DM patients in the UAE; for example, twenty-five percent only of the patients reported an increase in their physical activity levels following diagnosis with a mere 3% meeting the recommended guidelines and 76% could not distinguish between low and high carbohydrate glycemic index food items.

Despite an increase in number of years not all of that time is spent in good health. Combined with factors such as rising levels of obesity and related non-communicable disease, the demand for health services is requiring nations to consider new models of affordable health care. Given the level of disease burden, all staff, not just doctors, need to be part of the solution and encouraged to innovate and deliver better and more affordable health care, particularly preventative primary health care services (Barr, Marin-Link and Ravensdale, 2003). Allied health professions have been "defined as those professions that are distinct from medicine, dentistry, and nursing." Allied health professionals working in a multi- or interdisciplinary context have an important role to play in chronic disease management.

Examples include nurse-led, allied health-led, and student-led clinics; student-assisted services; and community empowerment models. These are reported for the interest of policy makers and health service managers involved in preventative and primary health service redesign initiatives. According to Chen, Bhutta and Frenk (2009), health professionals' preparation requires an increased emphasis on inter-

professional education, teamwork, and collaborative care (frequently referred to as inter professional practice) to support the delivery of effective integrated and well-coordinated health services. Top-down policy has limitations; therefore, communities, service users and lay educators must be engaged and involved in service planning and delivery processes.

In their study Bambra, Hillier, Moore and Cairns-Nagi (2013) indicates that, even the highest quality of clinical care to individuals with chronic condition will not guarantee improved health outcomes. The Expanded Chronic Care Model (ECCM) that integrates population health promotion into the delivery of chronic illness care, requires connections between health care systems and community resources. Self-management support is an integral component of the ECCM.

**Interventions in the United Arab Emirates**

There is little knowledge of diabetes among the local population. In a study by Al-Maskari et al (2013), only 3% of the population in UAE were meeting the recommended guidelines in controlling diabetes with 76% of the sample not able to distinguish between low and high carbohydrate glycemic index food items. Type 2 diabetes is reversible when treated at the initial stages, however, failure to recognize the onset of diabetes has witnessed progression of type 2 diabetes to type 1 diabetes with dire economic and financial costs. To lessen the impact of NCDs on individuals and society, a comprehensive approach is needed that requires a multi-sectorial approach. Traditional medical-led services can no longer suffice since the burden of disease is too large to be managed by one profession. New and innovative models of care must be developed and implemented.

Low-cost solutions exist to reduce the common modifiable risk factors (mainly tobacco use, unhealthy diet and physical inactivity, and the harmful use of alcohol). These interventions can be delivered through a primary health-care approach to strengthen early detection and timely treatment. When applied early and at various resource levels evidence shows that such interventions are excellent economic investments and overall can reduce the need for more expensive treatment. The greatest impact is thus (can be) achieved by creating healthy public policies that promote NCD prevention and control and reorienting health systems that address needs of people with such diseases, for example better nutrition and physical activities.

A study by Knowler etal (2002) tested an intensive lifestyle intervention with the goal of seven percent weight loss through a low-calorie, low-fat diet along with participation in a minimum of 150 minutes of moderate-to-vigorous physical activity per week. The study concluded that lifestyle intervention was more effective in preventing type 2 diabetes mellitus than pharmacological therapy. These studies highlight the importance of physical activity and exercise to manage risk and prevent progression to chronic disease. Exercise prescription in primary care may be an effective strategy to increase physical activity. A systematic review concluded that exercise prescription interventions were effective at increasing physical activity.

A three- faced extended solution consisting of epidemiological surveillance, primary prevention and secondary prevention is needed as many of the health sectors in emerging economies are feeling the pressures of increased economic burden of chronic diseases. These interventions need to be implemented through 'multifaceted multi-institutional' strategies that make efficient use of limited economic and human resources.

The policies, systems, and environments (PSEs) in communities, schools, workplaces, parks, transportation systems, faith-based organizations, and healthcare settings can significantly shape lives and health of communities. Elley, Kerse, Arroll and Robinson (2003), states that PSEs in communities that make healthy choices easy, safe, and affordable can have a positive impact on the way people live, learn, work, and play. Partnerships with community leaders in education, government, transportation, and business are essential in creating sustainable change to reduce the burden of chronic disease. PSE change is instrumental in creating and encouraging healthy behaviors in communities. Faith-based and community-based participatory approaches show promise for engaging population to change health outcomes. Evidence on faith- based led intervention in an Islamic country is limited or overly absent.

Places of worship, for example that serve as primary organizational units and sources of social support and leadership provide important avenues for intervention for health intervention programs.

The Mosque and role of the Imams- community leaders - have largely been overlooked and provide an ideal entry point for the intervention. UAE way of life is dominated and intertwined in the Islamic culture that is religiously followed and obeyed. Males and females are required and expected to attend place of worship at least twice a day in fulfillment of the religious codes. On Fridays it is mandatory for the males to attend to mosque services that are choreographed in line a weekly theme. It is during these sessions that individuals will be informed, motivated, and involved as partners in their own healthcare. Consistent messages of healthy choices that highlight importance of physical activities and proper nutrition will be promoted and encouraged through the Imams sermons.

Technology provides another avenue for intervention. In a country that is increasing embracing technology the population that is missed out in the faith led programs can be targeted trough traditional and Internet driven health programs. The term 'e-Health' is an umbrella term that covers a variety of concepts. Essentially, it refers to leveraging advancements in information technology for healthcare-related purposes. These include prescription management systems, mobile or Internet based patient monitoring systems, patient records management systems, electronic bill payment systems, image archiving systems, communications systems, and a variety of other examples. E-Health stakeholders include patients, healthcare professionals and healthcare providers, as well as vendors of technology, pharmaceuticals, healthcare equipment and consumables, insurance companies, and healthcare policy makers.

Countries in which there has already been extensive investment in the e-Health systems tend to have relatively sophisticated legal protection for personal data. In contrast, countries that have not yet had much investment in e-Health systems tend to have no legislation specifically pointed to the protection of privacy. One area of e-Health that is developing swiftly is 'm-Health', a term used for the provision of healthcare services supported by mobile devices. M-Health is particularly useful for providing public health education and awareness, training for healthcare workers, diagnostic and treatment support, data collection, remote monitoring and helpline-type services. In UAE like many emerging economies there is widespread use of mobile phones providing a tool and platform to further the health agenda.

SMS messages offering discreet public health information and mobile apps that result in better maintenance of a clinic's appointment schedule are basic examples of m-Health in action. Smartphones are carried on a person most of the day, allowing continual access to recommendations and information. The wide presence of smartphones has given rise to health apps, programs that are downloaded to mobile devices and can be used to target a wider audience especially in emerging economies where m-health is relatively in its early stages of development.

The integration of technology in the healthcare sector has great potential to improve healthcare generally. It can not only improve healthcare decision-making by both patients and healthcare providers, but also enhance the speed and promotion of healthcare interventions.

**Conclusion**

As elaborated by the United Nation, Non communicable diseases (NCDs) have grown to be the century's defining health and development challenge. Understanding how economic and social forces determine population health outcomes across the life cycle requires international collaboration and action. In response to the commitments made at the 2011 UN high-level meeting on non-communicable diseases (NCDs), countries have agreed to reduce premature mortality (defined as the probability of dying between the ages of 30 years and 70 years) from the four main NCDs—cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes by 25% relative to 2010 levels by 2025 (referred to as the 25×25 target) (Kontis etal , 2015).

The management of diabetes mellitus (DM) largely depends on patients' ability to self-care in their daily lives, and therefore, patient education is always considered an essential element of DM management. To achieve adequate self-management (SM) skills, individuals may require a series of SM interventions addressing their area of need. Low-cost solutions exist to reduce the common modifiable

risk factors (mainly tobacco use, unhealthy diet and physical inactivity). Interventions that can be delivered through a primary health-care approach to strengthen early detection and timely treatment should be identified and encouraged. Places of worship it has been demonstrated are potentially effective settings for implementing healthcare interventions.

Partnerships with community leaders in education, government, transportation, and business are essential in creating sustainable change to reduce the burden of chronic disease. To the wider population, technology provides an alternative of reaching a wider population who hitherto could have been left out in the faith- based led intervention programs.

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