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المحددات الاجتماعية والاقتصادية لانتشار الأمراض في الكويت

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ملخص: شهدت دول مجلس التعاون الخليجي خلال العقود الأربعة السابقة تنمية اجتماعية واقتصادية غير مسبوقة، يمكن ربطها بمصادرها النفطية وبتطورات أسواق النفط العالمية. ولكن كان لهذا الازدهار ثمن على مستوى الصحة العامة من خلال ما شهده الإقليم من تغيرات في أنماط الأمراض السائدة، وتمثل ذلك في ارتفاع شيوع الأمراض المزمنة (غير المعدية) بشكل واضح وملموس. وعلى الرغم من الأعباء الاقتصادية والمالية التي تفرضها تلك الأمراض على اقتصاديات الإقليم، فإن هناك القليل من الدراسات التي تطرقت إلى العوامل الاجتماعية والاقتصادية والديموغرافية الفردية والأسرية للأمراض في دول مجلس التعاون الخليجي. تستخدم هذه الدراسة بيانات ميدانية مسحية لأسر في الكويت تم استيفاؤها في عام 2009/2010 بهدف استقصاء مسببات الأمراض في الكويت. ونظراً لاختلاف طبيعة الأمراض وفترة حضانتها، تم القيام بتحاليل منفصلة للأمراض المزمنة من جهة والأمراض المعدية من جهة أخرى من خلال قياس نماذج Probit للمجموعتين. وأخذاً بالاعتبار خصوصية المكون الديموغرافي في الكويت، فقد تم قياس وتقدير النماذج لثلاث مجموعات سكانية: المجموعة الأولى تختص بإجمالي السكان، والثانية بالكويتيين، أما الثالثة فتتعلق بالوافدين. وتمهيداً لقياس النماذج، تم القيام بعدة اختبارات إحصائية للتأكد من مدى وجود اختلافات ذات معنوية إحصائية في قياس المعاملات الإحصائية للمجموعات السكانية الثلاث. وتعتبر نتائج الدراسة ذات قيمة بشأن المواضيع المتعلقة بالصحة العامة للسكان في الدول العربية المصدرة للنفط، التي تتمع بسمات اجتماعية واقتصادية مماثلة للكويت.

المصطلحات الأساسية: حدوث، أمراض مزمنة، أمراض معدية، Probit، الكويت.

Socio-economic Determinants of Morbidity in Kuwait

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Abstract: During the last more than four decades, the Gulf Cooperation Council (GCC) countries have experienced unprecedented socio-economic development, which is linked to their hydrocarbon resources and developments in the international crude oil market. However, the prosperity has come at a price for public health and the region has witnessed change in the disease pattern, whereby there has been significant rise in the chronic (non-communicable) diseases. Despite the economic and financial burden that these illnesses impose on the region's economies, there are hardly any studies that have looked at the socio-economic and demographic factors of individual and household morbidity in those countries. This paper used data from a survey of households in Kuwait completed in 2009/10 to investigate determinants of morbidity in the country. In view of differences in the duration and dynamics of different diseases, the analysis was conducted separately for chronic illnesses as a group and infectious diseases as a group by estimating Probit models for each group. Also, given Kuwait's demographic composition, the models were estimated for three population groups; whole sample, nationals only, and expatriates only. Prior to estimating the models, tests were conducted to determine if differences in the estimated coefficients across population groups warrant separate treatment. The findings of the study have relevance for oil-exporting Arab economies that have similar socio-economic characteristics with respect to issues related to public health.

Key words: Incidence, Chronic illness, Infectious disease, Probit, Kuwait

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Introduction

The Gulf Cooperation Council (GCC) region, which consists of Bahrain, Kuwait, Oman, Qatar, Kingdom of Saudi Arabia (KSA), and United Arab Emirates (UAE), was formed in May 1981 to promote coordination in policies for the region's socio-economic development. The GCC countries, with an estimated population in 2014 of approximately 50 million, share socioeconomic qualities, religious beliefs and demographic characteristics, and comprise a rapidly developing part of the world. During the last few decades, as a result of oil discovery and globalization, the region has witnessed surge in its income and socio-economic development, making it one of the wealthiest in the world. For instance, in terms of Human Development Index (HDI), the six GCC counties are ranked among top 52 countries, average HDI for the region has increased from 0.726 in 1990 to 0.826 in 2014, and average life expectancy in the region has increased from 71.2 years in 1990 to 76.2 years in 2014 (HDR 2015). However, the prosperity has come at a price for public health and during the same period, the GCC countries have experienced significant change in the pattern of disease. Whereas the share of communicable diseases in the causes of death has declined, that of non-communicable diseases (NCDs or chronic illness) has increased. In this context, some of the main NCDs are respiratory diseases, malignant neoplasms (or cancer), diabetes, and cardiovascular diseases (CVD). In 2012, four GCC countries (Bahrain, Kuwait, Qatar, and KSA) were among the 10 top countries with highest diabetes prevalence rates in the world (IDF 2012). Also, Hamdan et al. (2009), found that incidence rate for selected cancers among GCC nationals was equal to or higher than the industrialized countries. At the same time, Aljefree and Ahmed (2015), based on a systematic and comprehensive review of epidemiology of CHD, strokes, and related risk factors among adult population in the GCC countries, found lower incidence of strokes in the GCC countries compared to the developed countries, but those affected were relatively younger and observed high prevalence of key risk factors. Furthermore, the patterns of risk factors were found to be very similar among the GCC countries. Also, see Alamri et al. (2015) and Al-Nohair (2014).

As argued by Klautzer et al. (2014), the shift in the disease pattern (i.e., rise in chronic diseases) is driven by a complex multitude of factors, including the changes in lifestyles such as increased consumption of foods

rich in high saturated fats and refined carbohydrates coupled with a low dietary fiber intake, adoption of sedentary lifestyle with lower levels of physical activity, and genetic predisposition of the population. The rise in the chronic diseases has shown that national health care resources have been inadequate to meet the challenges, and it represents large burden on the economies both in terms of financial and human resources. According to one estimate, these illnesses are costing the regional economy three times what the GCC governments currently spend on healthcare annually, Strategy& (2013). Despite the recognition of the impact of the spread of diseases on economic development through population's health status and human capital formation, there are hardly any studies that have looked at the socio-economic and demographic factors of individual and/or household morbidity in the GCC countries.

This paper utilizes data from a household survey completed in 2009/10 to investigate determinants of morbidity in Kuwait. The household survey was conducted as a part of a study 'The Demand for Medical Services in Kuwait', which was conducted by the Kuwait Institute for Scientific Research (KISR) and partially financed by the Kuwait Foundation for the Advancement of Sciences (KFAS). For the survey a special questionnaire was prepared that covered a number of aspects (including household composition, socioeconomic-demographic background, monthly expenditure details, incidence of illness and utilization of medical care services), and a random and nationally representative sample of 1267 households covering all segments of the population (i.e., nationals and expatriates) and geographic regions of the country, was interviewed. Out of the total sample 659 (52%) were expatriate households and 608 (48%) were national households. The total number of individuals covered in the survey was 6,101; of which 46.8% were expatriates and 53.2% were nationals. Single person households, particularly bachelor expatriates, were excluded from the survey because most of them live in collective housing making it difficult to ascertain typical family characteristics and behavior.In view of the country's demographic composition; the analysis was conducted for each of the three population groups (i.e., overall population, nationals only, and expatriates only).Before estimating the models, appropriate statistical/econometric tests were conducted to ensure that sufficient evidence existed to warrant separate treatment of population groups.

Kuwait: Health Care System and Morbidity Patterns

In terms of area, Kuwait is one of the smaller countries in the world with a total area of approximately 18,000 m^2, of which less than 10 percent is inhabited, highly urbanized, and hardly any difference across different regions in terms of physical and transport infrastructure. It accounts for approximately seven percent of world's proven oil reserves (or 111,500 million barrels), which are expected to last more than 130 years. The oil sector contributes around 55 percent to country's gross domestic product (GDP) and more than 90 percent to government revenues. As a result of the developments in the international oil market, since the mid-1970s, it has experienced rapid economic transformation and development. A key aspect of this transformation has been sharp growth in the demand for social services (such as health and education). This growth in demand has been driven by rising income levels and standard of living, high population growth,demographic composition of the population, and welfare oriented policies adopted by the authorities, including provision of social services to the nationals free of charge. The free provision of social services is believed to have created superficial demand for those services. In view of rising costs and efficiency considerations, in recent years, the authorities have adopted necessary measures to increase the role and participation of the private sector in the provision of social services. As a result, the private markets for medical care and educational services are expanding.

The foreigners (or expatriates), who are temporary workers, account for approximately two-third of Kuwait's population.Whereas the population of the nationals has grown at its natural rate, which has been high, the population of the expatriates is mainly driven by the demand for labor in the economy and is controlled through government's immigration policy. As a result, the composition of the two population groups, in terms of gender and age structures, is very different. Because the two population groups differ from each other in terms of socio-economic background and face different sets of constraints (economic, social, political, institutional, etc.), it is generally believed that their behaviors regarding economic and social activities are different.

Like many developed and developing countries in the world, the health sector in Kuwait is a mix of both public and private health care

systems, but is dominated by public provision of medical care services that are publicly funded. This is mainly because, to distribute its oil wealth, during the last more than five decades, the government has pursued a welfare-oriented approach toward economic development. Under the policy, the authorities implemented plans and developed the public health care system to ensure that every national and resident of the country had access to health care. All types of medical care services are provided to the nationals free of charge (even any necessary treatment abroad) and to resident expatriates at subsidized rates through the public health care system. Up until 1994 the public medical care services were free of charge for the expatriate as well. Under the current law, in addition to the user fee, every expatriate is required to purchase public health insurance costing KD 50/- per year at the time of renewing his/her residence permit.The public insurance for resident expatriates covers basic health services, such as medical examination and treatment in government clinics and hospitals, regular dental treatment, laboratory tests and X-rays, surgeries, and cost of treatment and medication during stay in hospital. The fee for using public medical care services varies depending on residency status (resident vs. visitor) and type of service.

The public health care system in Kuwait consists of three levels; namely, primary, secondary, and tertiary. Primary care provides initial treatment in all areas of general health (including dental care, maternal care, child care, preventive care, and diabetes) through primary health care centers (referred to as area clinics) situated in residential areas. In the year 2013 there were 344 primary health care centers in the country, compared to 136 in 1975 (Table 1). Secondary care, which includes in-patient, out-patient, and diagnostic services, is provided through general hospitals, one in each governorate or medical zone. Secondary care is supported by specialized medical care, referred to as tertiary care, provided by specialty hospitals located in Al-Sabah Medical Zone and devoted to the treatment of chronic illnesses. At the end of year 2013, there were 16 hospitals in the country (six general and ten specialized), compared to 11 in 1975. While the number of secondary health care facilities has not increased since 1985, the size of the facilities has increased in terms of number of medical staff and hospital beds. Between 1975 and 2013, the number of physicians in the public health care system increased almost six times, from 932 to 7,151. At the same time, during

Table 1. Development of Medical Staff/Beds in Kuwait's Health Sector

Indicator	1975	1985	1995	2000	2005	2010	2013
Public							
Clinics	136	208	222	221	264	323	344
Hospitals	11	15	14	15	15	15	16
Physicians	932	2,528	2,788	3,204	4,150	5,680	7,151
Dentists	85	277	409	517	679	1,123	1,540
Nurses	3,660	8,187	7,618	8,232	9,419	15,283	16,649
Beds	4,056	6,226	4,409	4,903	4,903	6,338	6,756
Population per Physician	924.0	614.0	606.0	683.0	551.0	463.0	544.3
Population per Nurse	246.0	189.0	222.0	266.0	273.0	202.0	233.8
Population per Bed	241.0	294.0	383.0	479.0	520.0	485.0	576.1
Physicians per Bed	0.2	0.5	0.6	0.8	1.0	1.0	1.1
Nurses per Bed	1.0	1.6	1.7	1.8	1.9	2.4	2.5
Private							
Physicians	157	257	377	423	820	1,589	1,782
Dentists	24	33	68	54	239	511	658
Nurses	333	954	718	1,013	1,321	4,252	5,234
Beds		582	501	559	611	1,017	1,059
Population per Physician	6,711.8	6,778.5	4,318.1	7,275.0	6,778.0	3,945.0	2,184.0
Population per Nurse	3,164.4	1,826.1	2,267.3	2,641.0	2,682.0	1,516.0	743.6
Population per Bed	--	--	3,249.3	3,917.0	4,692.0	3,507.0	3,675.1
Physicians per Bed	--	--	0.8	0.6	0.7	0.9	1.7
Nurses per Bed	--	--	1.4	1.5	1.7	2.3	4.9

Sources: MOH (Various Issues).

the period, the number of nurses and hospital beds increased four times (from 3,660 to 16,649) and one-half time (from 4,056 to 6,756), respectively. While increases in the number of physicians and nurses has, to some extent, kept pace with increases in the population, as reflected by the developments in the population per physician and population per nurse ratios, increases in the hospital beds has lagged behind population growth (population per bed increased almost consistently between 1975 and 2013).

The size of the private health care system in Kuwait is relatively small compared to the public health care system. However, in recent years, as a result of the shift in government's policy toward private sector participation in economic activities, its size has increased sharply. Between 1975 and 2005, the number of private hospitals in the country remained unchanged at eight. Since 2005, however, four new private hospitals have started operating, and more are in different stages of completion. Between 1975 and 2013, the number of physicians working in the private health care system increased more

than 10 times (from 157 to 1,782), the sharpest increase occurred between 2000 and 2013. The same is true for nurses working in private hospitals/clinics (the number of nurses working in the private health care system increased from 333 in 1975 to 5,234 in 2013, an increase of almost 13 times; the sharpest increase occurred between 2005 and 2013). Increase in the number of hospital beds has been relatively slower and gradual, reflecting less demand for private in-patient services.

Morbidity is defined as departure from an overall status of health, but normally refers more specifically to the effect of illness, diseases or injury in a population (DesMeules, *et al.,* 2003). Ailments that afflict a population are generally categorized into two groups, depending on the duration of illness. Those that are of relatively shorter duration are classified as acute, which are also referred to as infectious (or communicable) disease. On the other hand, ailments that are of relatively longer duration are classified as chronic or non-communicable.

Table 2 presents prevalence rates, defined as number of notified cases per 100,000 populations,for infectious diseases in Kuwait for years 1985, 1995, 2005, 2010, and 2013. It may be noticed that variation has existed across years with respect to various types of notified communicable diseases. In 1985, the top ten infectious diseases were diarrhea,

mumps, measles, salmonella carrier, viral hepatitis (A), chickenpox, brucellosis, non-IV cholera, salmonella enteritis, and malaria. By 1995 the spread of a number of infectious diseases was reduced or eradicated. For example, both Non-IV Cholera and Brucellosis were completely eradicated, and the prevalence ratesof measles, salmonella enteritis,and mumps declined substantially. The prevalence of certain other infectious diseases was reduced; however, their rates have remained high.For instance, salmonella carrier, viral hepatitis (A), and diarrhea. It is worth noting that the prevalence of chickenpox and malaria increased in 1995.

By 2005, salmonella carrier was eliminated, whereas prevalence rates for measles, brucellosis and mumps were substantially reduced. At the same time, improvements were witnessed with respect to the prevalence of viral hepatitis (A), and hepatitis (B), malaria,salmonella enteritis, and diarrhea. However, the prevalence of chickenpox

Table 2. Prevalence Rates for Infectious Diseases in Kuwait*

Disease	1985	1995	2005	2010	2013
Cholera	6.6	0.0	--	--	--
Non-IV-Cholera (NAG)	34.8	0.0	--	--	--
Typhoid Fever	9.2	5.7	--	--	--
Typhoid Carrier	1.5	0.2	--	--	--
Para Typhoid Fever Type (A)	1.4	1.0*	--	--	--
Para Typhoid Fever Type (B)	0.8	--	--	--	--
Para Typhoid Carrier Type (B)	0.9	0.1	--	--	--
Para Typhoid Fever Type (C)	0.2	0.0	--	--	--
Salmonella Enteritis	33.7	12.8	--	--	--
Salmonella Carrier	89.2	51.7	--	--	--
Shigellosis	18.9	2.2	1.0	0.3	0.1
Shigella Carrier	0.5	0.0	--	--	--
Amebic Dysentery	1.1	0.4	--	--	--
Giardiassis	10.6	34.8	--	--	--
Food Poisoning	29.3	34.6	9.6	5.0	1.1
Viral Hepatitis (A)	88.3	29.1	11.4	12.0	11.2

Cont/ Table 2. Prevalence Rates for Infectious Diseases in Kuwait*

Disease	1985	1995	2005	2010	2013
Viral Hepatitis (B)	13.8	28.8	21.4	34.2	13.6
Viral Hepatitis non (A) Non (B)	1.0	0.3	--	--	--
Viral Hepatitis (C)	0.0	28.1	29.9	44.5	14.5
Viral Hepatitis Unspecified	45.1	7.5	--	--	--
Tetanus	0.1	0.1	0.0	0.0	0.0
Whooping Cough	1.3	2.6	3.8	1.9	0.8
Poliomyelitis	0.1	0.0	0.0	0.0	0.0
Measles	120.4	0.7	0.4	0.7	1.5
Rubella	41.0	6.2	2.7	1.2	0.2
Chicken Pox	83.4	171.1	228.1	57.5	72.5
Rabies	0.1	0.0	--	--	--
Mumps	172.9	14.2	3.0	3.3	0.0
Malaria	29.4	36.3	10.6	12.8	7.4
Filariosis	0.2	0.0	--	--	--
Rocky Mountain Spotted Fever	0.1	0.0	--	--	--
Brucellosis	68.2	11.7	--	--	3.1
Toxoplasmosis	0.1	0.0	--	--	--
Meningococcal Meningitis	0.4	0.5	0.7	0.2	0.1
Septic Meningitis	2.8	0.0	3.2	2.0	2.1
Aseptic Meningitis	1.6	0.0	--	--	--
Encephalitis	0.4	0.5	--	--	--
Mononucleosis Infections	1.2	0.9	--	--	--
Scarlet Fever	3.0	1.3	--	--	--
Herpes Zoster	2.7	3.7	--	--	--
Erysipelas	0.1	0.0	--	--	--
Streptococcal Sore throat	21.7	0.0	--	--	--
Leprosy	1.9	1.1	--	--	--
Lead Poisoning	0.4	0.0	--	--	--

Cont/ Table 2. Prevalence Rates for Infectious Diseases in Kuwait*

Disease	1985	1995	2005	2010	2013
Exanthema Subitum	0.3	0.0	--	--	--
Leishmaniusis	0.8	0.1	--	--	--
Enteropathogenic Escherichia Coli.	0.5	0.0	--	--	--
Notified Diarrhea	387.1	200.4	77.8	104.1	52.4
Non-polio Paralysis (AFP)	--	--	0.5	0.9	
Diphtheria	--	--	0.0	0.0	
Meningitis H. Influenza	--	--	0.1	0.3	0.1
Viral Meningitis	--	--	2.9	2.5	2.1
Salmonellosis	--	--	16.5	5.0	4.8
Typhoid Fever & Paratyphoid	--	--	2.2	2.4	1.2
H1N1	--	--	--	9.4	4.0
Others	--	46.5	--	--	--

Sources: MOH (Various Issues). **Note:** Rate per 100,000 populations.

increased sharply, and that of diarrhea remained somewhat high. Also, septic meningitis resurfaced, and for the first time, a large number of salmonellosis cases were reported. Alarmingly, the year 2010 witnessed increase in the prevalence of many of the infectious diseases. Notable among them were viral hepatitis (A), viral hepatitis (B), viral hepatitis (C), malaria, and diarrhea. Also, as a result of global epidemic, there were a large number of reported cases of bird flu virus (or H1N1) in 2009.

Overall, the evidence shows that after many years of continuous improvements in the prevalence of infectious diseases, in recent years, the trend had reversed. Improvements in life-style and education level, and awareness about personal health are believed to have contributed to the decline prevalence of infectious diseases. The recent reversal in trend, however, could be attributed to many factors, including inflow of large number of expatriate workers from different parts of the world where the diseases may be relatively more prevalent. Whatever the reasons, the increase in the prevalence of infectious diseases should be a cause of concern for the national authorities responsible for improvements in health status of the population.

The Analysis of prevalence of chronic conditions in Kuwait was conducted by utilizing statistics on discharges from public hospitals according to main chronic diseases. The discharge records enabled estimation of hospitalization rates, and allowed assessment of the types of hospital morbidity and prevalence of chronic diseases. Table 3 shows discharge rates per 1000 population from public hospitals according to International Classification of Disease (ICD) code for selected years. It is evident that maternal-related conditions (such as delivery, complications of pregnancy, abortive outcomes, and other maternal care) reported the highest hospitalization rates in 1985. Among other chronic diseases, asthma, appendix, tonsils/adenoids, anemia, and diabetes were the leading cause of hospitalization in 1985.

Although hospitalization rate for delivery declined over the years, overall the maternal-related conditions remain the highest cause of hospitalization.The decline in the rate for delivery might be the result of increased demand for private hospitals for such service. After remaining relatively low up until 2005, the hospitalization rates for most other chronic illnesses show sharp increase in 2010 but have declined since then. This is particularly true for diarrhea/gastroenteritis, anemia, diabetes, myocardial infarction, other ischemic heart diseases, acute upper respiratory infection, pneumonia, chronic tonsils, asthma, appendix, and urinary system diseases. Overall, the evidence

Table 3. Discharge Rates from Government Hospitalsby Causes

ICD Code	Causes	Rate				
		1985	1998	2005	2010	2013
5	Diarrhea/Gastroenteritis	--	3.2	1.2	5.5	2.2
34	Varicella and Zoster	--	1.7	--	1.1	0.7
98	Other Anemia	1.2	1.6	1.5	4.7	1.9
104	Diabetes	1.1	--	1.0	3.2	1.6
133	Cataract	--	1.4	--	1.3	0.6
147	Myocardial Infarction	--	--	0.8	3.3	1.8
148	Other Ischemic Heart Diseases	--	4.8	2.8	9.9	4.7
167	Acute Upper Resp. Infections	0.8	2.0	0.9	3.0	0.8

Cont/ Table 3. Discharge Rates from Government Hospitalsby Causes

ICD Code	Causes	Rate				
		1985	1998	2005	2010	2013
169	Pneumonia	--	1.9	1.6	6.3	2.6
173	Chronic Tonsils/Adenoids	1.4	--	1.5	5.5	2.6
176	Asthma	1.7	2.3	1.2	3.0	1.4
179	Other Diseases of Respiratory System	--	1.8	0.8	3.1	1.3
186	Diseases of Appendix	1.7	1.8	1.0	3.1	1.3
192	Other Dis. of Intestines/Peritoneum	--	1.7	--	2.5	1.0
195	Cholelithiasis	--	1.4	0.8	3.1	1.7
215	Urolithiasis	0.8	1.4	--	2.0	1.1
217	Dis. Urinary Sys.	--	--	1.0	4.0	1.7
236	Abortive Outcomes*	4.1	--	4.5	5.8	2.5
239	Other Maternal Care*	2.6	5.5	4.1	5.1	2.4
242	Pregnancy Complications*	5.7	15.8	11.3	12.4	5.7
243	Single Spontaneous Delivery*	40.6	26.6	18.7	19.3	8.0
267	Abdominal/Pelvic Pain	0.9	2.0	--	3.0	1.1
270	Other Symptoms	1.1	4.6	1.9	5.3	2.8
274	Fractures	--	1.6	1.0	3.3	1.8
281	Other Injuries	--	2.5	1.5	5.0	2.0

Sources: MOH (2010). *Representshospitalization rate per 1000 female population.

demonstrates that, over the years, the incidence of most chronic illnesses in Kuwait has increased, particularly in recent years (i.e., during the last 7-8 yrs). This should be a cause of concern for national authorities responsible for improving/maintaining health status of the country's population.

Evidence from the household survey on number of individuals reported suffering from chronic illness and infectious disease is presented

in Table 4. The chronic illnesses reported by the individuals include cancer, heart, obesity, metabolic disorder (diabetes), respiratory system (asthma, wheezing, etc.), allergy, renal system (kidney failure, stone, UTI), gastro-intestinal tract (digestion, bowel), inflammatory bowel, immune system, arthritis, gynecology, psychiatric, neurological, dental, ENT, ophthalmology, rheumatic (pain), dermatology (skin), anemia, and other. The infectious diseases include respiratory (viral and/or bacterial, such as fever, flu, cold, throat, ear, TB, etc.), gastro-intestinal (viral and/or bacterial, such as diarrhea, hepatitis, appendicitis, gallbladder, etc.), skin, eye, typhoid, chicken pox, measles, and other.Approximately 19% of the sample population reported suffering from chronic illnesses; the incidence among the Kuwaitis was 23% (or roughly one in every four Kuwaitis) and that among the expatriates was 14% (or one in every seven expatriate). Irrespective of nationality and gender, the incidence was found to be lowest among children of 0 - 5 yrs of age and highest among adults of 22+ yrs of age, confirming that vulnerability to chronic illness and incidence increases with age. Also, in general, irrespective of age and nationality, females had relatively higher incidence of chronic illness compared to their male counterparts.

In addition to chronic illnesses, 33% (or one-third) of the sample population reported to have suffered from infectious diseases during the 12 month period prior to the survey. Unlike chronic illnesses, the incidence of infectious disease among the Kuwaiti and expatriate populations was more or less comparable; 34% for expatriates and 32% for Kuwaitis. Also, in general, irrespective of nationality and gender, the incidence of Infectious disease decreased with age. It was highest among children (i.e., 0 - 5 yrs age group) and generally lowest among adults 22+ yrs of age. Finally, as for chronic illness, irrespective of age and nationality, generally incidence of infectious disease was relatively higher among females compared to their male counterparts.

Table 4. Persons Reporting Suffering from Chronic Illness and Infectious Disease by Age Group, Nationality, and Gender

Illness Type Age Group (Yr.)	Expatriate			National			Overall		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
Chronic Illness 0 - 5	6 (3.05)	3 (1.33)	9 (2.13)	13 (6.37)	10 (4.74)	23 (5.54)	19 (4.74)	13 (2.98)	32 (3.82)
5 - 15	15 (4.64)	15 (4.41)	30 (4.52)	31 (9.31)	44 (10.84)	75 (10.15)	46 (7.01)	59 (7.91)	105 (7.49)
15 - 22	9 (6.04)	6 (3.97)	15 (5.00)	84 (20.39)	38 (14.45)	122 (18.07)	93 (16.58)	44 (10.63)	137 (14.05)
22+	141 (19.34)	196 (26.45)	337 (22.93)	299 (42.35)	240 (33.76)	539 (38.04)	440 (30.66)	436 (30.03)	876 (30.34)
Overall	171 (12.23)	220 (15.10)	391 (13.70)	427 (25.80)	332 (20.87)	759 (23.38)	598 (19.59)	552 (18.11)	1,150 (18.85)
Infectious Disease 0 - 5	119 (60.41)	134 (59.56)	253 (59.95)	119 (58.33)	124 (58.77)	243 (58.55)	238 (59.35)	258 (59.17)	496 (59.26)
5 - 15	111 (34.37)	130 (38.24)	241 (36.35)	95 (28.53)	114 (28.08)	209 (28.28)	206 (31.40)	244 (32.71)	450 (32.10)
15 - 22	33 (22.15)	37 (24.50)	70 (23.33)	150 (36.41)	71 (27.00)	221 (32.74)	183 (32.62)	108 (26.09)	291 (29.85)
22+	219 (30.04)	118 (15.92)	407 (27.69)	201 (28.47)	170 (23.91)	371 (26.18)	420 (29.27)	358 (24.66)	778 (26.95)
Overall	482 (34.48)	489 (33.56)	971 (34.01)	565 (34.14)	479 (30.11)	1,044 (32.16)	1,047 (34.29)	968 (31.76)	2,015 (33.03)

A Morbidity Model

Health is considered to be one of the most valuable personal and universal rights. It is well established that improvements in the health status of population (or human capital) is not only an important means of increasing productivity and economic growth, but is also an end in itself. In his pioneering contribution in the form of formal economic model of the determinants of health, Grossman (1972a, 1972b) assumed a person's health as a capital stock that exogenously depreciates at an increasing rate with age. One of the main factors that impact the rate at

which a person's stock of health depreciates is morbidity or a state of ill health. There is a large body of epidemiological studies on almost every country that has investigated the patterns, causes, and effects of health and specific illnesses in different population groups. At the same time, the broad impact of the spread of diseases on economic development and prosperity of a country is widely recognized, and the focus of the literature is on the determinants of individual and household morbidity in various countries.

As the incidence of illness is a discrete variable that takes the value 1 if the person was reported to be ill and the value 0 otherwise, a following Probit regression model is specified to examine determinants of incidence of illness in Kuwait:

$$P(\text{Illness} = 1) = f(X1)$$

where X1 is a vector of explanatory (or control) variables. A number of factors are believed to determine incidence of illness in a population. While there is no consensus on any specific explanatory variables, a number of approaches and perspectives have been proposed to examine determinants of health or incidence of illness. As such, there is a general understanding on a broad group of factors that influence health of a population. Raphael (2006) provides an overview of different approaches that have been proposed in the literature and the main determinants of health in developed countries.

For this study, the set of explanatory variables included in the regressions consisted of five broad categories: personal characteristics, also known as predisposing characteristics (age, age-squared, age group, gender, nationality, marital status, head of household, completed education, and occupation), household socioeconomic status (family type, household income, household size, dwelling type, dwelling size, and tenancy status), consanguineous marriage practices (premarital relationship between spouses, parents, and grandparents), family health status (illness status of parents and grandparents), and participation in health promoting activities (frequency of drinking milk, eating fresh fruits, eating at restaurants, eating fast food; playing sports; membership of sports/health club; regular medical checkup; and whether smoker). Age reflects the health depreciation function emphasized by Grossman

(1972a). The variable is included with its squared term to explore non-linearity in the relationship. Education is taken as a measure of the efficiency of individuals in combining market goods and time to produce health. Employment status and occupation capture the demoralizing effects and neglect of low employment status and/or occupation on health.Education is described by seven indicators or dummy variables (less than primary, primary, intermediate, secondary, diploma, bachelor, and master/Ph.D.). Similarly, occupation is defined by 10 indicators (management, specialist, technician, clerical, sales, services, engineering support, security, student, and housewife). Except for age, age-squared, household income, household size, dwelling size, and frequencies for drinking milk, eating fresh fruits, eating at restaurants, and eating fast food, all other explanatory variables in the models are dummy variables that take values 1 or 0.

A priori, it is difficult to comment on the nature of relationship (or sign of the estimated coefficients with respect to different explanatory variables) between incidence of illness and the explanatory variables in each category of factors, because there is no clear theoretical basis and the signs can vary across countries and population groups. As such, the relationship needs to be established empirically. Broadly speaking, however, participation in health promoting activities should lower the probability of a person falling ill. Consanguineous marriage is included to examine if the practice of marrying a close relative has any relationship with incidence of illness, as suggested by medical science. As relatives share a proportion of their genes, it is much more likely that related parents will be carriers of an auto-somal recessive gene, and therefore their off-springs are at a higher risk of an auto-somal recessive genetic disorder. As per the household survey data, around 1.4 % of the Kuwait's surveyed population reported to be suffering from congenital birth defects (Kuwaitis 2 % and expatriates 0.7 %). As many of the chronic illnesses, such as heart, obesity, diabetes, hyper-tension, etc., which are relatively more common in the country, are linked to genetic disorder, in this paper association between consanguineous marriage and chronic illnesses was examined rather than with congenital birth defects. The inclusion of family health status is intended to capture if history of illness in the family has any bearing on the probability of a person being ill.

As the incidence of chronic and infectious ailments were observed to be different across different populations groups, following Ghosh (2006) the model was estimated separately for each illness type and within each illness type for full sample, nationals only, and expatriates only. Prior to estimating the models, the Chow test was conducted to determine if the observed differences in illness across different population groups were statistically different to warrant separate treatment of groups, and, hence, estimation of the model for each group. For details on Chow test, see Chow (1960) and Greene (2012, Ch. 6). To allow for the easiest set of testing circumstances, only similar variables were used in performing the Chow test.

Within the context of a four-part model, Irving and Kingdon (2009) used Probit regression to study factors that influence incidence of illness in South Africa. On the other hand, to correct for selectivity in the estimation of the choice of provider and expenditure on MCS in Nepal, Rous and Hotchkiss (2003) used a three-part model and controlled for endogenous illness by estimating a logistic regression for incidence of illness. Similarly, Deolalikar and Laxminarayan (2000) used Logit regression to examine determinants of illness and disease transmission in Cambodia. Costa-Font and Gill (2006) examined influence of obesity jointly with other determinants on prevalence of diabetes, heart disease, hypertension, and high cholesterol in Spain using seemingly unrelated Probit model. Dror *et al*. (2009) estimated a single equation model using ordinary least squares (OLS) method to investigate incidence of illness in India.

Results and Discussion

The results of the Chow test, which includesthe test statistics, degree of freedom, p-value, and the decision whether the differences in the estimated coefficients across the groups were statistically significant, are reported in Table 5. The null hypothesis of no difference in the estimated coefficients across different population groups is rejected if the p-value is 0.05 or smaller and is taken as statistical evidence that the sub-populations are worthy of being estimated separately. In the case of infectious disease, the evidence demonstrates a definite and significant difference in the estimated coefficients for nationals vs. expatriates, suggesting that the estimated coefficients are statistically different across

nationality and that the model should be estimated separately for the two groups. As for chronic illness, the p-value was 0.128, which demonstrates that there is weak or no statistical difference in the estimated coefficients. Thus, depending on the type of illness, the investigation into incidence of illness in Kuwait should consider taking into account the nationality factor and treating the two population groups separately.

Table 5. Chow Test Results: Model - Incidence of Illness

Illness Type/Group	Test Decision	DF	P-Value	Decision Different
Chronic Illness Nationals vs. Expatriates	71.4	59	0.12840	
Infectious Disease Nationals vs. Expatriates	135.2	58	4.12E-08	Yes

The results for estimated models by type of illness (chronic vs. infectious) and population groups (full sample, nationals only, and expatriates only) are presented in Table 6. Depending on the population group and illness type, the pseudo-R^2ranged between 0.083 and 0.296.For more details on pseudo-R^2, see Greene (2012, Ch. 14) and Maddala (1998, Ch. 8). Irrespective of the population groups (i.e., full sample, Nationals only and expatriates only) the logarithms of likelihood function (Log-L) values for chronic illness are always greater than those for infectious disease. Similarly, the Akaike information criterion (AIC), and Bayesian information criterion (BIC) values for chronic illness are always smaller than those for infectious disease. See Greene (2012) for details on Log-L, AIC, and BIC, and relationship among them, is provided by Greene (2012). The evidence demonstrates that the models for the incidence of chronic illness exhibited better fitcompared to models for the incidence of infectious disease. The Wald test statistic along with its associated p-values show that the null hypothesis is rejected in all cases,indicating that the estimated coefficients are not simultaneously equal to zero. In other words, the inclusion of the explanatory variables resulted in a better fit of the models, compared to not using any variables at all.

Table 6. Estimated Probit Model by Illness Type and Population Group

Infectious Disease	Chronic Illness			Explanatory Variable		
	Full Sample	Nationals	Expatriates	Full Sample	Nationals	Expatriates
Personal Characteristics						
Age	-0.03661*** (-4.44)	-0.02548* (-2.36)	-0.06279*** (-5.40)	0.04744*** (5.30)	0.04412*** (3.91)	0.05316*** (3.37)
Age-Squared	0.00045*** (4.38)	0.00029* (2.15)	0.00080*** (5.64)	0.00001 (0.08)	0.00006 (0.43)	-0.00006 (-0.31)
Gender: Male	-0.08216 (-1.85)	-0.15652** (-2.61)	0.04732 (0.70)	-0.09732 (-1.59)	-0.11625 (-1.53)	-0.03307 (-0.30)
Nationality: National	0.23895*** (3.43)			0.31924*** (3.59)		
Marital Status						
Currently Married	0.05258 (0.58)	0.08951 (0.77)	-0.02957 (-0.19)	0.06314 (0.58)	0.11574 (0.87)	0.02685 (0.12)
Never Married (Single)	-0.03542 (-0.23)	0.05046 (0.28)	-0.20149 (-0.66)	0.43846** (2.68)	0.52301** (2.76)	0.21936 (0.63)
Head of Household	0.03744 (0.46)	0.15260 (1.41)	-0.08579 (-0.66)	-0.00629 (-0.07)	-0.06585 (-0.55)	0.04429 (0.27)
Education						
Less than Primary	-0.29107** (-3.20)	-0.31500* (-2.55)	-0.12482 (-0.89)	-0.06504 (-0.54)	0.01002 (0.07)	-0.06510 (-0.33)
Primary	-0.16597 (-1.58)	-0.35822* (-2.58)	0.26246 (1.64)	-0.18213 (-1.42)	-0.02535 (-0.16)	-0.35007 (-1.63)
Intermediate	-0.20768 (-1.89)	-0.29151* (-2.01)	0.04333 (0.26)	-0.30266* (-2.33)	-0.11976 (-0.73)	-0.54331* (-2.40)
Secondary	-0.10690 (-0.95)	-0.15624 (-1.04)	0.06679 (0.40)	-0.44832*** (-3.41)	-0.30008 (-1.78)	-0.62874** (-2.93)
Diploma	-0.22631 (-1.81)	-0.43137* (-2.47)	0.15627 (0.85)	-0.46563** (-3.15)	-0.35247 (-1.80)	-0.58665* (-2.45)
Bachelors	-0.17952 (-1.49)	-0.48336** (-2.76)	0.22157 (1.30)	-0.48830*** (-3.46)	-0.34147 (-1.74)	-0.64734** (-2.90)
Master/Ph.D.	-0.40232 (-1.54)	-0.61822 (-1.80)	-0.20767 (-0.54)	-0.53880* (-1.97)	-0.49054 (-1.33)	-0.51305 (-1.22)

Cont/ Table 6. Estimated Probit Model by Illness Type and Population Group

Infectious Disease	Chronic Illness			Explanatory Variable		
	Full Sample	Nationals	Expatriates	Full Sample	Nationals	Expatriates
Occupation						
Management	0.06372 (0.44)	0.35939 (1.53)	0.01700 (0.08)	-0.07187 (-0.47)	-0.12477 (-0.47)	-0.30498 (-1.34)
Specialist	-0.02973 (-0.19)	0.16807 (0.73)	-0.17709 (-0.75)	-0.32105 (-1.89)	-0.31561 (-1.26)	-0.49982 (-1.94)
Technician	-0.13834 (-1.24)	-0.21490 (-1.30)	-0.02878 (-0.16)	-0.31165* (-2.47)	-0.20516 (-1.15)	-0.52949* (-2.44)
Clerical	-0.18133 (-1.59)	-0.29057* (-2.03)	-0.00744 (-0.04)	-0.35752** (-2.77)	-0.33193* (-2.11)	
Sales	0.03108 (0.18)			-0.13171 (-0.69)	-0.50113 (-1.05)	-0.38696 (-1.63)
Services	-0.08026 (-0.85)	-0.16243 (-1.11)	0.20304 (1.00)	-0.12469 (-1.20)	-0.03258 (-0.21)	-0.38513* (-2.10)
Engineering Support	-0.18349 (-1.39)	-0.14656 (-0.68)	0.05085 (0.33)	-0.17871 (-1.18)	-0.01588 (-0.07)	-0.49367* (-2.03)
Security	-0.16141 (-1.25)	-0.23486 (-1.64)	-0.14455 (-0.74)	-0.37021** (-2.67)	-0.26986 (-1.76)	-0.70178 (-1.64)
Student	-0.26220*** (-3.44)		-0.39214 (-0.92)	0.15219 (1.58)	0.23327 (1.86)	-0.09010 (-0.56)
Housewife	-0.04069 (-0.43)		-0.32457** (-2.70)	-0.22367* (-2.11)	-0.13933 (-1.02)	-0.41000* (-1.99)
Household Socioeconomic Status						
Family Type: Nuclear	-0.27606*** (-3.96)	-0.24736** (-3.19)	-0.22006 (-1.29)	-0.02555 (-0.30)	-0.00543 (-0.06)	-0.20372 (-0.90)
Household Income	-0.00004* (-2.02)	-0.00005* (-2.33)	0.00005 (0.89)	0.00001 (0.49)	0.00002 (0.85)	-0.00007 (-1.00)
Household Size	-0.01886* (-2.08)	-0.01194 (-1.00)	-0.02781 (-1.84)	0.00500 (0.45)	-0.01140 (-0.80)	0.03154 (1.65)
Dwelling Type						
Villa/House	-0.14167 (-1.14)	-0.36770 (-1.75)	0.10315 (0.59)	-0.12861 (-.80)	-0.00006 (-0.00)	-0.41912 (-1.85)

Cont/ Table 6. Estimated Probit Model by Illness Type and Population Group

Infectious Disease	Chronic Illness			Explanatory Variable		
	Full Sample	Nationals	Expatriates	Full Sample	Nationals	Expatriates
Apartment	-0.09149 (-0.78)	-0.33824 (-1.51)	0.01275 (0.09)	0.19886 (1.26)	0.30683 (1.12)	0.15932 (0.84)
Dwelling Size: Rooms	-0.01977** (-3.11)	-0.01763** (-2.61)	-0.03618 (-1.75)	0.00468 (0.71)	0.00180 (0.25)	0.06064* (2.48)
Tenancy Status						
Owner	0.07062 (0.86)	0.00267 (0.03)		0.09994 (0.94)	0.15527 (1.20)	
Tenant	0.20346* (2.27)	0.26594* (2.49)		-0.10651 (-0.88)	-0.01910 (-0.14)	
Consanguineous Marriage Between Spouses						
First Cousins	-0.20776** (-2.86)	-0.28358** (-2.84)	-0.13423 (-1.22)	0.06368 (0.82)	0.02400 (0.23)	0.11880 (1.00)
Other Cousins	0.15548 (1.73)	0.19659 (1.67)	0.05110 (0.34)	0.12179 (1.22)	0.06997 (0.54)	0.22598 (1.46)
Other Relatives (Parents' Cousins)	-0.55924* (-2.21)	-1.07804* (-2.28)	-0.11736 (-0.37)	0.18357 (0.84)	0.14186 (0.44)	0.23034 (0.77)
Between Parents						
First Cousins	-0.09582 (-1.76)	-0.26123*** (-3.62)	0.09407 (1.10)	-0.00472 (-0.07)	-0.00493 (-0.06)	0.02727 (0.24)
Other Cousins	0.07067 (1.21)	-0.02548 (-0.33)	0.15919 (1.67)	0.01359 (0.19)	0.03276 (0.34)	0.01510 (0.12)
Other Relatives (Parents' Cousins)	-0.13122 (-0.90)	-0.18429 (-0.91)	-0.01825 (-0.08)	0.05691 (0.30)	0.24047 (0.98)	-0.12747 (-0.40)
Between Paternal Grandparents						
First Cousins	-0.06791 (-1.00)	0.05172 (0.60)	-0.30723** (-2.60)	-0.00684 (-0.08)	0.01357 (0.13)	-0.15690 (-0.95)
Other Cousins	-0.10737 (-1.65)	-0.03469 (-0.42)	-0.24856* (-2.20)	0.01511 (0.18)	-0.02013 (-0.19)	0.05962 (0.41)
Other Relatives (Parents' Cousins)	-0.26343 (-1.58)	-0.36846 (-1.79)	-0.17342 (-0.56)	-0.55957* (-2.30)	-0.77467* (-2.41)	-0.30876 (-0.87)

Cont/ Table 6. Estimated Probit Model by Illness Type and Population Group

Infectious Disease	Chronic Illness			Explanatory Variable		
	Full Sample	Nationals	Expatriates	Full Sample	Nationals	Expatriates
Between Maternal Grandparents						
First Cousins	-0.02634 (-0.36)	0.06616 (0.74)	-0.15564 (-1.17)	0.15146 (1.68)	0.20950 (1.90)	0.01663 (0.10)
Other Cousins	-0.05363 (-0.82)	-0.02570 (-0.32)	-0.08975 (-0.78)	0.10012 (1.13)	0.13155 (1.21)	0.09019 (0.56)
Other Relatives (Parents' Cousins)	-0.28453 (-1.47)	0.07653 (0.31)	-0.43230 (-1.37)	-0.16349 (-0.64)	-0.06121 (-0.17)	-0.19057 (-0.60)
Family Health Status						
Father Chronically Ill	-0.02520 (-0.66)	-0.02293 (-0.43)	-0.02144 (-0.38)	0.11593* (2.47)	0.17061** (2.73)	0.04338 (0.59)
Mother Chronically Ill	0.08944* (2.29)	0.19646*** (3.56)	-0.04020 (-0.68)	0.36459*** (7.61)	0.42085*** (6.56)	0.28342*** (3.77)
Paternal Grandfather Chronically Ill	-0.12622* (-2.57)	-0.06395 (-0.92)	-0.16115* (-2.23)	-0.05378 (-0.80)	-0.02306 (-0.27)	-0.11691 (-1.04)
Paternal Grandmother Chronically Ill	-0.00836 (-0.17)	0.06936 (1.01)	-0.12278 (-1.75)	0.10244 (1.53)	0.14885 (1.71)	0.02184 (0.20)
Maternal Grandfather Chronically Ill	0.12511** (2.61)	0.14298* (2.12)	0.11821 (1.65)	0.16070* (2.34)	0.14852 (1.71)	0.15583 (1.32)
Maternal Grandmother Chronically Ill	0.08175 (1.73)	0.10672 (1.64)	0.00286 (0.04)	0.10609 (1.57)	0.10275 (1.18)	0.08088 (0.72)
Participation in Health Promoting Activities						
Drink Milk: Frequency	-0.08354*** (-8.48)	-0.07900*** (-5.90)	-0.08553*** (-5.76)	0.00819 (0.77)	0.01584 (1.13)	0.00080 (0.05)
Eat Fresh Fruit: Frequency	0.01793 (1.57)	0.02615 (1.77)	0.00189 (0.10)	0.05591*** (3.75)	0.07635*** (4.21)	-0.00474 (-0.17)
Eat at Restaurant: Frequency	-0.03826** (-3.22)	-0.06374*** (-3.71)	-0.01288 (-0.76)	-0.02200 (-1.54)	-0.03435 (-1.74)	-0.01118 (-0.52)
Eat Fast Food: Frequency	-0.03726** (-3.12)	-0.00928 (-0.52)	-0.06340*** (-3.84)	0.00028 (0.02)	0.02951 (1.45)	-0.02288 (-1.13)

Cont/ Table 6. Estimated Probit Model by Illness Type and Population Group

Infectious Disease	Chronic Illness			Explanatory Variable		
	Full Sample	Nationals	Expatriates	Full Sample	Nationals	Expatriates
Play Sports	0.01253 (0.29)	0.13409* (2.24)	-0.15373* (-2.29)	-0.04360 (-0.83)	-0.05494 (-0.82)	-0.01769 (-0.20)
Member -Sports Club	0.03484 (0.27)	-0.04361 (-0.28)	0.23330 (0.97)	0.36319** (2.59)	0.42127* (2.56)	0.13948 (0.51)
Member-Gym/ Health Club	-0.31607* (-2.54)	-0.32570* (-2.20)	-0.36754 (-1.53)	-0.19073 (-1.38)	-0.29590 (-1.74)	-0.02717 (-0.11)
Medical Checkup	0.01985 (0.39)	-0.00155 (-0.02)	0.00634 (0.08)	0.63338*** (11.53)	0.71392*** (9.72)	0.55540*** (6.35)
Smoke	-0.25117*** (-3.32)	-0.32346** (-3.14)	-0.18644 (-1.63)	-0.06282 (-0.78)	-0.10710 (-0.98)	0.02140 (0.18)
Intercept	1.40607*** (7.37)	1.68909*** (5.82)	1.68552*** (6.12)	-2.70338*** (-10.06)	-2.88907*** (-8.06)	-2.25245*** (-5.57)
Model Statistics						
N	6101	3246	2855	6101	3246	2855
K	60	58	57	60	59	57
Log-L	-3550.938	-1841.332	-1649.049	-2117.905	-1243.415	-848.361
Wald-Chi^2	575.738	358.134	338.238	1294.147	792.598	529.141
Prob	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo-R^2	0.0825	0.0968	0.0991	0.2828	0.2957	0.2560
BIC	7624.848	4151.605	3751.637	4758.783	2963.856	2150.262
AIC	7221.876	3798.665	3412.098	4355.811	2604.830	1810.723

Note: Figures within the parenthesis are z-values, which are based on heteroskedasticity-robust standard errors.See, White (1980).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In general, the nature of the relationship between incidence of illness and the set of explanatory variables was found to vary depending on the illness type and population group. The results points to important differences between different population groups and across illness types. The relationship between age and incidence of chronic illness was found to be positive and statistically significant, irrespective of the nationality

(i.e.,full sample, nationals, and expatriates), implying that older persons were more likely to suffer from chronic illnesses. However, the opposite is true in the case of infectious disease. The estimated coefficient with respect to age-squared was found to be positive and statistically significant for infectious disease, suggesting that the relationship age and probability of contacting infectious disease was non-linear. While Irving and Kingdon (2009) found the relationship between age and incidence of illness to be linear, Costa-Font and Gill (2006) and Deolalikar and Laxminarayan (2000) found it to be non-linear.

The estimated coefficient with respect to gender was found to be negative and statistically significant for nationals in the case of infectious disease, implying that Kuwaiti males were less likely to suffer from infectious diseases. The finding is consistent with Irving and Kingdon (2009), Costa-Font and Gill (2006), and Deolalikar and Laxminarayan (2000). Dror *et al.* (2009) and Rous and Hotchkiss (2003) found no gender difference in the incidence of illness. Nationals were found more likely to suffer from both infectious diseases and chronic illnesses. Material status was found to have no impact on the probability of suffering from any illness. There was some evidence to suggest that more educated nationals (expatriates) were less likely to suffer from infectious disease (chronic illness), which supports that educated individuals are relatively more efficient in combining market goods and time to produce health; Dror *et al.* (2009), Irving and Kingdon (2009), Rous and Hotchkiss (2003), andDeolalikar and Laxminarayan (2000).

In general, households'socioeconomic status (family type, income, household size, type and size of dwelling, and tenancy status) was found to have no bearing on the likelihood of an individual being ill. However, there is evidence that nationals from nuclear families,nationals living in bigger houses, and rich nationals were less likely to suffer from infectious diseases. Whereas Dror*et al.* (2009) and Irving and Kingdon (2009) found positive relationship between income and incidence of illness, Rous and Hotchkiss (2003) found the relationship to be negative.

The results of the estimated model suggest that there was no association between consanguineous marriage and the probability of being ill for different population groups in Kuwait.There is large volume of research that has shown positive association between consanguineous marriages and a wide range of common health related disorders. For a brief overview, see Tadmouri *et al.* (2009). The risk of birth defects in

first-cousin marriages has been estimated to be 2-2.5 times the general population rate, see Bittle (2001), Zlotogora (2002), Bromiker *et al.* (2004), and Bennett *et al.* (2002). For such reasons, while cousin marriages have become highly stigmatized in some parts of the world, particularly in the West, they remain a widely practiced tradition in many other parts, particularly in the Muslim countries.

Table 7 shows evidence on consanguineous marriages in Kuwait, as reported by individuals during the household survey. Approximately 24 percent of the couples in Kuwait (30 percent among nationals and 18 percent among expatriates)reported to be first cousins, and another 11.5 percent (16 percent among nationals and 8 percent among expatriates) reported to be second/distant cousin. This is consistent with other studies; see for instance Tadmouri *et al.* (2009). The data further showed that proportion was successively smaller among parents and grandparents, suggesting that with time the tradition has become more wide spread. It is important to note that the household survey did not comprehensively inquired about genetic conditions or illnesses that may have a stronger association to consanguinity than chronic illness generally. It may be that since genetic disorders resulting from consanguinity are relatively rare, a broad survey of this nature was unable to capture the true association between consanguinity and chronic illness. Thus, any conclusions regarding the relationship of consanguinity to chronic illness should be regarded as limited to the illnesses covered in the survey and not a broad statement of the same. Also, see Tadmouri *et al.* (2009).

Table 7. Prevalence of Consanguineous Marriage among Different Population Groups in Kuwait

Relationship	Expatriates				Nationals				Overall			
	1	2	3	4	1	2	3	4	1	2	3	4
First Cousin	18.1	15.0	8.4	7.2	29.9	24.0	14.6	13.0	23.5	19.8	11.7	10.3
Other Cousin	7.9	9.9	9.7	9.3	15.7	18.9	20.6	20.5	11.5	14.7	15.5	15.2
Parent's Cousin	1.7	1.7	0.7	0.8	1.8	1.3	1.6	0.8	1.7	1.5	1.2	0.8
Other Relative	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.0	0.2	0.1	0.2
No Relationship	72.3	73.4	81.1	82.7	52.6	55.5	63.0	65.4	63.3	63.9	71.5	73.5

Note: 1 = Spouse, 2 = Parents, 3 = Paternal Grandparents, 4 = Maternal Grandparents.

Among many, one of the factors that have been found to be linked to an individual being ill is the history of illness among successive generations of the family. Table 8 shows the proportion of Kuwait's sample population reporting their parents and grandparents suffering from chronic illness. As is evident, around 40 percent and 29 percent of the surveyed individuals reported their parents and grandparents, respectively, to be suffering from chronic illness. The proportion was higher for nationals compared to the expatriates, and irrespective of the nationality, the proportion was higher for parents compared to grandparents. The results from the estimated model show that, irrespective of the nationality and illness type, a person was more likely to be ill if his/her mother had a chronic illness. Also, a Kuwaiti was more likely to suffer from chronic illness if his/her father had a chronic illness. In other words, health status of immediate family (i.e., parents) directly impacts the likelihood of a Kuwaiti being ill.

Table 8. Population Reporting Parent and Grandparents Suffering from Chronic Illness (%)

Relation	Population Group		
	Expatriates	Nationals	Overall
Father	34.7	42.7	40.2
Mother	31.7	45.3	38.9
Paternal Grandfather	27.4	32.1	29.9
Paternal Grandmother	24.0	35.8	30.2
Maternal Grandfather	23.9	29.1	26.7
Maternal Grandmother	22.8	33.6	28.6

The association between incidence of illness and participation in health promoting activities was found to be mixed, and some cases contrary to expectations. In general, such activities were found to have no association with being chronically ill, and impact only the likelihood of the catching infectious disease. Surprisingly, people who participate in health promoting activities were found more likely to be sick from infectious disease.For instance, the coefficients with respect to frequency of drinking milk, eating at restaurants, and eating fast food were found to be negative and statistically significant, suggesting, that individual

with unhealthy eating habits (i.e., less frequency of drinking milk, eating fresh fruits, eating at restaurants, and eating fast food) are less likely to suffer from infectious disease. Similarly, a person, particularly a Kuwaiti, who plays sports (smokes) was more (less) likely to be ill from infectious disease. Also, a Kuwaiti with membership of a health club had lower probability of getting ill from infectious disease, and an expatriate playing sport regularly was less likely to get ill from infectious disease. For a Kuwaiti, fewer intakes of fresh fruits and membership of sports club were associated with higher probability of suffering from chronic illness. Rous and Hotchkiss (2003) found positive association between incidence of illness and alcohol drinking and smoking.Finally, irrespective of the population group, the coefficient with respect to annual medical checkup was found to be positive and statistically significant, implying that those suffering from chronic illness go for regular medical checkups.

Applications and Health Policy Implications

This paper draws on a household survey conducted in 2009/10 to investigate determinants of incidence of illness in Kuwait, an oil exporting economy that shares many characteristics with its regional neighbors, particularly in the context of economic structure, economic development strategy, population composition, and health care delivery system. In view of the country's socio-economic characteristics and the dynamics of the ailments, the analysis was conducted by estimating a Probit model by population groups (i.e., whole sample, nationals only, and expatriates only) under each illness type (i.e., chronic and infectious). Prior to estimating the model, tests were conducted to determine whether differences in the estimated coefficients across different population groups were statistically significant.

Preliminary data analysis showed that around 19% of the full sample population in Kuwait suffered from chronic illnesses. The incidence among the nationals (i.e., Kuwaitis) was found to be approximately 23% compared to 17% among the expatriates. In addition to chronic illness, approximately 33% (or one-third) of the population reported to have suffered from infectious disease during the 12-mo period prior to the survey. The results of the tests led to the conclusion that differences between the estimated coefficients for the

nationals and the expatriates were statistically significant implying that the two population groups should be treated separately.

The evidence from the estimated models demonstrated that the model for incidence of chronic illness exhibited better fit compared to that for infectious disease, and that the inclusion of explanatory variables results in better fit of the models generally. Broadly speaking, the nature of the relationship between incidence of illness and the set of explanatory variables was found to vary depending on the type of illness and population group. While a linear relationship was found between age and probability of being ill from chronic illness, in the case of infectious disease the relationship was non-linear. Nationals were found more likely to suffer from both infectious diseases and chronic illnesses. Households' socio-economic status (income, household size, type and size of dwelling, and tenancy status) was found to have no bearing on the likelihood of an individual being ill and no association was found between consanguineous marriages and the incidence of illness. Finally, evidence was found to suggest that family health status impacts the likelihood of a person being ill.As Kuwait shares many of its socio-economic, demographic, and cultural characteristics with the GCC and Arab countries, the findings of this study have relevance for those economies, particularly with respect to issues related to public health.

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