

## **Anxiety and Depression among Diabetics in Samoa: Using Health Behavior Instruments to Assess the Linkage Between Mental Health and Chronic Illness**

**Philip Szmedra, PhD.**

Professor of Economics  
School of Business Administration  
Georgia Southwestern State University  
Americus, Georgia, USA 31709

**K.L. Sharma, PhD.**

Professor of Economics  
School of Business and Economics  
University of Fiji, Private Mail Bag, Lautoka, Fiji.

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### **Abstract**

*Diabetes is an increasingly important public health issue in both the developed and developing world. In some Pacific Island nations the disease affects up to forty percent of adult populations. Compounding the problem are the often hidden emotional costs associated with diabetes. In this paper we report the results of a survey taken in Samoa in March 2008 among diabetics being treated as out-patients at hospitals and clinics. We evaluate the degree to which the disease and its emotional impacts are affected by environmental, cultural, and societal factors using two behavioral instruments and regression modeling. We found higher pain levels, years of being ill, and higher wages contribute to greater levels of depression and anxiety. Depression among diabetics is a common co-morbidity that can affect the physical markers of the disease, negatively effects the desire to engage in physical activity, and decreases the desire to be involved in disease management.. Effective treatment of depression can improve diabetic management and control.*

**Key Words:** Diabetes, Depression, South Pacific, Samoa, EQ-5D standardized health measurement, Health Promoting Lifestyle Profile.

### **1. Introduction**

Diabetes has been recognized as an increasingly important public health issue in both the developed and developing world. The current number of people worldwide afflicted with the disease is projected to rise from approximately 200 million currently to 370 million by 2030 (Wild, et al. 2004). Diabetes causes about 5% of all deaths globally each year. Eighty percent of people with diabetes live in low and middle income countries where most diabetics are middle-aged; people in their 40s and 50s. The World Health Organization estimates that diabetes deaths are likely to increase by more than 50% in the next 10 years without urgent action (WHO1, 2010). Public health agencies have marshaled resources to increase public awareness of the causes and prevention of diabetes with little apparent success judging by the uninterrupted increase in disease incidence worldwide.

In no region of the world is the incidence of diabetes greater than in the Western Pacific where, in some countries, up to forty percent of the adult population is affected. Countries in the region spend up to 60 percent of their public health budgets on the care and treatment of individuals with diabetes and other chronic illnesses (Szmedra, et al. 2008).

Compounding the problem are the hidden emotional costs associated with diabetes and chronic illness. Symptoms of depression are common among diabetics (Anderson 2001). Depression among diabetics has also been shown to be a common co-morbidity that can affect the physical markers of the disease.

For instance, the stress of depression can lead to low blood sugar levels (hypoglycemia); an effect that is more pronounced in adolescents. Further, diabetic teenagers have a higher incidence of suicidal tendencies (Goldston 1997). In addition, as the effects of diabetes compromise the quality of life of the diabetic, the additive effects of depression can deprive the individual of any functional ability to engage fully in the clinical management of his or her illness. Earlier research work has shown that effective treatment of depression can improve diabetic management and control (Lustman 1997). Other work has noted that depressed individuals have a much higher risk of developing Type 2 diabetes (Kinder et al. 2002).

A number of countries in the South Pacific have the dubious distinction of having the highest rates of diabetes in the world. Approximately forty percent of the adult population of Nauru is diabetic. In Fiji, both the indigenous Fijian and Indo-Fijian populations suffer equally from diabetes, with approximately 25 percent of their adult populations afflicted (Coyne 2000). In spite of the public health awareness of the link between diabetes and depression and that depression is one of the most important causes of morbidity and disability in the developing world (Patel et al. 2001), there has been little work exploring the nexus between diabetes and depression in the Pacific region. In this paper we report the results of a survey conducted in Samoa during March, 2008 at hospitals and clinics in urban and rural locations on the principal Samoan islands of Upolu and Savai'i. Our objective was to determine the health and emotional status of diabetics and explore the interaction of physical and emotional illness in a representative Pacific island country.

## **2. Depression**

Depression is a set of psychological and physiologic symptoms that may occur acutely or be experienced as a chronic problem ranging from mild depression to chronic dysthymia, defined as a sad or blue mood accompanied by a loss of interest in usual activity that persists for two or more years (Stewart, et al. 2003). Depressives have decreased quality of life through their inability to work and carry on daily life tasks effectively, have greater levels of morbidity and mortality for similar age cohorts, and incur losses in productivity to employers in the hundreds of billions of dollars per year (Bent and Masters 2005; Newport 2004). The World Health Organization (WHO) has identified depression as the fourth leading cause of disease worldwide and the second leading cause of disability in women (Gutman and Nemeroff 2004).

## **3. Previous Research**

The WHO and the South Pacific Commission (SPC) have reported on the problems of obesity in the Pacific, which contributes significantly to the non-communicable disease (NCD) problems in the region (WHO/SPC 2000). Elstad et al. (2008) studied the perceptions of individuals with Type 2 diabetes in American Samoa to provide design guidelines for culturally appropriate interventions to prevent and manage diabetes effectively. Their work demonstrated that diabetics experienced significant individual, familial, cultural, and environmental stress in dealing with their disease and offered that stress management and reduction be a key area for intervention. Katon, et al. (2009) determined that among patients with Type 2 diabetes and poor disease management, depression was associated with an increased likelihood of poor adherence to diabetes control medications.

## **4. The Prevalence of Obesity and Diabetes in Samoa**

Although the containment and treatment of communicable diseases remain a concern for public health authorities, most commonly typhoid, and dengue fever, which are both endemic and periodically reach epidemic proportions, NCDs are an increasingly important public health issue in Samoa. The rate of obesity, which plays a critical role in increasing the susceptibility of people to serious chronic medical conditions, is estimated to be greater than 57 percent according to the most recent statistics (WHO 2010).

### **4.1. Obesity**

Figure 1 provides data describing obesity prevalence by age in Samoa. Obesity is defined as having a Body Mass Index (a measure of body fat calculated as weight in kilograms divided by height in meters squared) of 30.0 or more. The total prevalence of obesity is 48.4% in males and 67.4% in females and increases with age and degree of urbanization. The highest rates of obesity (males 53%; females 69%) are found in and around Apia, the capital city on the island of Upolu, while lesser rates are found in rural Upolu, (males 48%; females 66%), and on the other principal island of Savai'i which has no urbanized center (males 40%; females 65%). Other risk factors that increase NCD susceptibility are prominent in the Samoan population including a high level of tobacco use (40 percent of the population smokes cigarettes, 56 percent of males and 22 percent of females);

poor nutrition (40 percent of the population does not include fruit in their regular diets); alcohol consumption (40 percent of males and 20 percent of females are at risk for developing a NCD because of their alcohol consumption habits); and, lack of physical activity (21 percent of the population undertakes very little or no physical activity) (WHO2 2010).

#### **4.2. Diabetes**

Diabetes results when the body cannot use blood sugar as energy, either because it has too little insulin or because it cannot use insulin. Type 2 diabetes, which accounts for 90 to 95 percent of cases worldwide, typically develops later in life and is associated with obesity and lack of exercise. Type 1 diabetes, which is often diagnosed in children, occurs when the immune system mistakenly destroys cells that make insulin (WHO3 2010). The incidence of diabetes in Samoa has increased from an estimated 6.4 percent of the adult population in 1978 to 11.5 percent in 1991 to its current 23 percent with prevalence increasing with age (Figure 2) (Ainuu 2007).

These data indicate a doubling of diabetes incidence in the Samoan population between age groups 25-34 and 35-44 and a fifty percent increase in succeeding age group intervals. By comparison, the number of Americans with diabetes in 2010 had grown to about 25 million, or 8 percent of the population. Almost 25 percent of Americans aged 60 and older had diabetes in 2007 while the rate for Samoans of the same age category is twice as high (Parker-Pope 2008). In Samoa the disease strikes males and females in equal proportions with 22.9 percent of adult males and 23.3 percent of females affected (WHO1 2010). As in most Pacific island nations diabetes is more prevalent in urban areas since, in general, higher levels of personal income among city dwellers allow greater discretionary spending on prepared and packaged foods which are a significant risk factor contributing to diabetes susceptibility. In addition, urban dwellers engage in less physical activity, compared to rural people, which contributes to weight gain establishing a precondition for the onset of diabetes.

The modern diet in Samoa is made up of traditional food high in fat and starch such as coconut cream used in all types of traditional cooking as well as processed foods such as rice, mutton flaps (the fatty portion of a sheep's belly), turkey tails, corned beef, corn crisps, potato crisps, and other types of snack foods, canned soda pop, and fast foods from local global food emporia such as McDonalds (Galanis 1999). Imported white rice and flour are gradually replacing the local staples of taro, yams, breadfruit and sweet potato. Continued economic development and the improvement in income and living standards that development affords will assure the diabetes epidemic will continue unabated. Paul Zimmet, the director of the International Diabetes Institute has referred to the public health menace that diabetes poses to the Pacific region thusly: "What AIDS was in the last 20 years of the 20th century diabetes is going to be in the first 20 years of this century. It is wiping out Nauru, the Marshall Islands, Tonga. Name any island, and diabetes is its main health threat" (Zimmet 2008).

#### **5. The Prevalence of Depression in Samoa**

Mental health ranks low in public health priorities among health ministries in the developing countries of the Pacific. As a result, specialized mental health care competes for resources with what are felt to be more critical public health needs such as communicable and other non-communicable illnesses. In addition, few good statistical estimates of the incidence of mental illness exist in the region adding invisibility to the problem of developing effective strategies to address the issue (SPC 2009). Further, the social stigma associated with mental illness contributes to its being relegated to a lower tier in the public health hierarchy of importance. The government of Samoa has been among the first Pacific nations to formulate policy objectives to confront this important public health issue. The National University of Samoa (NUS) has created a program to train psychiatric nurses that may be a model that other countries in the region could emulate (National University of Samoa 2007). However, currently the human resources devoted to mental health are miniscule. Three nurses are trained specifically in the field of mental health with one licensed psychiatrist to service a country with a population of 220,000. Approximately twenty percent of the population is afflicted with some level of emotional stress including depression while about five percent suffer from serious emotional illness (NUS 2009).

#### **6. Research Methodology**

##### **6.1. Participants**

The research team obtained permission from the Samoan Ministry of Health and the National Health Service to conduct interviews with outpatients receiving treatment for their diabetes at hospitals and clinics at a number of sites on Upolu and Savai'i, during a one week period in March 2008.

Our most important sources of patient contact and data were the Diabetes Association of Samoa outpatient clinic at Matagalalua and The National Hospital, Tupua Tamasese Meaole located at Motoootua in Apia. These sites provided 183 usable surveys. Another three interviews were conducted at the Alafua Medical Clinic in suburban Apia. An additional 28 individuals were interviewed at the outpatient clinic of the Malietoa Tanumafili II hospital on Savai'i. In all, we spoke with 214 individuals, 109 men and 105 women. These observations form the basis of this analysis.

## **6.2. Health Behavior Instruments**

Two behavioral instruments were used to measure health maintenance attitudes in the survey sample. The dependent variable measuring degree of anxiety and depression is taken from the responses given to the EQ-5D standardized health measurement. An EQ-5D health state (or profile) is a set of observations about a person defined by a descriptive system. An EQ-5D health state may be converted to a single summary index by applying a formula that essentially attaches weights to each of the levels in each dimension (EuroQol Group 2010).

The five dimensions included in the index are: Mobility, Self-Care, Usual activities, Pain/Discomfort, and Anxiety/Depression. Each dimension has 3 response categories corresponding to (1) no problem; (2) some problem; (3) extreme problem. Regression equation 1 uses the anxiety/depression dimension as its dependent variable.

Equations 2 through 4 use three subscales from the Health Promoting Lifestyle Profile (HPLP) as dependent variables including Health Responsibility (HRA), Physical Activity (PAA), and Stress Management (StressA) (Walker et al. 1987). The HPLP was designed to assess the relationship between several different lifestyle behaviors and health status. The questionnaire has a four point response format with seventy items that are divided into six subscales. We chose to use the three mentioned above that were most pertinent to our research interests.

## **7. Results**

Table 1 provides results for the initial regression model in which the level of anxiety/depression among respondents is the dependent variable. The regression coefficients have their associated t-statistics in parentheses. These results provide a cursory understanding of the factors contributing to feelings of anxiety and depression among the sampled population. The  $R^2$  statistic implies that there exist many other factors that have not been captured by the regression equation that contribute to anxiety and depression among diabetics. The effects of anxiety and depression become more revealing when these emotions are used to describe attitudes toward other health promoting activities as they are in the equations that follow. However, model 1 does offer some insight. While the signs on most of the included variables are intuitive, only the variables wage/day, years of being a diabetic, and level of pain, are statistically significant. Each has a positive sign associated with it indicating higher wages, a longer time living with the disease, and greater levels of chronic pain all contribute to greater levels of anxiety and depression in the sampled population. The wage/day result may be counter-intuitive as one may expect that low income individuals with a chronic illness may be more susceptible to feelings of anxiety and depression than those with higher income would be. However, the GOS provides free health care to Samoans removing that concern from the minds of the low income chronically ill. It simply may be that higher income diabetics are beset and concerned with the common financial problems that confront others in Samoan society, leading to higher levels of emotional anxiety.

Table 2 reports results for regression equations 2, 3, and 4. Equation 2 describes the factors affecting health responsibility (HRA) which models individual initiative in learning about how to pursue a healthy lifestyle including talking to health professionals, attending health education programs, querying health care workers about diabetes and in general becoming more knowledgeable about and learning to cope with chronic illness. In equation 2, the older the respondent as well as higher levels of education are indicators of active engagement in health responsibility. Significantly, greater levels of anxiety and depression signal diminished concern for health responsibility. In practical terms anxiety and depression interfere with the ability of the individual to seek ways to effectively deal with the disease and is therefore more negatively affected by it. Equation 3 describes the factors affecting the level of physical activity (PAA) engaged in by the diabetic patient. Participation in regular physical activity in many cases postpones or reduces the debilitating effects of chronic disease including diabetes. Participation in physical activity diminishes as an individual ages, increases as general health improves, and, in what might be a collinear relation, increases as greater concern for stress management including sufficient sleep, and daily relaxation are practiced.

Greater levels of anxiety and depression correspond with less engagement in physical activity though the t-statistic here is not significant. Though most depressives realize that physical activity is beneficial to emotional health, the power that emotional duress holds over those afflicted is difficult to overcome without medical intervention. Many diabetics therefore bear a double burden of attempting to manage a chronic illness while suffering from depressive feelings that prevent them from carrying out effective disease management. Equation 4 describes the factors affecting the level of stress felt by the typical respondent (SA). Here each included explanatory variable is significant at the .10 level or greater save years of schooling. Stress levels increase as the age of the individual increases and his general health deteriorates. Higher levels of stress are also associated with more concern for nutritional intake and higher levels of physical activity. These are intuitive outcomes as the diabetic concerned with alleviating stress associated with his illness, or stress in general, would look to exercise as a method to lower blood pressure, heart rate, and promote relaxation in general. Preoccupation with nutrition may be a defining characteristic of the diabetic. The more stressed the diabetic becomes in dealing with life as a diabetic the more concern is given to diet and nutrition. This is borne out by the regression results.

What is surprising and more difficult to explain is the apparent contradiction between the AGE and YRS DIAB results. The negative sign on the YRS DIAB regressor indicates that levels of stress are more severe for the young diabetic or those more recently diagnosed. The AGE variable very strongly indicates a positive relation between age and stress level. Good explanations can be developed to support both cases. Recently diagnosed diabetics are dealing with the social and economic implications for themselves and their families of living with long term chronic disease. The elderly are concerned about their ability to easily access regular treatment and clinic visits as well as increasingly greater care requirements as the ravages of the disease affect the nervous and circulatory systems. We will look into the issue of differential age impacts on diabetics in the Pacific region in future work we are proposing to potential funding agencies.

### **8. Discussion**

More than the physical deterioration that diabetes inflicts is the psychological degradation that accompanies the physical impacts. The public health policy problem that this finding poses is easy to recognize but difficult to address in the South Pacific. In Samoa, institutional structures are in place to treat the physical manifestations of diabetes. Problems occur periodically with availability of medication and sufficient medical staffing. However, dealing with the problems of emotional illness that may accompany physical debilitation is often beyond the scope and wherewithal of the Samoan National Health Service and most other health agencies in the region. Resources are concentrated in providing the facilities and personnel to treat the life-threatening physical symptoms of illness while the emotional aspects of chronic disease are often relegated to the end of the policy queue. This is a mistake as the emotional well-being of a chronically ill individual can play a major role in successfully treating and coping with the physical symptoms of disease. An important aspect of the problem is the lack of trained professionals to provide timely interventions. A new initiative entitled PIMHnet (Pacific Island Mental Health Network) established by the WHO is attempting to establish a mental health network in the Pacific (Tone 2007). Its objectives are to coordinate the development of effective resources, advocacy, planning, and training of medical staff capable of dealing with mental health issues in the region.

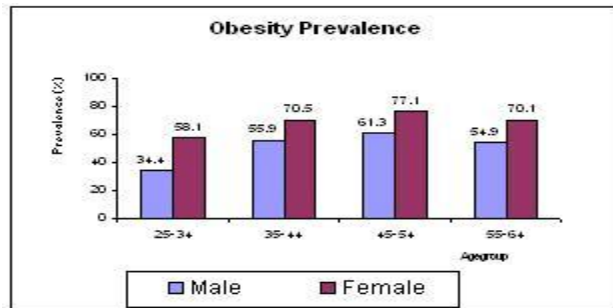
The long term solution is to promote the training of psychiatric and psychology professionals in the medical and nursing schools in the region. In the short term, workshops sponsored and financed by regional cooperative organizations such as the SPC, or by global bodies such as the WHO, addressing the emotional problems faced by the chronically ill and offering appropriate interventions, would expose the problem to greater institutional scrutiny and perhaps move the issue further up the public health policy priorities queue. At the clinical level, the diabetes staffs at the clinics and hospitals could use an instrument such as the Beck Depression Inventory (Beck et al. 1961) to routinely screen for depression. Patients that screened positive would be referred to the mental health unit. That would produce a case load imperative which would lead to greater awareness of the issue amongst the medical staff and ultimately to an increase in mental health training and staffing (Parkin 2010). The emotional health of the diabetic patient in the region is an issue that has been ignored in the past and must be dealt with as aggressively and conscientiously as have the physical symptoms of the disease.

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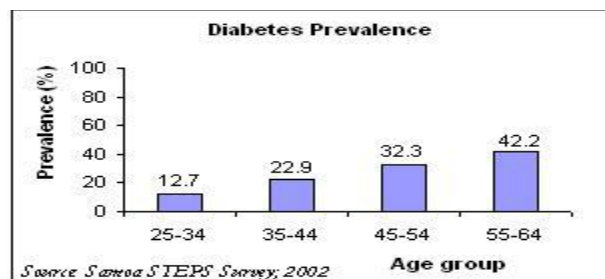
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Figure 1. Obesity Prevalence by Age Stratification, Samoa



Source: Samoa STEPS survey, 2002

Figure 2. Diabetes Prevalence by Age Stratification, Samoa



Source: Samoa STEPS survey, 2002

Table 1. Regression Results Model 1 - Anxiety/Depression

Dep Var	Independent Variables							R <sup>2</sup>
	Num HH	School	Wage Day	Gen Health	Yrs Diab	Pain		
Anxiety/Depress	-.037 (-.384)	.018 (.176)	.200 (1.987) <sup>2</sup>	.071 (.739)	.397 (4.068) <sup>3</sup>	.286 (3.213) <sup>3</sup>	.304	

<sup>2</sup>significance at the .05 level

<sup>3</sup>significance at the .01 level

Table 2. Regression Results Models 2-4

Dep Var	Independent Variables										R <sup>2</sup>
	School	Gen Health	Yrs Diab	Age	Depres	Diab Visit	Days Work	Stress Avg	PA Avg	Nutr Avg	
2.HRA	.385 (5.51) <sup>3</sup>		.075 (.950)	.183 (2.15) <sup>2</sup>	-.131 (-1.94) <sup>2</sup>	.042 (.644)					.141
3.PAA	.170 (2.644) <sup>2</sup>	.289 (4.10) <sup>3</sup>		-.104 (-1.505)	-.037 (.558)		.087 (1.434)	.229 (3.375) <sup>3</sup>			.287
4.SA	-.024 (-.381)	-.351 (-5.55) <sup>3</sup>	-.127 (-1.83) <sup>1</sup>	.259 (3.473) <sup>3</sup>					.195 (2.971) <sup>3</sup>	.266 (4.480) <sup>3</sup>	.345

<sup>1</sup>significance at the .10 level

<sup>2</sup>significance at the .05 level

<sup>3</sup>significance at the .01 level