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TYPE II DIABETES IN THE BRITISH VIRGIN ISLANDS

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## **Abstract**

The objective of this project was to develop an addendum to the current Project Lifestyles program that would stimulate student interest in maintaining a healthy lifestyle. To develop this curriculum, meetings with the Ministry of Education and the Ministry of Health were held to determine the areas of the Project that needed improvement. The D.A.R.E. Program curriculum was also used as a basis for our additions to the curriculum. The hope is that with the basic lesson plans established, an interactive system of teaching and evaluation will be further developed by future WPI students.



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# 1 Introduction

The British Virgin Islands is home to 18,000 people and is composed of more than 50 islands: the largest islands are Tortola, Virgin Gorda, and Anegada. The Virgin Islands are known for their beautiful beaches, warm weather, and their lively culture, but their alarming rate of Type II Diabetes is also a reality of life in the BVI. The occurrence of Type II Diabetes in all of the Caribbean Islands has been increasing at epidemic rates over the past 20 years and the rate is projected to continue to increase in the future. Research, which will be discussed in later sections, as to why Type II Diabetes is so prevalent in the Caribbean shows that among other factors, there is a lack of prevention education. Our group aimed to confirm the research done previously and take some steps to make people more educated about diabetes and its prevention methods.

Our research and analysis of the past, current, and upcoming health and wellness education programs within the BVI schools was aided by the British Ministry of Education and Ministry of Health Education. Using curriculum techniques from the Drug Abuse Resistance Education (D.A.R.E.) prevention program used in the United States, a model for a diabetes prevention program was designed, including classroom demonstrations and lesson plans.

Meetings with local governmental authorities and businesses were held to introduce Worcester Polytechnic Institute and the Interdisciplinary Global Studies Division to the island as well as to determine the proper procedure needed to set up future projects on the island. Since Tortola, BVI is not an official project site within the Interdisciplinary Global Studies Department, another goal of our group was to make contacts in Tortola and give an evaluation of the island as a site for future projects. Future projects and projects sites were researched and then discussed with governmental authorities.

The results of our research and evaluations are presented in our final written report and were given to the British Governmental Ministries, the BVI Diabetes Association, and our advisor, Dr. Daniel Gibson III. A formal written report was also given to the IGSD department. It is the hope of our group that our research and results will be used to help improve current health education programs within the primary schools. We further hope that our suggestions for a diabetes education and prevention program can be extended beyond the primary school curriculum to serve as a basis for programs in secondary schools and for the adults in the community.

## **2 Literature Review**

### **2.1 History of Tortola**

Very little is known of the Caribbean's first inhabitants of 4000 years ago. No one knows where these Stone Age people came from or where they went. They did not have permanent settlements; they were hunters and gatherers who made stone and flint tools but not pottery. They disappeared about 1000 years before the arrival of the next wave of natives, the Arawaks (Fleming, 1989).

#### **2.1.1 The Arawaks and the Caribs**

The Arawak Indians traveled to what would later become the British Virgin Islands around 100 BC. They followed the currents from the Orinoco Basin in South America in only dugout canoes. They arrived on the Windward Islands and gradually migrated up the island chain. The Caribs were later migrants to the West Indies who had begun conquering the Arawaks and settling the islands only about 200 years before the arrival of Columbus and the Europeans.

The Arawak and the Carib were both advanced tribes. They farmed, hunted, and fished in comparable ways and used similar techniques for making pottery, canoes, build huts, and weave cloth (Rogozinski, 1999). Both tribes brought a system of raising root plants with them from South America known as "conuco" which involved cutting and

burning the bush to clear the land (Fleming, 1989). This method produced large amounts of starch-rich root crops and other foods with little effort, and was well suited to the “fragile soil” of the Caribbean islands. Yuca and Yams were the main crops, as well as arrowroot, peanuts, peppers, gourds, and small amounts of tobacco, corn, beans and squash (Rogozinski, 1999). Fruits such as pineapple and guava often accompanied these vegetables.

From land, the hutia, the iguana, and several birds such as pigeons, doves, and parrots were hunted for protein. The Sea, however, proved to be more fruitful, providing many kinds of shellfish, crabs and fish. Whether meat or fish, most of what they caught was placed with vegetables such as the sweet yucca into a pepper pot, a bowl left on the fire to simmer continuously (Rogozinski, 1999).

When Columbus first arrived in the Caribbean in 1492, the Arawak population numbered between 200 and 300 thousand. Four years later, one-third of them were dead: either killed outright, or victims of disease and overwork (Fleming, 1989). Few survived the 16<sup>th</sup> century and the Caribbean Arawaks were soon a vanished race.



**Figure 1- Christopher Columbus Arrival in Haiti**  
(<http://www.discoverhaiti.com/images/columbus2.jpg>)

The warlike Caribs fared slightly better against the European intruders. The Caribs were as fierce as the Arawaks were peaceful. It was the Caribs' custom to go out on raids in their long dugout canoes, which were rigged with sails (Fleming, 1989). The Caribs were expert sailors and fierce warriors. "They fought with arrows dipped in manchineel poison" (Fleming, 1989). When they returned with captives, the tribe would eat the men and boys (Carib is derived from the Spanish word for *cannibal*), and marry the women. The women retained their Arawak customs, so only the men in the Carib tribe spoke Carib. Over time these cultures intermingled.

After about 150 years, most of the Carib tribe had been destroyed or deported by the newcomers: there is still one colony of them on the remote coast of Dominica (Mintz, 1985). They had been wiped out by the side effects of colonization—war, disease, and

enslavement.

### **2.1.2 The New European Colonies**

The Spanish had the Caribbean largely to themselves until the mid-1500s. They colonized, held Mass, converted, enslaved, killed, and in general tormented the docile Arawaks, fought the Caribs, and above all looked for gold.

In 1521, when Cortez captured the Aztec stronghold in what is now Mexico City with its great accumulation of wealth, the center of Spanish power began to slip away from the Caribbean. “The settlements there gradually became way stations and guardians for the transport of Spanish gold and silver” (Fleming, 1989). The Spanish inhabitants on the islands managed their own estates, but “remained town dwellers with churches, shops, schools, and hospitals centered around useful harbors” (Fleming, 1989).

As the Caribbean developed as a sea-lane for the Spanish treasures of gold and silver transport from Mexico and Peru back to Spain, the area entered a “new historic phase—the oft-romanced era of gentlemen pirates, or privateers” (Rogozinski, 1999). Among these state-sanctioned plunderers come the infamous names, John Hawkins and Francis Drake: “willing to endure for God (in this case, Protestant), queen, and country (in this case, England)” (Fleming, 1989).

Although state-sanctioned, these privateers were not part of a formal Navy. They continued their rampage even when there was peace in Europe. To protect herself, Spain set in fleets and fortified her cities. Continual attacks on Spanish shipping and ports severely weakened her hold on the New World. By the early 18<sup>th</sup> century, colonists from other countries were staking claims in the Caribbean (Fleming, 1989).

This period in the Caribbean was marked by a game of musical chairs among European countries. Ownership of Tortola shifted about: the Dutch established a permanent settlement in Road Town in 1648, until the English ousted the Dutch from Tortola in 1672. In 1882, Britain granted colony status to the BVI.

### **2.1.3 The Beginning of the Slave Market**

Once the Europeans settled on the Islands, they began building plantations. Many of the plantation owners were Quakers (Fleming, 1989). With this new wave of experienced planters and hard workers, the islands prospered: producing sugar, cotton, rum, indigo and spices.

Sugar brought wealth to many planters as well as their homeland markets—and sugar made slavery on the island necessary. The Slave Market was the basis of life in the colonies. Economically, politically, socially, all lifestyles were bound tightly to slavery (Rogozinski, 1999), even though most of the plantation owners were Quakers, who did not

believe in slavery. By the 1750's almost nine out of ten men and women were slaves on the islands. Never before in human history had such a high proportion of a population been slaves (Fleming, 1989).



**Figure 2- Sugar Cane** (<http://www.sucrose.com/images/cane3.jpg>)

As the Quakers began to emigrate to America, most of their slaves were set free or given control of the land. The Virgin Islands boasts of being the first New World region to set their slaves free. Soon after, slave unrest and ideological doubt brought an end to slave auctions in 1803 and by the 1830s; the remaining slaves had been emancipated.

Abolition at home and the introduction of sugar beet in Europe and the USA were disastrous for the islands: capital and settlers departed for more buoyant economies, and for the next 100 years the islands' economy stagnated. Locals survived by farming and



fishing, and managed to export some of their crops. During this depression, the population dropped from 10,000 to 5,000 people.

## ***2.2 Tortola Today***

The current population on Tortola is approximately 18,000. Unfortunately, no current residents can trace roots to the islands' original Indian population; today's inhabitants are mostly descended from slaves. The hybrid Caribbean culture is evident in the food, in the music and the spoken language.

Each island in the Caribbean has its own culinary secrets as well as delicacies. The numerous dishes in the region are rich in history as well as masterful methods of preparation. The base substance in many dishes is sugar. Sugar is found in every possible dish: lobster, chicken, vegetables. Sugar is considered a BVI tradition. Much of the food in the Caribbean is also well seasoned with herbs and spices, and fish is a staple item for most dishes. The traditions of food preparation are mixed with European, African and Indian influences, although most almost all of the food available to the islanders, save fish and rum, is imported from America.

Virgin Island music is of course as eclectic as the food, but it emphasizes rhythm and has considerable African roots. Scratch bands are an example: they shake and scratch gourds and washboards and sing songs that often comment on local social and political

issues. Calypso, known originally as kaiso, was brought to the Caribbean by African slaves and used as a form of communication and rebellion (Rogozinski, 1999). It's still an integral part of the islands' Carnival, which began as a celebration of slave emancipation.

Although the accepted language of the islands is English, the spoken language is a laid-back mixture of English, French, Dutch, and Spanish, with the Islands' own slang thrown in. English-speaking tourists usually have difficulty adjusting their ears to the island tongue.

In 1917, the United States purchased the adjacent Danish West Indies (US Virgin Islands) as a strategic outpost in the Caribbean. In the 1930s and '40s, livestock, vegetables and fishing were still the basis of the economy. By the 1960s, Laurence Rockefeller had leased land in Virgin Gorda and built a luxury resort at Little Dix Bay. Farming spurred economic growth and the slow social reform on the British Virgin Islands, prompting moves toward self-government.

In 1967, islanders were finally given the right to administer their own affairs. The airport at Beef Island was opened in 1968, and the opening of the first charter yacht operation in 1969 marked the beginning of the island's rich yachting industry.

### **2.2.1 Economy of the British Virgin Islands**

Today, the economic and political stability of the British Virgin Islands, coupled

with an ideal climate and unspoiled natural surroundings, attract around 300,000 visitors a year (Rogozinski, 1999). Local citizens have learned from the mistakes of other Caribbean islands and taken steps to guide growth, resulting in a comparably well protected environment. The islands' growing offshore banking industry may give the British Virgin Islands the option of further limiting tourist industry growth, should they wish to.

From the early 1980s the economy has been consistently strong. Before 1977, the government was not focused on balancing the budget, and commonly employed “deficit spending.” The BVI had depended on the UK for large amounts of budgetary and developmental aid. The BVI did not have its own budget and produced revenue only from customs and duties, income taxes, postage stamps and other miscellaneous fees and licensing (Lettsome, Deputy Chief Education Officer, personal interview).

The existing government of the BVI played a large role in creating the improved existing economy. Government officers and agencies have focused their efforts on keeping a balanced budget. This protocol has created a surplus that has been used to further develop the Islands. The BVI is not fully economically independent of the UK, however. Each year the UK provides \$10 million (US) in loans for developmental aid.

This economy has remained strong for a number of reasons. The government keeps stringent control of surplus funds in order to prevent future deficits. It also has a number of

systems in place, such as working visas, to allow for quick changes in the case that the local economy needs a boost. Tourism is a pivotal economic asset for the BVI, and the safe and secure nature of these islands portends for continued prosperity in this area.

Other endeavors that round out the economy in the BVI include Industry and Agriculture. Industry includes manufacturing, construction, and public utilities. Agriculture includes forestry and fishing (Rogozinski, 1999). The BVI exports a few agricultural products as well as salt and manufactured fiberglass (<http://www.slogold.net/bvi-e.html>). Since the 1960s, most of the agricultural and manufactured products in the BVI are imported from the US, even those products that can be grown or made locally. This has led to increased inflation rates that are currently standing at 2% (2000) (<http://www.slogold.net/bvi-e.html>).

### **2.3 Diabetes**

Diabetes type II, non-insulin dependent, is a disease that most often occurs in adulthood. The people who are most at risk for developing this disease are in general inactive, obese, and have long periods of excessively high blood sugar levels. This disease does not just come out of the blue; it requires years to build to a point where the body is not producing enough insulin and the body's tissues are refusing to use the insulin. Recent studies among 3,234 people in the high-risk category many were able to reverse their

diagnosis by changing their diet and exercise regime to reflect a 5-7% loss of weight. (NIH, May 2002)

This form of diabetes is the most common form of diabetes and although referred to as adult onset it can strike people of any age. The disease begins with a resistance to insulin whereby the body's tissues refuse to accept insulin, and no can longer use it. In the early stages the pancreas responds to this increased blood sugar level by increasing its output of insulin. As the disease progresses, the pancreas can no longer keep up with the demand and glucose levels skyrocket in the blood. Once things have progressed to this point, a strict diet and medication are required to keep metabolism, hydration, and blood pressure under control. (NIH, May 2002)

This disease is almost entirely lifestyle dependent. Lack of exercise and obesity go hand in hand with this disorder. High blood pressure and cholesterol levels also contribute the onset of diabetes, but these conditions may themselves result from not exercising or unbalanced diets. Family history of diabetes is a risk factor that contributes, but of course cannot be avoided.

It has been found that a large majority of cases occur in the section of citizens known as minorities, including African Americans, American Indians, Asian Americans, Pacific Islanders, and Hispanics. (NIH, May 2002) This statistic carries into the Caribbean

as well due to their historical status as British cash crop islands with African slaves doing the brunt of the work. This is especially significant in Jamaica, and similar numbers carry in Tortola. Tortolan health officials recognized these high levels 5 years ago and implemented an island-wide awareness program which has lowered levels on the island to more containable levels. Similar programs have been attempted on Jamaica headed by Professor Errol Morrison, University of the West Indies, but “my words have fallen upon stony grounds.”

Professor Morrison recently gave a report to the Jamaican government explaining how a disease that once affected less than 1 in 100 adults in the 1970’s is projected to affect 25 in 100 within 20 years. He attributes the drastic rise on his island to bad eating habits, especially from the increase in the number of fast food establishments. Even with attempts at education against fast food and obesity resulting from poor diet, the Jamaican people continue to increase in girth and continue to get sick. Professor Morrison doesn’t believe he had any kind of success educating his people. (Observer, 2001)

Type II, or insulin independent, Juvenile Diabetes should not be confused with Type I diabetes, which is known in lay terms as Diabetes. Type I diabetes is usually diagnosed early on in a person’s life, generally in childhood but as late as young adulthood. One theory of the cause of this disease is that the Beta cells of the pancreas have been

destroyed by the immune system rendering the pancreas unable to produce insulin. Treatment of this form of diabetes is usually with insulin shots, or insulin pumps. Diet, exercise, and controlling blood pressure are also factors contributing to the health of people with this disease. (NIH, May 2002)

This form of the disease seems to have a genetic component or might result from immune deficiency and nothing but currently known treatments with insulin can be used to slow or stop the course of the disease. A person never is cured of this disease, and there are no lifestyle deficiencies of exercise or diet linked to the onset. Once diagnosed, care must be taken to ensure a balanced diet, exercise, and insulin treatments are used to regulate the level of sugar in the blood.

While Type I and Type II Diabetes are very different diseases, Gastrointestinal Diabetes, affecting late term pregnant women, has been linked to later acquisition of Type II Diabetes. In this case, hormonal imbalances, or shortage of insulin during pregnancy, cause episodes of Type II Diabetes in the woman. While these symptoms generally go away shortly after the baby has been born, a higher chance of later acquiring full blown Diabetes Type II has been found in women suffering from Gastrointestinal Diabetes. (NIH, May 2002)

If this form of diabetes goes untreated the developing baby can be harmed. Due to

the extra glucose in the mother's blood the baby will also have higher blood sugar levels which can cause a condition known as macrosomia. Macrosomia basically means fat baby, and is a serious condition that can cause damage to the baby's shoulders during birth. The added sugar in the baby's blood will also cause his body to produce more insulin, which can cause abnormally low sugar levels at birth. These low levels can make it difficult for the baby to breathe after birth. The excessive insulin can also lead to obesity in the baby as well as causing him to be at risk for developing Type II Diabetes later in life. (ADA, 2003)

Since it has been clinically proven that Diabetes Type II can be reversed, our aim is to see what aspects of the education program worked amongst the general population of Tortola through surveys and interviewing. With this information in hand it may be possible for future IQP groups suggest "educational therapies" to Jamaica where the situation is extremely critical.

Diagnosis of this disease requires medical testing, which is recommended to begin once a person has reached the age of 45. Waiting for symptoms is not a good idea because many people never experience the symptoms of the disease. In fact nearly 6 million Americans have this disease and do not even know. There are also cases where symptoms are severe and a blood glucose level test very easily validates Diabetes Type II is the cause. Some symptoms to look for are increased thirst, increased hunger, fatigue, increased



urination, weight loss, blurred vision, and sores that do not heal.

Regardless of the form of Diabetes that a person has acquired, keeping track of his blood sugar level, and how his body processes food becomes an important part of treatment. The best test to determine blood sugar levels over a three-month period is the hemoglobin A<sub>1C</sub> test. This test allows doctors to see how their prescribed treatment plan has been working, and allows them to adjust accordingly if it is not. This test should be performed at least twice a year, but if previous tests have shown high levels of blood sugar level then this test is likely to be performed more often. A normal level reported from this test is 7 percent, an 8 or greater indicates severe health complications such as eye disease, kidney disease, and nerve damage is possible. (NIH, revised March 2002)

While the A<sub>1C</sub> test is great for doctors in determining the course of treatment, daily checks of blood sugar level are very important. Typically one uses a machine that uses a drop of blood to check the blood sugar level. Exact numbers vary in different people, but somewhat standard goals are 80-120 mg/dl before a meal and 100-140 mg/dl at bedtime. Blood sugar is usually checked before meals and bedtime, but again a doctor may prescribe more, or a different regime of testing based on personal factors of the patient. Even with daily testing the A<sub>1C</sub> test is still recommended to ensure proper treatment. (NIH, revised March 2002)

These daily tests come in two basic types: litmus like urine samplers and blood testing units. Urine samples work by dipping the test strip in urine and comparing the change in color to the chart included with the strips. The test typically costs around \$20 for a box of 100 strips. Blood samplers use little cartridges that suck blood up by capillary action. To use these, a diabetic pricks his finger or suitable place on his body and places the cartridge over the wound to collect a sample. Once a sample is taken the cartridge is placed in a test unit that measures the blood sugar level directly. Cartridges for this test cost around \$25-30 for a box of 50, and the test units range from \$15-70. (DiabetesStore.Com, 2003)

Keeping blood sugar at appropriate levels is all about finding what works for a body and sticking to that daily plan. It is important to eat at the same time everyday and trying to eat the same amount of food with each of these meals or snacks each day. Skipping meals is not desirable because it throws the cycle off. Once a cycle of food intake becomes consistent, medicating at the same time is also important. Exercise is also a big part of treatment especially with Diabetes Type II. One should try to work out at the same times each day as well. The aim of creating this cycle is to ensure the body gets into a normal regime of getting sugar in the blood and appropriately controlling it. The more stringent the cycle, the more likely one will be able to properly control levels throughout the day. (NIH, March 2002)

Exercise is a big part of controlling blood sugar because it directly is involved with clearing glucose from the blood. As cells use their glucose, the decline of intracellular glucose causes an influx of blood glucose by (facilitated) diffusion. It is important for diabetics to have proper equipment. Dry, clean, well fitting shoes will allow optimal blood circulation. Bad circulation is common amongst diabetics, and injury to the feet can be exacerbated by the loss of feeling (neuropathy). One should be especially concerned if sores appear on the feet. Immediate medical attention is required. (NIH, March 2002)

Proper hydration is important during exercise. Drinking two cups of water before beginning and every 20 minutes of activity is a good idea. Upon conclusion of exercise, two more cups is recommended, and all this water should be taken despite not feeling thirsty. The workout should not immediately go into hard strenuous activity but should build up to peak level slowly over 5 to 10 minutes and should end the same way slowly concluding the exercise. (NIH, March 2002)

Knowing blood sugar before, during, and after exercise is also important. If a person has a fasting blood sugar level of 300 mg/dl he should not exercise, and if the level is around 100 a small snack should be eaten before exercise. Knowing the signs of low blood sugar, hypoglycemia, is essential. Not only should the *diabetic* know, but also if exercising with friends, *they* should know how to treat this potentially serious condition.

Hypoglycemia occurs if a person's blood sugar drops below 70 mg/dl. To treat it, immediate ingestion of glucose tablets, fruit juice, regular soda, or hard candy is necessary.

If symptoms do not improve immediate medical attention is required. (NIH, March 2002)

Symptoms of hypoglycemia include feeling weak or dizzy, increased perspiration, irregular changes in heartbeat, and feeling hungry. (NIH, March 2002) Severe symptoms of low blood sugar include convulsions, moderate psychosis, and unintelligible speech. When a diabetic friend of this group slipped into symptoms like these, his behavior became completely erratic and the paramedics had to be called (Personal Anecdote: Brian McKeon) Upon their arrival we heard how close he had come to slipping into a coma he might never had awakened from. Since then, everyone in his living group learned the symptoms of hypoglycemia and its immediate treatment.

### **2.3.1 Diabetes Prevention in the United States**

The hemoglobin A1c (HbA1c) test provides information on a person's average blood sugar over the past two to three months and does not require fasting. Although the fasting plasma glucose test is still considered the most accurate measure, not having to fast makes the A1c test easier and more appealing for patients and doctors. This simple test may help the more than five million Americans that have undiagnosed Type II Diabetes prevent the serious medical complications that follow the disease or the over eight million

American with pre-diabetes, or Impaired Glucose Tolerance (IGT) to help prevent full-blown Type II Diabetes. Although the Journal of General Internal Medicine suggests that more cases of diabetes can be caught, it is not yet a cost-effective way to do routine tests, nor is there evidence to support widespread screening at the doctor's office. If, however, certain high risk patients, like African Americans, Hispanics, or those who are overweight, agreed to routine screening, a more cost-effective way could possibly be developed. Certain risk factors like hypertension, weighing more than 20% over ideal for the person's age and height, and having a history of diabetes in a parent or sibling would be those who are at greatest risk and with greatest need for screening (Journal of General Internal Medicine 2002; 17:1-7). Currently about 16.5 million American have been diagnosed with Type II Diabetes, and that number is expected to increase 42% over the next 25 years (Diabetes Care 2001; 24:2065-2070).

In New York, a study of more than 3,000 individuals aged 70-79, 8% had undiagnosed diabetes and over 16% had diagnosed diabetes. The undiagnosed cases were most likely among men and overweight individuals, as well as those with hypertension. Diabetics who are not aware of their disease or the complications of their disease are less likely to take steps to control their blood sugar or try to prevent long term complications. The journal "Diabetes Care" suggests that elderly people with high blood pressure and

those who are overweight are appropriate targets for diabetes screening. The study found that the rates of undiagnosed diabetes were equal among elderly black and white men, about 9%, but that black men had higher rates of undiagnosed diabetes, about 23% compared to 14% for whites. The rate of undiagnosed diabetes was also higher among black women, at 22%, than white women, at only 8% (Diabetes Care 2001; 24:2065-2070).

African-American diabetics receive medical care at the same rate as American diabetics in general, but the control of blood glucose and cholesterol levels and were very different. Certain barriers like lack of health insurance to a lack of access to healthy foods and safe places to walk seem to prevent US blacks from healthy control and habits. Perhaps providing classes on healthy cooking and nutrition, exercise, and how to monitor blood glucose could encourage healthier behavior. A study of 625 African Americans living in the southern US found that 25% said that they had never checked their blood sugar, and only 18% reported having all of the yearly recommended medical exams and 46% reported having their blood sugar levels checked by doctors to monitor long-term control. Less than one third of adults exercised regularly, 25% smoked and 40% of men and 58% of women were obese; all major risk factors for diabetes. At least half of adults had cholesterol levels that exceeded recommended levels, and one fourth of these adults had levels that should be treated with medication (The American Journal of Preventive Medicine 2001; 21).

### **2.3.2 Diabetes in the Caribbean**

Currently the Caribbean and the British Virgin Islands have soaring rates of diabetes, with numbers that are reaching epidemic levels. The Caribbean Epidemiology Center (CAREC) has already announced that in the not too distant future, one in every six persons aged 45 years or more will be diabetic. The BVI already celebrates World Diabetes Day, on November 14 of each year. The BVI Diabetes Association is a non-governmental organization working to assist the local diabetic population and sensitize public opinion about this serious health condition. Official data from the Pan American Health Organization (PAHO) states that in the British Virgin Islands, between 1992 and 1995, diabetes mellitus was the number one cause of hospitalization in the territory, with an average of 62 admissions per year. These patterns have been increasing annually and continue to get more serious each year. Diabetes and hypertension rank in the top five causes of death and reasons for hospital admission, district clinic attendance, and home visits by nurses.

The Ministry of Health, in cooperation with the BVI Diabetes Association, have attempted to control these diseases through public education and improved clinical advice for diabetics and their families. Diabetes has been called a public health concern of “pandemic proportions” with good reason. The number of cases of Type II Diabetes is

expected to increase in the order of 45 percent over the next 10-15 years, especially in the Caribbean. The organizations advise that the community needs to be more aware of their eating habits and needs to focus on healthy eating. The health authorities need to focus on improved and more effective care for persons with diabetes. Overall, patient and public education are the main goals that are needed to overtake the out-of-control rate of diabetes increase (Island Sun, Nov. 2000).

### **2.3.3 Why the People of the Caribbean Are High Risk**

According to a report from the US Centers for Disease Control and Prevention (CDC), women with diabetes are twice as likely to have low household incomes than their non-diabetic peers, and they also tend to be less educated. In the year 2000, a Behavioral Risk Factor Surveillance Systems survey of 110,000 women by telephone in the United States gathered evidence that would support that some of the risk factors of diabetes are low income and poor education. The survey showed that about 28% of women with diabetes have not completed high school, and nearly 40% live in households with an annual income below \$25,000. Only 12% of non-diabetic women had not completed high school and 22% lived in households with an annual income under \$25,000. These estimates stayed the same after adjusting for age, race, and ethnicity, marital status, size of household and employment status factors. Perhaps higher educational levels help to positively influence



decision-making, and a higher income provides better access to healthcare, higher living standards, and other material benefits. These socioeconomic factors could be important to how diabetes successfully targets the people of low income and who not normally have higher education. “Poor people tend to be more obese, and in truth, they do tend to have diets that are more energy dense, and engage in less regular physical activity (Dr. Gloria Beckles, of the National Center for Chronic Disease Prevention and Health Promotion).” Obesity, diet, and lack of exercise, may be the prime factors that keep the economically less fortunate people of the Caribbean in the high risk zone for Type II Diabetes (Lifescan.com, Hitt, Feb. 2002)

Many black and Hispanic Americans are unaware that Type II Diabetes raises their risk of heart attack, although they have an increased risk of the disease. Over 1,200 African Americans and Hispanics were surveyed, and over 40% of those with Type II Diabetes did not consider the condition to be related to heart disease, although the statistical correlation is indisputable. Only about one third of those surveyed recognized heart attacks as a complication of Type II Diabetes (Association of Black Cardiologists [ABC]). These statistics, although gathered in the United States, show that education is desperately needed to spearhead increasing Type II Diabetes numbers and to possibly aid in prevention.

Insulin is the hormone in the body that helps to move glucose, or sugar, from the blood into the cells to be used as energy. When the body cannot properly use insulin, or the body has trouble making enough of the hormone, Type II Diabetes develops. Heart disease is a long-term complication due to Type II Diabetes and several other metabolic factors like obesity and high cholesterol that add to heart problems. Insulin resistance that occurs during the disease also builds up to impair the cardiovascular system over the years. According to the ABC, black and Hispanic Americans are at particularly high risk of developing insulin resistance. More than 10% of the US populations of both African-American and Hispanics have Type II Diabetes, making them twice as likely as whites to develop the disease. Since the population of the Caribbean is mainly black and Hispanic, this is yet another reason why the area is overwhelmed with cases of the disease. Although it is proven that blacks and Hispanics are prone to Type II Diabetes, in the US survey mentioned above, nearly half of respondents said that they were not concerned about developing the disease. A similar percentage of Hispanic respondents believed their ethnicity was a risk factor for the condition, while 66% of black respondents believed so. A key factor in preventing diabetes complications like heart disease, kidney failure, blindness and nerve damage is A1c testing to monitor long-term blood sugar control. Among the over 200 people surveyed who had been diagnosed with Type II Diabetes, about 40% could not

define the purpose of A1c testing (Lifescan, Reuters Health, Feb. 2002).

A study conducted by the Southwest American Indian Center for Diabetes Prevention in the United States assessed the Type II Diabetes reduction over a period of three years in patients with high blood glucose levels. The average age of the study participant was 51 years old, and the average body mass index (BMI) was 34. The BMI is a measure of weight in relation to height; a person with a BMI of 30 or greater is considered obese. Half the study participants were randomly assigned a diabetes-fighting drug called “Glucophage” twice daily, or a lifestyle change program. The lifestyle change program was intended to help the participants lose at least seven percent of their weight and engage in 150 minutes of physical activity per week. The study showed that patients in the lifestyle intervention group saw a reduction in their developing diabetes by 58%, while those given Glucophage cut their diabetes risk by only 31%. This shows that a lifestyle change early on in the stages of diabetes can prevent the disease altogether or decrease the risk significantly, more so than a Glucophage drug intervention (The New England Journal of Medicine 2002; 346:393-403). Type II Diabetes is not inevitable, although certain races are at higher risk than others; there are common ways that the occurrence of the disease can be reduced for all those at risk.

## **2.4 D.A.R.E.**

The Drug Abuse Resistance Education program, or D.A.R.E., is a drug prevention program used within kindergartens, elementary, junior high, and high schools throughout the United States and in other countries around the world. By teaching the world's youth the negative effects of drugs, the program aims to one day rid the world of drug abuse and addiction problems (Donnermeyer, [www.dare.org](http://www.dare.org)).

### **2.4.1 Mission of D.A.R.E.**

The Drug Abuse Resistance Education program was founded in 1983 in Los Angeles, CA to teach the skills children need to avoid involvement in gangs, drugs, and violence. Today, over 75 percent of the school districts in the United States, and over 10 million children each year in 52 countries around the world, will take part in the D.A.R.E. program (Donnermeyer, [www.dare.org](http://www.dare.org)).

D.A.R.E. is taught by specially trained police officers, who are respected role models of most every child, during classroom sessions from kindergarten through the 12<sup>th</sup> grade. During the lessons, the children are taught how to resist peer pressure and live productive, drug-free and violence-free lives.

The main goal of D.A.R.E. is to prevent substance abuse, gang affiliation and involvement in violence among school children. In order to accomplish this goal, D.A.R.E.

provides students with accurate information about alcohol and drugs, teaches students how to say “no” to drugs while giving them alternatives to drug use, teaches students decision-making skills and the consequences of good and bad decisions and of their actions, and they build the self-esteem of the students to teach them to resist peer pressure.

The students of D.A.R.E. learn the harmful effects of drugs and alcohol and how to identify drugs. They are taught the skills they need to recognize and resist the subtle and explicit pressures that may lead them to experiment with drugs and alcohol. Role-playing games help to teach self-confidence, and how to respond when a friend, parent or media pressures or influences them to use alcohol or drugs. The students learn how to take control and make healthy decisions when angry or under stress, and to choose positive activities instead of just “hanging out” on the streets.

#### **2.4.2 D.A.R.E. Curriculum**

The D.A.R.E. curriculum was developed by health education specialists and is taught by police officers that have the life experience to answer the questions about drugs and alcohol that the students pose. These officers serve as knowledgeable role-models for the students and are carefully selected before they undergo an intensive 80 hours of training in the areas of child development, classroom management, teaching techniques, and communication skills. Once the police officers are experienced enough to move on to

teach middle and high school, an additional 40 hours of training is provided (Donnermeyer, [www.dare.org](http://www.dare.org)).

The K-4 visitation, or kindergarten through fourth grade, sessions focus on child safety and prevention issues. Potential dangers found in the home, such as chemicals and the misuse of medicine and other substances are alerted to the children. For grades K-2, four sessions are held, and for grades three and four, five sessions are held to help introduce the officers to the children, and to lay the groundwork for the rest of the program.

Grades five and six have one lesson per week for 17 consecutive weeks and are taught by the D.A.R.E. officer, but require that a certified teacher be present to help enhance classroom activities. Teaching techniques used include question and answer, group discussion, role-play, and workbook exercises. These lessons focus on providing students with the skills they will need to resist peer pressure to use drugs and join gangs in their adolescent years (Donnermeyer, [www.dare.org](http://www.dare.org)).

The junior high school, or seventh and eighth grade, curriculum consists of ten follow-up lessons to the previous 17. They are used to reinforce and build upon the skills the students learned in elementary school. New skills are introduced, regarding anger management, violence avoidance and dealing with gangs and gang violence. Strong emphasis is also placed on helping students to recognize and cope with feelings of anger

without causing harm to themselves or others and without resorting to violence or the use of alcohol and drugs.

Values and experiences learned previously are applied to real life situations in the high school years, grades nine through 12, to help the young adults realize the value and advantages of staying drug free. The classroom sessions aim to reinforce the skills the students need to enable them to act in their own best interest when facing high-risk, low-gain choices, and to resist peer pressure and other influences when making their personal choices. The D.A.R.E. officer teaches six of these lessons and the regular classroom teacher independently leads three of the lessons as a follow-up (Donnermeyer, [www.dare.org](http://www.dare.org)).

In order to stimulate interest in the community and to motivate families to help prevent substance abuse and community violence the D.A.R.E. parent program is used. Six two-hour sessions are held in the evenings or at the parent's workplace during lunch hour by the D.A.R.E. office in order to help involve parents with the program as well as to give the parents access to community resources. Topics covered include communication and self-esteem building, risk factors associated with young children, basic information on drug usage and stages of adolescent chemical dependency, sources of pressure and protective factors, violence and conflict resolution, and agency networking in the

community.

### **2.4.3 D.A.R.E. Success**

In 1993, a Gallup survey of 11-18 year old D.A.R.E. graduates showed that 93% have never tried drugs, 75% have never tried a cigarette, and 70% had never tried alcohol. Over 90% of D.A.R.E. graduates surveyed said that they believe that D.A.R.E. has helped them avoid drugs and alcohol, increase their self-confidence and deal effectively with peer pressure (Donnermeyer, [www.dare.org](http://www.dare.org)).

The success of the D.A.R.E. program has led to its spread to communities in all 50 of the United States, its territories and possessions, and Department of Defense Dependents Schools around the world. The program has also been implemented by 52 other nations including Colombia, Australia, Canada, New Zealand, Costa Rica, Brazil, Hungary, England, the Philippine Islands and many of the Caribbean Island nations (Donnermeyer, [www.dare.org](http://www.dare.org)).

### **2.4.4 D.A.R.E. Scientific Advisory Board**

The D.A.R.E. Scientific Advisory Board serves to promote meaningful evaluations of D.A.R.E., and to provide recommendations on ways to keep the program at the forefront of prevention efforts in the United States. The Board is composed of leading experts in the field of drug prevention and research. With the Board's research of the



D.A.R.E. program, critiques and improvements can be made based on the results of continuous research so that the program is always improving and adapting. The Board is in charge of evaluations of the officers, teachers, and of the children to measure the program's effectiveness, as well as handling any suggestions made, any refinements needed, and any expansion opportunities (Donnermeyer, [www.dare.org](http://www.dare.org)).

#### **2.4.5 D.A.R.E. Funding**

The funding for the D.A.R.E. program is handled by a national non-profit organization called *D.A.R.E. America*. D.A.R.E. America also serves as a resource to communities, helping to establish and improve local D.A.R.E. Programs, officer training, support the development and evaluation of the D.A.R.E. curriculum, provide students with educational materials, monitor instruction standards and program results, and create international awareness for D.A.R.E. through a website, an international magazine, and special events and conferences (Donnermeyer, [www.dare.org](http://www.dare.org)).

#### **2.4.6 Connection with D.A.R.E.**

By modeling with a proven methodology of role model based education and esteem building we hope to achieve a program best fitted to help the youth. This is of course the best way of forming healthy habits, establishing them early in life. D.A.R.E.'s success with preventing drug and alcohol abuse in schools and communities made it a logical plan to

follow for healthy lifestyle development. Obviously the program's content, and role-model selection, will be altered to educate on diabetes using the most workable format.

D.A.R.E. is a wonderful program that targets teaching children about the harmful effects of drugs and unhealthy living. The skeleton on which it is framed is perfect for fleshing out a juvenile diabetes awareness curriculum. Such a program would be well received by the congenial local residents. Their love of life and helping their fellow man forms a foundation to work with the new tools to supercharge their community.

This kind of programming fits well into planned healthy living education the Ministry of Education was going to implement in their current 5-year plan phase. They have seen a need to raise the level of healthy living awareness on the island, one method being to refine the health education of their students. On our initial contact with the Secretary to the Chief of Education, Ms. Rosalie Adams, she was pleased to hear a group of individuals were willing to help the Ministry help their people.

## ***2.5 Governmental Concerns***

There are several potential concerns we have with regard to our project and possible conflicts with the local government. As we understand it we will need to be cleared by customs to conduct research at the BVI site. We have made several contacts there who assure us it will not be a problem and that registration at the local college would

be an alternative if customs turned us down. The British bureaucratic system is the form of government which could prove to be difficult. We will only have six weeks to get approval and conduct our research. Considering we are not going to a pre-established site, this could be a potential problem. The British bureaucratic system is notoriously slow in delivering decisions and time will be the number one factor. We are sufficiently prepared to deal with reasonable delay and have several parts of the project that are still achievable without major government help. In the case that the government will not approve of our active hands on research, we have consulted Ms. Emma Baker, the registrar at the only college on Tortola (H. Lavity Stoutt Community College), who has assured us we can register at the college and conduct research through documented materials. If need be, we are prepared to rearrange our goals in a way that reasonable delays will not significantly impact our project. With Ms. Baker's help we look forward to an interesting and exciting project.

## ***2.6 Methods of Research***

There are a variety of research methods we intended to use in Tortola, BVI. We have assessed our individual backgrounds and careers here at WPI and have collaborated to ascertain what types of research methods would work in the BVI. Our diverse backgrounds afford a broad base and understanding of how factors such as subject matter, environment as well as physical location, and presentation provoke different reactions and

responses from people. Some of the methods we arrived at are: general observations regarding our environment, both physical and social; organized meetings with school officials and educators; personal contact such as phone conversations and personal interaction; and surveying the population. It is imperative to notice and observe how social and physical interactions in the BVI, from customs to geography. (*Editor's note: This section is written in the present tense, but refers to our planning phase before we arrived in Tortola*) The more knowledge we can gain about our surroundings, the better position we will be in to extract important details and find potential sources. We must join the local community if we are to be successful in helping it. Most likely there will be meetings with officials and educators both for the purposes of assuring them we are safe and not a threat, as well as gathering information about the schools and how education is handled. From personal experience here in the US, we expect there will be a level of professionalism that must be maintained when dealing with people in positions of authority. Being that BVI is part of the United Kingdom and operating on the same ministry system, we also assume that there will be a higher sense of and demand for respect by people in official positions. Personal contact is inevitable and certainly will occur between our project group and local people in the BVI. Friendships and acquaintances will serve as great sources of knowledge. Once we establish these ties we will learn how to establish less professional methods of

communication, and exactly how to interact with people on a more informal level. Surveying the people may be another way to gather information. A very basic sample survey that we have constructed can be found in Appendix J. Based on information retrieved from several sources it remains unclear if it is feasible to conduct surveys with any statistical significance. There are many factors such as population density, population diversity, availability, and many more that must be considered before meaningful survey research may be conducted. This re-emphasizes the dynamic nature of some research methods and reestablishes the need for a physical presence in Tortola, BVI.

There will be two main categories of research we will conduct when in the BVI. Printed media and historical information will be one of the essential categories we will need to research. By finding and reading published papers as well as media forms such as newspapers, radio, and television we hope to gain insight into social interaction. With a solid understanding of society and social interaction further, more specific research will undoubtedly be a much simpler and more achievable task.

The other category will be based more on human interaction. More specifically, it will be very important to understand how the government and people interact as well as how people in general interact. After understanding this and assessing the feasibility of data-gathering, we might proceed to gather statistical information that may lead to

conclusions or even discoveries after our phase of the project is complete. Understanding social structure and individuals' day to day lives is crucial in deciding which methods will provide meaningful research and useable statistics. The uncertainty of survey effectiveness may also be reduced or even eliminated with this understanding. It is clear from our preliminary readings and overall preparatory research that our task will be dynamic in that many of the goals will need to be altered or perhaps changed completely once we understand what it is like to physically be a part of the Tortola community.

### **3 Methodology**

From the very beginning of our project we had a difficult time establishing contacts in Tortola, BVI. We often found that phone numbers had changed, or e-mail addresses were no longer valid or simply never responded to. The people we did establish communication with gave us an impression that being there locally was crucial to understanding how we would need to go about conducting research. A solid contact we did establish before going to Tortola was Emma Baker, the registrar at H. Lavity Stoutt Community College. After arriving in Tortola we contacted Ms. Baker and scheduled a meeting, from which we got some useful information including insight into what methods of communication would serve us best. The methods that were eventually used to gather information about diabetes and Tortola while in the BVI began with general observation and published written documents and led to face-to-face communications, phone conversations, and scheduled meetings.

Our general observations mainly involved understanding the demeanor of the general public. As we progressed in our research we always took the time to observe situations and how people reacted to things. From the atmosphere in the grocery store, to service in restaurants, every observation yielded some information about local social

interaction. Newspapers offered views on how the media interpreted and portrayed events, whether locally or nationally. Informal meetings within our project group were a useful way to discuss and cross reference observations we had made individually. The mutual comprehension of culture, customs, and etiquette we gained afforded us a confidence in our actions. Face-to-face communication was the preferred method of communication as it sometimes sparked a greater interest in our cause. People generally fed off our enthusiasm and were able to provide more feedback and useful information. We often found that simply showing up in person places got more useful responses than calling alone, also that calling ahead was appreciated but seldom required. Unfortunately the expense of travel in Tortola sometimes made it difficult to go everywhere in person without the certainty that something would be accomplished. A taxi ride of any distance cost a minimum of \$18 US. Many times we sought out information through telephone conversations. If the people were not available we would simply call back at another time. Through our phone conversations, indirectly, we were able to find sources such as the Red Cross and the Rotary Club. Persistence in communication was a necessity as often the people who could best direct us were actually eager to help us but very busy. Our scheduled meetings began with some of our previously established contacts such as Emma Baker. From our meeting with Emma Baker we were able to obtain several new leads including a meeting with



Rosalie Adams, the Permanent Secretary of the Ministry of Education and Culture. Ms Baker made an appointment for us to stop in and schedule a meeting with Rosalie Adams. Upon arriving at the Administration Building (described in Governmental Agencies), we were greeted by a receptionist type secretary who informed us that we would need a letter documenting our statement of purpose, after that was submitted and Ms Adams concurred the meeting would be scheduled. We prepared the letter (in Appendix M) and delivered it as promised, with that our meeting was scheduled and our project was progressing well. Soon after thereafter, we met with Ms Adams and began to gain crucial insight into how the local government works and how we would need to gage our research in order to meet our objectives. We were informed by Ms Adams that we would be cleared by the Ministry to visit schools and contact anyone necessary in conducting our research. With this new approval we began contacting people on our list of leads, which is now our list of acknowledgements (see also Appendix G), as everyone we sought out to work with or seek help from was more than willing to help. In many cases our tasks were completely dynamic in that information was seldom organized in one place or under one specific person or group. Often after establishing a fact we would need to alter our objectives to include or pursue another.

### **3.1 Governmental Agencies**

Most of the governmental agencies in the BVI are located in the Administration Building in Road Town, Tortola. The building is fairly new and has a very modern and professional look to it. Most of the day to day governmental concerns are handled directly inside in the appropriate office. In our research we visited the offices several times to attend meetings and interviews with many respected officials in the Ministry of Education and Culture as well as the Ministry of Public Health. Most of our meetings included multiple Ministry representatives as they were very busy and needed to maximize their time.

From our experiences scheduling and meeting with officials we were pleasantly surprised with the overall friendliness and willingness to help. This was the case with almost all encountered people of the BVI, and government officials, at least the ones we encountered, were no exception. The Government Agencies were extremely helpful and rich sources of information and should be a focal point in any further trips to Tortola.

#### **3.1.1 Ministry of Education and Culture**

The Ministry of Education is the governing body responsible for developing and executing plans dealing with education goals and cultural trends. It oversees the following organizations:

Department of Education, Pre-Primary Schools, Primary Schools, Secondary Schools, Libraries, Her Majesty's Prison, Recreations Trust, Visiting Committee of the Prison (<http://www.bvi.gov.vg>). Through these organizations the Ministry gets feedback and assistance in making policy and physical changes to systems currently in place in order to achieve its goals. The Ministry is continuously working to ensure that all age groups receive the proper education and skills needed to remain competitive and succeed in the modern world. Through some of our research we obtained portions of the past and current five year plan and it clearly shows that the ministry believes in educating all age groups. With regard to specifically to diabetes, in a meeting with the Ministry of Education and Department of Education we learned that the Diabetes II problem is a growing concern and the ministry is actively seeking out ways to minimize it. Some of the things discussed were how to go about assessing which age groups responded to what types of education. In addition to this, they had already begun to incorporate “healthy lifestyle” and general health as a bigger, more serious subject matter in all levels of formal education. While continuing to compete with the fast pace world, the Ministry also has the objective of preserving the culture and history of BVI. It achieves this by preserving museums, cultural sites, and historical documents. We met with Dr. Quincy Lettsome who was a wealth of knowledge. He has a passion for spreading the history of Tortola. He has written and

published many works on general history and the history of education in the BVI. Dr. Lettsome granted us access to his work and gave us great insight into how education has progressed in the BVI. Dr. Lettsome now serves as the Deputy Chief Education Officer in the Ministry of Education and Culture.

### **3.1.2 Ministry of Public Health and Welfare**

The Ministry of Public Health and Welfare is responsible for developing and promoting policies to maintain and improve public health. It oversees:

Clinics, Cemeteries, Charities, Community Centers, Community Development, Drug Control, Drug Council, Hospital Administration, Mental Health, Social Welfare, Solid Waste Management, Voluntary Organizations, Environmental Health, Medical Services ([www.bvi.gov.vg](http://www.bvi.gov.vg)). Initially we contacted Ms. Ivy George who was referred to us by Ms. Rosalie Adams. There were two phone conversations with Ms. George which yielded many additional sources and contacts, especially those involved with the hospitals and clinics. Eventually we were able to meet in person when a joint meeting was scheduled by the Ministry of Education. Ms. George played was able to educate us on some of the ways health is evaluated, as well as how the Five-Year Plan (see Appendix O and section 4.1) is altered to reflect goals in public health. Diabetes II was clearly reflected as a concern that needed to be addressed. Though the focus in the past had been on

diabetes control, the realization that education is a necessity had clearly developed.

### **3.2 Protocol and Etiquette**

Much of our project dealt with communication and meetings with the Ministries of Education, Health, and Immigration. One has to keep in mind they are governmental agencies of a foreign sovereign land. This requires business casual dress, and proper decorum in conducting orderly business with the Ministry. What will immediately be noticed is the level of bureaucracy in dealing with any government office on Tortola. Any Britain inspired government may in general use a very starchy structure based on long established rules of governmental order.

#### **3.2.1 Dress and Decorum**

Dress should be appropriate for dealing in an executive office, recommending slacks and collared shirts for males. Females should wear business friendly attire of the same caliber. Formal meetings may require a tie as well but this is not necessarily a requirement. Suit jackets are not commonly worn by males; however women's suits are quite common. In reality, as long as you are presentable and put thought into your attire, your efforts will be appreciated and you will be received with respect.

Despite the fact that we met with some of the island's most respected and authoritative figures, the discussions were casual no matter how serious the topics of

conversation. If offices could not be reached by phone, stopping by the office was just as, if not more, effective means of scheduling meetings with the various offices. Of course this does not imply that a single "drop-in" will result in an immediate meeting, but if the requested protocols are observed, the officials will respect and help anyone who comes to speak with them. This being said, group members should prepare themselves with a mutual understanding of the material to be presented and each member's area of contribution defined.

### **3.2.2 Bureaucracy of Government**

Proper procedure to make contact with the offices of government is important to consider. This is true even if dealings with the Ministry are just to acquire visas from the Ministry of Immigration. These offices are extremely busy, so quick scheduling of meetings is more fortuitous than normal. Planning is important to allow for coordinated meetings amongst groups of several officers, to reduce the need for chains of meetings. Joint meetings also reduce redundancy and expedite communication among agencies.

Early sending letters of intent to the Ministries of interest is essential. These letters should be concise briefs of intent to the required office, with contact between information established. Ministries will be responsive and can be offered further literature, as they desire. These letters should seek to establish meetings in advance so that joint efforts can

be better scheduled and all parties briefed sufficiently. All government officials we encountered were very friendly and willing to discuss matters frankly. However for this to work efficiently, sending briefs prior to meetings is recommended.

These letters can be delivered upon arrival to the island as we were forced to do. However, the best approach is to schedule all serious meetings well in advance to departure so that no party's time is wasted in strings of unnecessary meetings. This will also eliminate having to wait so long between submission of letters and ability to schedule meetings. Such preparation also opens the door past the chain of secretaries likely to be encountered by cold visits. This chain is necessary to filter the insignificant inquiries from legitimate business, but the ill-prepared will find even reasonable requests may be honored after a long interval of waiting. We have found that a filter goes up for outsiders, but once contacts learn that the group is on the island, they are very willing to point out the right directions to go.

### ***3.3 Civilian Agencies***

The role of the Civilian Agencies on Tortola and the sister islands is strongly felt and needed. We found that not only did the people most educated and most aware of Tortola's situation associated themselves with these agencies, but that they played key roles in taking actions to educate others and to take preventative measures for the future.

### 3.3.1 BVI Diabetes Association

The British Virgin Islands have had a Diabetes Association for over twenty years. The Association was set up to provide the community with free screening and counseling. In the past the Diabetes Association was located on Main Street, in Road Town, Tortola, but a few years ago had to move out for a reason that we were not told. Now the group meets at the British Virgin Islands Red Cross Center once a month.



Figure 3- BVI American Red Cross Center (Photo taken by Nicole McMahon)

We were able to attend a meeting on April 9<sup>th</sup>, and gained insight to the future visions the board members have for the Diabetes Association. President Allen Rhymer addressed the proposal for a new Diabetes Center. Although some of the members did not understand the need for a center, head officers clarified the situation stating that a central location would be beneficial to the community and themselves.



The BVI Diabetes Association is working with the Ministry of Health to try to establish a Diabetes Center that would house a counseling area, a fitness center, a doctor's office, and a store to sell diabetes testing supplies at whole sale prices. This would also be a place where all officers could meet and store materials and supplies. Our group knows firsthand how difficult it was to reach members of the Association. A new building, located in the center of Road Town, would provide all telecommunications necessary to contact Medical Advisors and Nurses with any questions or concerns that a patient might have. Another idea is to be able to service walk-ins that need questions answered or have would like to have their blood sugar tested.

Also at the meeting, Nurse Noelene Clarke summarized the events of the 9<sup>th</sup> International Diabetes Conference entitled "Living with Diabetes". Nurse Clarke summarized the conference in a document that is attached in Appendix Q. Two key points from the conference that she mentioned were: **(1)** although an effort is made by nursing staff to educate patients what diabetes is, many still do not understand, and **(2)** only one in three diagnosed diabetics stick with their prescribed medications. She also suggested to the Association that they begin a "Walking Club" to get out in the public and show people what they need to do to stay healthy and to encourage their friends to join.

The BVI Diabetes Association holds many community events to try to raise

awareness of the Diabetes problems plaguing the territory. Attached in Appendix I are some articles from the local newspapers highlighting events sponsored by the Diabetes Association on World Diabetes Day, November 14<sup>th</sup> of last year, and editorials written by members of the Association to raise the reader's awareness of the problems. The Association also helped to support the Health Exposition sponsored by the Rotary Club of Road Town (See Section 3.2.2).

Although the Diabetes Association is limited in what they can do at this time, they are continually trying to get the community to recognize their organization and to raise awareness amongst the public of the effects of diabetes, and what can be done to help combat the problem.

### **3.3.2 The Rotary Club of Road Town**

The Rotary Club of Road Town is a part of Rotary International, an organization of businesses and professional leaders who are united in service. Rotary Club can be found in 160 different countries around the world with over 1.2 million people providing humanitarian service, promoting high ethical standards in all vocations, and encouraging good will and peace throughout the world (<http://www.rotary.org/aboutrotary/index.html>).

The Rotary Club allows people of different backgrounds and professions to come together to provide service in their community, workplace and throughout the world.

Members strive to develop programs that address critical problems in their community “such as children at risk, poverty and hunger, the environment, illiteracy, and violence” (<http://www.rotary.org/aboutrotary/index.html>). The motto of Rotarians is “Service Above Self” The Rotary Club is a not-for-profit organization that is supported solely by voluntary contributions from members and others who want to help.

The Rotary Club of Road Town has recently initiated community service projects that include the AIDS Walk, a Kiddie Fiesta with inflatable jungle gyms, repainting houses for the elderly, an Anti-Domestic Violence Rally, Clothing and Toy drives, and Health Expositions.

The Health Exposition is an event that is organized by the Rotary Club, in conjunction with other local businesses and organizations, to provide free Blood Glucose, Blood Pressure, Cholesterol, Breast Cancer, Cervical Cancer, Glaucoma screenings and height and weight checks to the community. This event was held in Road Town on March 29<sup>th</sup> and on Virgin Gorda, a neighboring island, on the 12<sup>th</sup> of April 2003. This was the third consecutive year that the Rotary Club provided these services (Interview with Vance Lewis, Event Coordinator for the Rotary Club).



**Figure 4- Health Exposition in Road Town, Tortola** (Photo taken by Nicole McMahon)

The Rotary Club provided all of the supplies necessary to test blood glucose level, cholesterol, blood pressure and to determine blood type. Supplies include: blood test strips for glucose and cholesterol, along with the meters that produce the readings, blood pressure cuffs, and instruments needed for pap smears. Pap Smears and Mammograms were done at the nearby Eureka Medical Clinic, in Road Town and at the Public Clinic on Virgin Gorda. Dr. Herbert O’Neal, at the Pearl Vision Center, provided free glaucoma testing to patients that attended the screening event.

The Rotary Club held the event in the Vanterpool Plaza, a centralized location in Road Town. This location attracted over 100 people to the event. Healthy food was sold for lunch to attendants, including tofu lasagna, an onion soup over rice, and black bean salsa. For entertainment, and to attract passers-by, the Rotary club hired a local Calypso band to

play music.

Our IQP group found out about the Health Exposition in Road Town through contacts at the British Virgin Islands Red Cross. We attended the Health Exposition in Road Town, and while there, met the Event Coordinator, Vance Lewis. The group was able to ask him questions about the event's history and organizational structure.

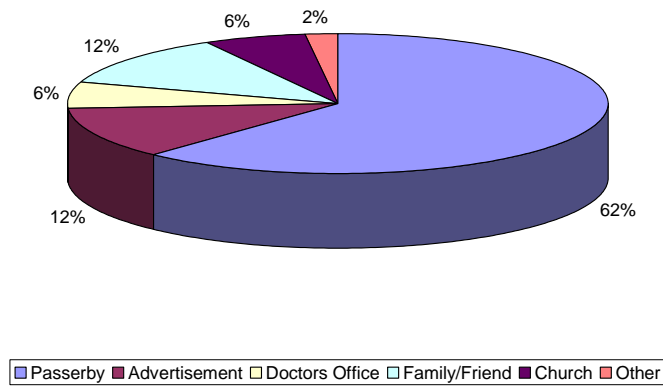
We found out that no take-home informational pamphlets were available for those whose results for any of the screenings necessitated follow up, e.g. a high blood glucose reading or elevated blood pressure. If a person's tests indicated a health risk, the Rotary Club would take that person's phone number and make a follow-up telephone call a week later to ensure that the person has seen or made an appointment to see a professional about the problem, and if not, encourage them to do so.

Our group was concerned that patients were leaving with no knowledge of what the newly diagnosed health risk was or what was happening to their bodies. We spoke to Mr. Lewis about creating informational brochures to be given to people who test high for blood glucose. Mr. Lewis was very receptive to this idea and decided that it might be best to make pamphlets for not only diabetes, but high cholesterol, high blood pressure, glaucoma and breast cancer as well. He also suggested that the group hand out the brochures at the screening the following weekend on the neighboring island of Virgin Gorda.

Using information from the National Institute of Health, the Cancer Institute, and the American Diabetes Association, the group put together informational packets outlining what each disorder does to your body, who is at highest risk for each health problem, some signs and symptoms of each problem, and what can be done to reverse or reduce the effects of each disease, along with contact information for doctors in the area. The pamphlets are attached in the Appendix (B-D). These files were e-mailed to Vance Lewis, who had them printed for distribution at the Virgin Gorda Health Exposition. Two members of the group were invited to travel with the Rotarians to Virgin Gorda to assist with the screenings and to hand out the pamphlets to those patients who showed a positive score for the various screening tests. The pamphlet on Diabetes, High Cholesterol, Hypertension and Height/Weight was given to everyone who registered.

While in Virgin Gorda, we surveyed the attendants on how they had heard of the event. Although the Rotary Club posted flyers and paid for radio commercials and newspaper advertisements, a majority of the people, 62%, had just been passing by and stopped to see what was going on.

How People Heard About The Health Exposition



**Figure 5- How People Heard About the Virgin Gorda Health Exposition**

Included in the Appendix is “A Summary of Numbers for the 2003 Health Exposition.” In this summary, provided to us by the Rotary Club, is detailed information of how many people signed up for free screenings, and how many people completed each diagnostic test. Also available is a cost breakdown, and thanks to those who helped to make the 2003 Health Exposition possible.

## **4 Results**

### ***4.1 Five Year Plan***

The Ministry of Education has the educational curriculum of the schools set up into 5-Year plans to outline the educational topics and goals to be focused on through the coming years. These plans were under regular reviews by the Ministry and were adjusted as needed. The Ministry was more than willing to give our group a copy of the past Five-Year plan, after all alterations had been made, as well as the current Five-Year plan. Our group had planned to analyze how the Ministry could incorporate more health and health sciences into their current curriculum and also how the plan had changed from year to year. However, after reviewing the current Five-Year plan (see Appendix O), the problem was obvious: there was no current health or health sciences program within their curriculum.

### ***4.2 Proposed Curriculum***

This is a sample curriculum, based on the actual D.A.R.E. curriculum (see Appendix R). This proposed curriculum could possibly be used by educational professionals as a basis to design a diabetes prevention curriculum. It is meant to be an explanatory example, based on our knowledge of diabetes and D.A.R.E., as we are not experts in diabetes or children's education.



#### 4.2.1 Diabetes- Grades K-2

- **Introduction to the body-** Understanding your body is the first step to controlling what happens to it. A simple introduction to your body, how it grows, how it works, and what it needs to survive.
- **Food groups-** The food we feed our bodies is the fuel that gives us energy. Our bodies require the right combination of foods to keep it running smoothly. An introduction to the food pyramid and how much of what kinds of foods your growing body needs to stay healthy and working its best. Fun, healthy snack or meal recipes or ideas may be distributed.
- **About feelings-** Explains positive and negative feelings that people can have about themselves and how listening to others or certain events might affect how we see and feel about ourselves. Activities may include having children draw self portraits and critiquing them with a supportive group of peers or adults.
- **Exercise-** Exercising everyday is important in order to keep our bodies healthy. Students may review activities and games that they currently do alone or in groups for exercise and think of new activities.

#### 4.2.2 Diabetes- Grades 3-4

- **Feeling special-** Feeling special is important in building feelings of self-worth.

Student exercises include making a list of their best and worst qualities and how to improve on them or having each student in the class write something different and nice about every other student in the class. This shows students their strong points and builds self-confidence.

- **The body-** Building off of the original lessons taught in K-2 on the body, students will continue to learn about the different foods in the food pyramid and how to distinguish them from one another so that they can start to learn to assess their own eating habits.

- **Why eat healthy? -** Students will start to explore the benefits of eating healthy and the consequences of unhealthy eating. Diseases such as heart disease, cancer, stroke and diabetes will make their first appearances. Surveys may wish to be distributed among the children as to make them start to realize whether they generally have a healthy diet or not.

- **Exercise-** More ideas for types of fun exercises may be discussed. Students may be encouraged to make a chart of the things that they do each day and

which of those things may be considered exercise or healthy, and which of their activities are not healthy.

- **Introduction to diseases-** What are diseases? Students will review some examples of common genetic and lifestyle diseases and what makes them different from other types of illnesses like common colds. This will serve as an introduction to non-communicable diseases like diabetes.

#### **4.2.3 Diabetes- Grades 5-6**

- **Program explanation-** Preventing adulthood diseases that are linked with years of an unhealthy diet and exercise lifestyle starts with the children and youth of today. It is a collaborative responsibility between the schools, ministries, parents, teachers, health professionals and the community.
- **Understanding effects of unhealthy eating-** Years of eating unhealthy foods can clog your arteries and start to change the way your body breaks down and stores food. These can lead to deadly conditions, most of which are preventable by maintaining a healthy lifestyle over your lifetime. This section will focus on the changes that the body and your health go through over the years.

- **Considering the consequences-** Considering the consequences that may result from an unhealthy lifestyle can be helpful in deciding to eat healthy and exercise.
- **Changing your current lifestyle-** A physician should be contacted before any serious exercise is started. After approval, this section will go through the steps to help the student determine their current physical fitness status and assess their current eating habits and other lifestyle factors. Then the student will be shown the proper, gradual program to introduce them to exercise and healthy eating from a sedentary, unhealthy diet lifestyle or how to improve an already in-motion, healthy lifestyle.
- **Self-esteem building-** Developing positive attitudes about one's own abilities and achievements is important in building self-esteem. Lack of self-confidence should not be an influence on the student's diet and activity level.
- **Learning self-discipline-** Students will learn how to be motivated to exercise and eat healthy foods. Knowing how to fight the temptation of eating unhealthy foods or partake in unhealthy activities or sticking to a healthy diet or exercise schedule can be so rewarding!

- **Managing your weight-** Examples of healthy meals and snacks, according to the food pyramid, should be reviewed. A chart of foods they eat, exercise they do, and possibly weight for a weekly basis could be developed and monitored.
- **Combating outside influences on exercise and eating healthy-** Other people can influence the way the student thinks, feels, and acts about exercising and eating right. It must be explained that it is not “un-cool” for the students to care about their health and the way they look and feel about themselves.
- **Having positive role models-** Junior high or high school student leaders who exercise regularly, do not use drugs, or play on a sports team can serve as positive role models and help influence younger students to eat healthy, exercise, not to use drugs, and live healthy in general. Professional athletes and their healthy lifestyles can also be discussed.
- **Summarizing the lessons-** Diabetes prevention education involves learning about ways to develop a healthy lifestyle and keep that healthy lifestyle that will dramatically lower the student’s risk for many life-threatening diseases.
- **Taking a stand-** Taking a stand means eating a healthy diet and getting appropriate exercise so that the student’s health is not jeopardized. The students

will be encouraged to relay what they have learned and other helpful tips to their family, friends and community.

- **Diabetes prevention culmination-** Encouraging students to make pledges to themselves to eat healthy and exercise throughout their lives. They may also want to pledge to be a role model for future students to help them learn to exercise. Students may also want to make a pledge to their families to help them learn to eat healthier and to be a mentor and to provide encouragement in their exercise program.

#### **4.2.4 Diabetes- Junior High**

- **Reconnecting with diabetes prevention-** A review of past topics: proper exercise and healthy eating habits. Students may wish to bring in past or current personal charts of weight management, eating or exercise habits.
- **Diabetes review-** A review of the way the body normally digests foods and produces energy. How diabetes affects the body and its complications will also be reviewed.
- **Overview of other risk factors-** Lack of exercise and unhealthy eating over a lifetime greatly increases one's risk for many life-threatening diseases. A review of these diseases, how they affect the body, and signs, symptoms, and

side effects will be discussed.

- **Changing your current lifestyle-** A review of how the student can develop the proper, gradual program to introduce them to exercise and healthy eating from a sedentary, unhealthy diet lifestyle or how to improve an already in-motion, healthy lifestyle.
- **Self-esteem building-** More activities on how to develop a positive attitude about one's abilities and achievements to build self-esteem.
- **Learning self-discipline-** Students may wish to exchange ways that they have found to be helpful in keeping up with a healthy exercise schedule or eating habits. Perhaps “exercise groups”, similar to study groups could be formed amongst friends.
- **Managing your weight-** Recipes of healthy meals and snacks, according to the food pyramid, could be distributed. A chart of foods they eat, exercise they do, and possibly weight for a weekly basis could be developed and monitored.
- **Being a positive role model-** Junior high or high school student leaders who exercise regularly, do not use drugs, or play on a sports team can serve as positive role models and help influence younger students to eat healthy, exercise, not to use drugs, and live healthy in general. Some students may wish

to be volunteers that act as mentors to younger students as they once had.

- **Summarizing the lessons-** Diabetes prevention education involves learning about ways to develop a healthy lifestyle and keep that healthy lifestyle that will dramatically lower your risk for many life-threatening diseases. A review of healthy eating and exercise management, as well as the non-communicable diseases that people who do not eat healthy are at risk for may be reviewed.
- **Diabetes prevention culmination-** Encourage students to make a life-long pledge to themselves to eat healthy and exercise throughout their lives if they have not already.
- **Helping the community-** The students may wish to donate a weekend of their time as a fundraiser/consciousness-raiser to create healthy foods that the public can sample with the recipes available for them to take home. Fun exercises can be demonstrated for people of all ages that the community can also take home with them.

#### **4.2.5 Diabetes- Parent Program**

- **Effective Communication-** Self-esteem, listening and communication skills are critical in adult-child communication. The practice of these skills will assist



in the development of stronger family communications essential to prevention of unhealthy lifestyles.

- **Role models-** Parents are among their children's role models. Role models may also be found in other family members, siblings, neighbors, community leaders, teachers and peers. Therefore, parents, too, must be aware of what their child is learning in school and how to be positive role models for their children and other children they encounter. Parents must learn and practice healthy lifestyles so that their children and children in the community can learn by life experiences. A section in the curriculum might say: "By eating a healthy diet and exercising with your child by playing games or going for a bike ride or hike, you will demonstrate that exercise is fun and important as well as experience quality family time together. Try to follow along in the parent workbook at home with what your child is learning in school so that the child sees what he or she is learning as a life lesson."
- **Establishing a healthy lifestyle –birth through eight years-** Designed specifically for parents of children ages birth – eight years old; this session provides a background on what constitutes a healthy diet, what proper exercise is and some examples of family activities, and what diseases an unhealthy

lifestyle can put parents and children at risk for. In addition, the session introduces strategies parents can use to motivate young children as they get older to exercise, eat right, and continue to live healthy and avoid unhealthy ways.

- **Unhealthy lifestyle prevention and intervention –Ages nine through adolescence-** This session introduces the casual behaviors or habits in early adolescents that are known to progress into sedentary and or seriously unhealthy lifestyles as adults. The session also introduces parents to basic signs of depression or self-esteem problems that could lead to eating disorders, substance abuse, or other unhealthy activities.
- **Youth pressures/ Resistance Skills-** Through this session, awareness and understanding of life skills, particularly in the areas of dealing with peer pressure and media influences, the family network is strengthened.
- **Prevention Strategies and conflict resolution-** This session will introduce profiles of abnormal eating habits, such as binge eating or depressive eating, and strategies to prevent or diminish them. As the section on prevention, behavior leading to participation in gangs and association with "unsavory characters" should be discussed here, with recommendations on how to redirect such behavior.

- **Panel Discussion-** Members of the community from a variety of disciplines and backgrounds will discuss the scope of adult non-communicable diseases, youth sexual activity with concern for spread of HIV and Sexually Transmitted Diseases and drug use if needed, locally and exchange ideas on resources and referrals. Panel members are selected from a cross section of the community and may include: educators, students, therapists/counselors, prevention professionals and other community related leaders.

### ***4.3 History of Education in Tortola***

Information in this section was gathered from an interview that the group initiated with Dr. Quincy Lettsome. Dr. Lettsome is the Deputy Chief Education Officer and has written numerous papers on the history of the education system in the British Virgin Islands.

In 1789, the Methodist Church of Tortola began teaching the people of the island how to read the Bible. These basic beginnings were expanded and in the 1900's there were 10 schools with more than 500 students. Students were divided by learning abilities and were taught how to read, write and perform basic mathematical calculations.

The government began to take over teaching from the religious-based schools in 1967 and a ministry system was put into effect. Now the government had acting bodies that

decided what the students would learn and how they would learn. The government also began to build schools that were separate from the churches. In 1971, the government finally took full control of the school system.

With one exception, all of the schools on Tortola follow the British Schooling System. Rather than being placed in grades, students follow a form and level system, in which each form represents one year in school. The schools are based on a vocational system in which students are all grouped together in the beginning years, but as they advance in knowledge, their learning is directed into specific career choices. The forms are divided into two series, the ten series and the eleven series. The ten series prepares students to take the CEC (Caribbean Examination Council) Exam and going on to college. The eleven series prepares students to follow a trade and join the work force. After graduation, most high school students enter the work force of the specific trade that they trained for. Of the 1400 students that are currently enrolled in the high school, only 43 are college preparatory students.

There are currently twelve elementary schools and one high school on Tortola. This dramatically lopsided ratio provides various problems for students going on to the secondary school level. Many students are not allowed to attend BVI High School in Road Town because of over crowding problems. Many students must travel to neighboring

islands of Virgin Gorda, or Anegada to attend school everyday. This over-crowding is difficult on teachers as well as students. With 30 students per classroom, even the best teachers have trouble reaching all of their pupils. This is a problem that the school system struggles with constantly. Parents, students, and school faculty are all encouraging the building of a second high school on Tortola. Smaller student teacher ratios, closer proximity and more school activities are only a few of the advantages that these groups look forward to with the completion of another high school.

#### **4.4 School Curriculum**

As discussed in section 4.1, the need for a current health and health sciences program is essential in regulating the increasing rates of non-communicable diseases such as diabetes. Within the high school level, there are some after-school sports offered, but there are none at the primary school level, nor are there gym classes throughout any of the grades. Teaching children about their nutritional and exercise needs is essential, and its poor representation in the curriculum is most likely a contributor to the lack of diabetes awareness and extremely high rates of diabetes.

#### **4.5 Project Lifestyles**

Project Lifestyles is a pilot intervention program that is has been implemented within two of the twelve primary schools in Tortola to enhance positive Healthy Lifestyle

Habits (HLH) in children. HLHs are the certain behaviors and traits that reduce the risk of developing certain types of chronic and acute diseases. The need for this program was felt to be a high priority, to combat the prevalence of poor eating habits, lack of exercise, and low self-esteem. The use of social learning theory, social marketing principles, and combinations of operational philosophies and approaches are implemented throughout the program. These operational philosophies include sequential behavior development, personalized-action oriented approach, participatory non-experimental approach, and intersectional and multidisciplinary approach.

One of the main goals of Project Lifestyles is to prevent the occurrence of chronic, non-communicable diseases such as diabetes, hypertension, stroke, types of cancer, arthritis and coronary heart disease. It is also a goal of this program to help school children and adolescents develop four key Healthy Lifestyle Habits. These focal habits include the proper management and control of weight, diet, exercise, and self-esteem. These goals mirror the Diabetes prevention program that was developed in section 2.5 of this IQP.

Also like the D.A.R.E. program and the proposed Diabetes prevention curriculum, Project Lifestyles is taught in primary or elementary schools. But unlike the previously mentioned programs, it is taught solely by the schools' teachers and is built into the schools' normal academic schedule of science, English, social studies, home-economics,

and physical education classes.

The Ministry of Education hopes to do more with this program in the future, continually adding to and revising its curriculum. To determine the effectiveness of the program, our group suggested periodic surveys of the students and the parents to ascertain how much the students were learning through Project Lifestyles and if the parents were seeing any changes in their children. The Ministry also hopes to continue spreading this program to all of the schools on the island as it is perfected and the effectiveness is proved.

#### ***4.6 Possible WPI Influence in Tortola***

The rich culture and continuous need for social improvements in the British Virgin Islands makes Tortola a promising location as a future WPI Interactive Qualifying Project Site. As our group became familiar with various parts of the island, we frequently encountered project topics where WPI students could have an impact: continuing the diabetes education program, working with the Department of Conservations and Fisheries, sewage/septic control, road development and engineering, feasibility of building a second High School on the Island, setting up a recycling program, and telecommunications development.

Future WPI Students could continue to develop and implement the child-oriented program that we laid the foundation for. When we met with Education Committee in

charge of the Project Lifestyles program, they were very helpful and eager to have us help them. They recognize the Diabetes problem here and they have encouraged introducing an education program to the children of the island to develop healthy eating and lifestyle choices. When our group told the Committee that there was the possibility that future students could come down here to continue the program, they were very pleased. The Education Department is working on a new Five-Year plan and they would be happy to have WPI students be involved with the future planning and development, as well as evaluating the effectiveness of the Project Lifestyles Program.

Fish is a main food on the Island; everyone that we talked to is either a professional fisherman or fishes for recreation. There are not enough fish to fill the demand and many species are becoming endangered. Future students could work with the Ministry of Conservation and Fisheries to develop better and more stringent regulations for fishing. Currently the only restrictions/prohibitions are the taking of red hinds during their breeding season, the use of spear guns, and the taking of spiny lobster smaller than three inches or that are near eggs. There is no limit to how many fish one may catch or a size regulation for fish. The native lobsters of the Caribbean, the Spiny Lobsters, are mostly wiped out of the area. Fishermen do not even bother to drop traps along the shores of Tortola because the yield would be too low; they boat to the island of Anegada, 18 miles northeast of Tortola



(Billy Estrella, from interviews with fishermen).

The current sewage situation is similar to that of Third World countries: there are four foot deep trenches running along the sides of the streets and in between buildings. For some of these, the water runs in the cement drainage pipes and then into the harbor, but many are stagnant systems that have collected trash and waste. These are perfect breeding grounds for mosquitoes and the deadly diseases that these insects bring with them (malaria, dengue, yellow fever, filariasis [heartworm]), not to mention the infectious agents that live in human waste.

Tortola and most of the Caribbean islands are part of a chain of volcanic mountains following the contour of South America. Tortola throughout is very mountainous, there is a main road that circumnavigates the land and various roads that cross the area. In order to travel across the island, cars must travel up, down, and around the mountains: the roads are very steep and very dangerous. Better road development and engineering is greatly needed in Tortola, as is reliable public transportation.



**Figure 6- Congested Intersection in Road Town, Tortola** (Photo taken by Nicole McMahon)

There are 12 primary schools on the island and only one high school. This leads to over crowding in the high schools and forces some students to travel to Virgin Gorda, five miles northeast of Tortola, to attend school every day. There is need for another school, but it is difficult to determine a proper location for a building that would require such a large level and solid area. Research and Development of an area is greatly needed. One of our suggestions was in East End. This area is moderate to highly developed and the topography of the land is relatively flat. An advantage to having another High School on the far eastern end of the island is that this would separate the island into two “districts”, providing students from not only the eastern half of Tortola, but those coming from Beef Island as well, to have a school that is local to them.

There are dumpsters on the sides of the road where people put their trash. The garbage men pick up the dumpsters and take that trash to be burned. Students could help initiate a recycling program that would be beneficial to the people and the environment of the island. Another possibility for better solid waste reduction when incineration is necessary is the high-temperature incineration method in which air pollutants are completely oxidized. The high heat from such incineration could be used to power electric generators, distilleries, and for heating asphalt prior to paving. There are numerous possibilities for WPI students to gain experience in and outside of their chosen majors and to substantially help the people of the island of Tortola and nearby islands.

## **5 Recommendations**

With the close of our project we found that while the scope of diabetes holds many opportunities on the island of Tortola, there also exist many other possibilities for future projects on the island. These points presented as conclusions in the following sections, and come to the ends that: Type II Diabetes is a serious problem on Tortola, and a project center on Tortola would be helpful in aiding this and many more causes.

### ***5.1 Feasibility of a Tortola Project Site***

Despite the desire for assistance from WPI there are some issues that must be resolved in order to make a site feasible. First off, a suitable structure must be found to house the site, or at the very least serve as an office of administration. Secondly, the government would likely be involved in final approval for foreign intervention. Finally, our own IGSD must be convinced to look at this possibility and make the decision to expand its number of sites, realizing the Puerto Rico site and the one proposed here would have different missions.

#### **5.1.1 Permanent Structure for Site**

Once of the hardest things to accomplish would be establishing a permanent structure on the island to house the administrative aspect of a project site. Such an office would be important to facilitate constant communication with the local organizations

seeking aid. This site could also be used to house computer labs and Internet resources for the project groups to use. The major problem with construction is cost of land, and permits required from the government to build and own land as a non-local resident.

This makes using existing resources much more logical, and one such resource that is perfect is the local college, H. Lavity Stoutt Community College, where we have already had productive discussions and received help from the Registrar, Ms. Emma Baker. Ms. Baker is a Tortola native, but spent 20 years in various capacities at Texas Christian University in Forth Worth, TX, so she is familiar with US colleges

With such a link academic resources are already available for project groups to use, and a WPI liaison could hold an office at the school allowing a permanent faculty member. The other option with this configuration is to enlist proxies, faculty at the college as the WPI adjuncts running the site. This would help link schools allowing not just project site potential but classes abroad as well.

### **5.1.2 Logistics of Project Site**

For a project site to be successful there are logistical aspects to consider. These include: transportation, living, and security. Having a car to use would save large amounts of money for students due to the cost of using taxis (\$18 US per trip, no matter the distance). However, we concede that Tortola is a hazardous place to drive because of the hills,

switchback roads, and British-inspired driving on the left, but with right-drive cars. Furthermore, IGSD regulations prohibit driving in the furtherance of an IQP. While we had no real issues with crime on our stay, security is still something that must be addressed for any permanent site to be considered. For the most part securing living and transportation would be of great help in ultimately establishing a project site. An attractive feature of a close working relationship with H. Lavity Stout Community College is that shuttles from the college to Roadtown and back are available and free. The 3.5 mile route to the college from Roadtown is one of the flattest and straightest roads on the island, so living quarters near the college or in town would each provide easy access to both destinations.

Housing is also something that would need to be worked out, or at least rentals cataloged for students to choose their dwelling. There are no dormitories at the college, so project groups will need to rent apartments. This will amount to at least eight hundred dollars a week, making location of housing important for a successful project. We found an apartment where most of the organizations we needed to contact were within walking distance of our apartment in Roadtown. The shuttle between the college and Roadtown and probably to East End as well, makes living to the east of Roadtown possible, or at least should be researched as a possibility

Lastly, longstanding security of the project site and the students' general welfare

must be addressed. From our experiences safety on the island is assured. On Tortola one can walk anywhere, at any time and not be in danger. It is safe to say that problems will only arise if students to place themselves in bad situations. In the unfortunate event that trouble occurs, the police station is within walking distance in Road Town, and foot patrols are constantly conducted around the island. In reality the locals are not violent, and even those that will wish to take advantage do not want to deal with the harsh punishment for criminal acts in the British Virgin Islands. Unlike some Caribbean islands with reputations for crime, drugs, and hotheaded inhabitants, Tortolan decorum and gentility is more like that found in Canadian cities than in Caribbean hotspots. The BVI is not Jamaica; their immigration policy forbids admittance to Rastafarians and to Hippies, groups whose religion and/or lifestyles involve consumption of drugs. The Quaker heritage of the people should also be noted as a social factor contributing to the peaceful character of the Tortolan culture.

When all aspects are integrated together a site on Tortola would be productive and useful to WPI and to the Tortolans. All expenses, averaged four thousand US dollars per person for our group, including airfare. With a host of projects available for students, and an enriching environment to see directly how technology and society mingle, it seems logical for WPI to establish a site in Tortola.

## **5.2 Necessity of Continued Research**

The major aim of our project was to assess the diabetes situation on the island of Tortola, and what we found was alarming. It is evident that only a small handful of individuals understand the severity of diabetes, and its almost epidemic level. While the government has begun to add healthy lifestyle education to its curriculum, it was never aimed directly at diabetes and its preventability. What is most surprising is the lack of governmental statistics on the rates of affliction for diabetes on the island. The situation is not a good one, and requires more research to build statistics, raise awareness, and help lower the rate of occurrence.

### **5.2.1 Knowledgeable Individuals**

The only individuals who completely understand the problem of diabetes on the island are the doctors that deal with patients and the organizations that hold awareness events. This encompasses the Diabetes Association, the Rotary Club, and the head doctor at the island's only hospital. While the government is informed about the disease and its implications, they lack statistics on the problem, and do not consider it to be paramount. If proper statistics could be collected to record the rate of increase and the mortality rate from the disease, the severity of this epidemic could be better appreciated.



### **5.3 Acceptance of WPI in Tortola**

Our experience in dealing with government agencies on Tortola convinces us that future WPI projects would be welcomed there. Discussions with authorities in the Ministries about the Global Studies concept and WPI's philosophy of Project-based learning provoked interest, curiosity, and a willingness to consider future projects in any of several areas, and the world's foremost engineers-in-training (i.e., WPI students) would greatly benefit from project work in Tortola. This location provides not only an experience for visiting students: the locals themselves can benefit greatly from our talents. Practically any major, from engineering to management to biology could find an exciting MQP possibility on Tortola, where there is great latitude for the development of infrastructure improvements and technological solutions for island problems. The following sections are examples.

#### **5.3.1 Civil Improvements**

While the people and island are very accommodating, the conditions of their civil infrastructure could stand improvement. . The runoff water sewer system consists of concrete entrenched channels that pass through the town. In some places these sewers are creatively covered with slabs of preformed concrete making a sidewalk and easily maintainable sewer. Despite being used primarily for runoff, the smell that emanates from

these trenches confirms their role as sanitary sewers as well.

This is a problem on the island as there is no central sewage system that handles the whole island. Civil engineers working with the Ministry of Public Services could help design and plan a sewer system for the entire island or at least aid in piping the waste water. With such a project helping to improve the availability of potable water would be quite useful. Presently most citizens collect their drinking water in cisterns from rainwater runoff; and continue to use outhouses for bathrooms. These conditions exist side-by-side with an enviable desalination plant in the only city, Roadtown, and indoor plumbing in hotels and apartments. That sewage may end up piped out to sea, potentially more harmful to the environment than the outhouse solution, and the desalinated water must often be purchased by homeowners whose cisterns have dried up in the current years-long drought.

The beautiful, winding, and hilly roadways mean one thing for the islanders: burnt clutches. Many of these roadways are still only single lane two-way drives, and more alarming is the tendency for the mountains they are carved out of to continually erode. This causes rocks of considerable size to fall into the road. Mountain goats walking around the cliffs overhead exacerbate the problem. Buttressing these naked mountain walls would be perfect for a civil engineer to practice his art of supporting earth.

Many opportunities like this exist in all the guilds of engineering. The largest

roadblock in the development now is the lack of capital to pay professional engineers to complete all the work. Most of this work would teach students from WPI how to use the basic skills that once built their major to the technological state it is in now.

### **5.3.2 Electrical Engineering Improvements**

One discipline that would greatly benefit from experiences on Tortola would be the electrical engineering one. The great push at our school in ECE is to ride the wave of expanding technological growth by working on high tech computers, and cellular electronics. This pulls our curriculum and growth away from the traditional interests of power production and distribution. With the lack of jobs it is important to note that while one makes more money in high tech trades, everybody needs power making for a stable career. Opportunities to develop telecommunication infrastructure exist as well for those that still feel too kingly to get their hands dirty.

Presently the transformer that powers our accommodations is a 13.2kV pad mounted transformer, a site not normally seen on residential complexes in the States. Just for comparison in the USA 240V and 480V drops are considered high voltage, with many occurrences of electrical arcs jumping from them to surrounding people or equipment. One would suspect these 13.2kV transformers to be found all around the island as common installations. Considering only an unlocked wooden fence protects ours, there exists much

need for concern.

Cellular technologies are emerging on the island but due to the now monopoly state of the present telephone company rates are ridiculously high. Development of a cellular infrastructure would not be exceedingly difficult because of the central hills throughout the island and the existing network capabilities. Even a modest number of cellular towers would be able to serve the entire island and quite possibly the surrounding Virgin Islands.

The usual problem with cellular infrastructure building is the disdain for the physical appearance of the antenna towers. People on this island are embracing the cellular wave and don't seem to mind the edifices of improvement, i.e., cellular towers. The hills themselves are so high that even tree-high antennas would likely be effective in covering the cell. These advances would warrant improved telecommunication infrastructures such as fiber optics and satellite capabilities to improve upon current facilities.

Satellites would help lower the now outrageous cost of three dollars a minute to call mainland USA by increasing bandwidth and line capacity. This will increase data bandwidth with the increase of telephone capabilities as well as helping to add general media coverage to the Virgin Islands. Many more such improvements can be made, and would gladly be welcomed by the locals forced to pay high rates because of the existing

monopoly. Such improvements should not be too complicated as fiber optics are existing on the island, and bottlenecks for telephone calls occur mostly because of landlines utilized on places where satellites could be used.

### **5.3.3 Biological Project Opportunities**

The British Virgin Islands are blessed with coral reefs engulfing the islands. These beautiful living ecosystems are full of all varieties of fish life, and a fair number of crustaceans. The unfortunate situation is that many of these exotic critters have been and are being over fished. The spiny lobster and coral crab are two shellfish we had all hoped to snorkel with on a regular basis. However the crab has not made an appearance and only one small reef in Brewer's bay was home to the three lobsters we saw. Dr. Gibson spotted a single turtle in Cane Garden Bay.

The licensing process is even more surprising considering that the locals concur that certain fish are going extinct. Licenses allow the keeping of anything, limiting only certain fishes in spawning seasons and the size of lobsters. The process involves filing paper work and paying a twenty-five dollar fee, presently, which is filed in the Ministry of Environmental Conservation. With a license any person duly approved can remove any organism from the sea fishing or snorkeling. At least one sensible conservation practice is in place: scuba fishing and spear fishing are strictly banned with postings made all over

Tortola.

Any project involved with conservation and stock building would be helpful on Tortola and the surrounding Virgin Islands. Other opportunities include studying the reefs themselves and any effects of pollution from the sewer system. This island desires to build itself and the Ministries are looking for competent help, and WPI projects would be able to offer that.

#### **5.3.4 Diabetes Association's Needs**

Currently the local Diabetes Association is attempting to increase the awareness of diabetes in order to prevent the exacerbated conditions found in Jamaica. They realize that the failure of Jamaica's Diabetes Association to jump on top of the problem allowed amazing and almost uncontrollable increases in the disease. When the BVI government finally finds a building the BVIDA or commissions construction of one, the Association will have the facilities to educate, treat, and prevent diabetes from growing out of hand.

The organization currently meets in the British Red Cross building. This situation is not beneficial because it is difficult to store literature, and testing equipment in any place but the officers' automobiles. Once a building is found for this organization they will need more volunteers to help distribute this literature, and aid in manning the office. IQP students would be a perfect solution for filling the ranks of volunteers allowing this noble

organization to combat the standing ignorance about diabetes. Volunteers to aid in running education, fundraising, and treatment efforts will be of great value to the Association. Students would be of even greater value when the Diabetes Association has been able to acquire a building. Project groups could be trained to educate, diagnose, and treat diabetes at a nurse's level, which is a set of skills for any student considering medical school, or a profession in health care.

### **5.3.5 Rotary Club Help**

The Rotary Club, much like the Diabetes Association is a volunteer organization whose purposes are general community building events and interventions. With this organization, students would be able to help run educational events, as well as civil improvements and developments. Lifelong friendships and connections can be built with interaction with this group of citizens. Members range from the local fisherman to the managers of island's only telecommunications company. Every person we explained our project to was interested, and often offered assistance. This was the way a cold contact made by Sara Ibbitson and Nicole McMahon enabled us to participate in a health awareness event on Virgin Gorda and write an informational pamphlet for the event..

In an island-based community like Tortola, everyone is a potential source of information. This is especially true in a group of many of the island's most notable citizens.

Not only can they be useful in later employment opportunities, but also meeting one person can spawn contacts with other organizations that might provide project opportunities.

We were able to give the Rotary Club some time, some ideas, and a tangible improvement in the way they do things, i.e., the informational pamphlets on health issues that Sara and Nicole handed out at the Virgin Gorda health fair. These organizations are very well structured, with great missions, but resources and labor can be costly. An off-site cost that would be borne by WPI and not be an expense to the Tortolan agency involved would be preparation via a PQP program, tailored to the task at hand

### **5.3.6 Student Benefits**

Student projects offer educated manpower for planning and development. All fields of engineering can be utilized to help improve everything to the unsafe roads to the unsafe electrical distribution transformers now employed. The best learning does not come out of books; it involves students getting their hands dirty. This alone is the most valuable source of education because the theory can be intertwined with the fabric of practical application. I (Brian McKeon) know from experience that an engine is a simple concept when reading through a repair manual or an ME class, but getting all the nuts and bolts in place is where an engineer is born.

With WPI's intervention students could spearhead the initiatives of the various



Ministry agencies with a more missionary labor force. This would save the island money by not having to work directly with commercial firms. Students would be rewarded not only by helping the nicest group of people we've encountered, but by one of the most beautiful places on this world: Camaraderie and empathy is felt anywhere on the island.

### **5.3.7 Desire for Future Collaborations**

All the organizations contacted and worked with were quite taken aback that students from far-away Massachusetts were interested with the plight of Tortola. The possibility that more students could venture and offer assistance where needed was equally appreciated. So much can be done to help the Diabetes Association, Rotary Club, and the government in general with simple volunteer labor forces of students. Not only does this need exist but also is greatly welcomed and appreciated. We conclude that to offer the services made possible by the educational program of WPI to the sincere population of Tortola would benefit us and them.

It is necessary for agencies such as IGSD to look very carefully at the feasibility of any project site; however, at the very least, independent sponsored project teams should be allowed to continue traveling to the Caribbean. IGSD could evaluate the desirability of the site based in part on the success of these future project teams. One day we hope to see WPI in Tortola on a permanent basis and as alumni our first order of business will be to promote

this dream.

In order to obtain permission to visit the schools and work as students on the island, we needed to insure that we were allowed to do so by the government. During our first contact with the Ministry of Education we explained our purpose on the Tortola, the intended goals of our project, and about WPI's students and IQP projects in general. We also reviewed some diabetes related health statistics and some information on previous diabetes research done on the island. During that same first meeting, the Ministry official, Ms. Adams, was so excited and enthusiastic about our project that she personally contacted Immigration and arranged for the visa requirements effectively waiving the two-month application process. This anecdote speaks to the interest and good will that this second ISP IQP in Tortola generated (the first was in 1998).

### **5.3.8 The Technological Humanist**

Tortola is on the ever-shortening list of places where Americans are welcome without judgment or criticism. It is a safe and attractive location for an engineer to gain global experience. Tortola is a close-knit community of individuals genuinely helpful to each other. Students in the slower paced, relaxed community can, as we did, reflect on how to apply their college training in a socially conscious manor. Tortola provides an environment for such socially-conscious projects, and WPI could easily become the

premiere school for consultation for the Ministries of government. In fact, Rosalie Adams of the Ministry of Education readily offered to include WPI as the primary university for research project requests.

#### ***5.4 Intervention in the British Virgin Islands***

Intervention in the BVI should stem first from further research on the lack of general awareness to the problem of Diabetes, and further the grassroots efforts started on our IQP. While it is true the average citizen of the BVI knows very little about Diabetes there are local organizations that wish to educate the locals. Organizations such as the BVI Diabetes Association and the Rotary Club have the infrastructure in place to help, by need manpower. With WPI's assistance it will be possible to continue spreading their good works throughout the entire BVI, and not just Tortola.

Help is desperately needed based on the continuing rise in cases of Diabetes, and the disregard of the severity of this affliction. The Diabetes Association is constantly reminded of how things can get out of control, by their neighbor Jamaica. On Jamaica the problem was never taken very seriously and now it has the highest rate of new cases, and no means of controlling the spread. Their Diabetes Association disbanded, due to lack of interest in the problem by the citizenship. With the aid of students, the existing organizations might be able to spread their services, and hopefully spread enthusiasm for a

healthy lifestyle Diabetes free. (Rhymer, 2003)

The simple truth is that only a few key people in the BVI understand the problem, and the general public has no idea of what Diabetes is. Even those who have the disease on average do not properly treat themselves, often not even checking their own glucose levels on a daily or even weekly basis. This is just one of the reasons why Diabetes is climbing out of control in the BVI. The other cause seems to stem from the growing trend to Americanize the islands. Most food products are shipped from America. The once fertile farms are shutting down as the youth move into the cities and off their family farms. (Rhymer, 2003) Once domestic production was able to feed the masses, now it is only a hobby for most locals. Increasing the intake of processed foods, and eating fewer vegetables due to their cost is detrimental to healthy eating. Changing the trends of the youth would not be an easy task, and so the potential root problems can only be bandaged, not healed. Studying how a country moves into the modern American lifestyle is a very promising research opportunity. It would be interesting to see how many modern conveniences attribute to death more than life.

## ***5.5 Extension into the Caribbean***

As mentioned in the introduction, the entire Caribbean has dangerous levels of Type II Diabetes, and the levels are only predicted to increase. We recommend that Project

Lifestyle and the Diabetes Prevention curriculum be first implemented in Tortola, and then surveyed by other WPI project groups, the Ministries, or volunteers within a few years to determine the effectiveness of the program. If successful, these results should be shared with other countries within and outside of the Caribbean to sell the programs where needed most

## 6 Conclusion

This project suggests that the problem of diabetes in the Caribbean is much larger than our research had first estimated, and it becomes more of an issue as Americanization of the island continues. Imported food exacerbates the problem by shifting the balance from healthy island-grown produce to processed and less perishable foods made cheaper by subsidies to US farmers. While civilian organizations are aware of the increasing problem and trying to educate the people of the island to diabetes, the nutritional part of the diabetes equation has largely been ignored.

A situation of this magnitude warrants further effort to aid in the educational and statistics-gathering programs currently being implemented. The government's Healthy Lifestyle Pilot Program and existing health education curriculum teach primary school students a variety of topics on hygiene, disease prevention, and nutrition. However the program does not specifically mention diabetes at all.

Our hope is that the Ministry of Education will read through this document and try to experiment with the D.A.R.E.-based curriculum outlined in this report. We know of its success with drug prevention in the US and its process of positive character building is always very effective in educating.

More project groups could provide valuable aid, not just continuing the diabetes education project, but also in the host of infrastructure building and conservation efforts mentioned in this report. We recommend establishment of a permanent project site on Tortola. The feedback that we received convinces us that Tortola is an ideal location for WPI students in training for careers in engineering, management, communications, health care, environment, or biotechnology to observe the mitigating effects of any or all of those technologies on an urbanizing island community. Such an island setting, with space and fresh water limitations, is a metaphor for the entire planet, and an excellent situation for pilot studies in a microcosm that could develop broader applications.

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