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## Quality of Health and Disease Assessment among Selected Marginalized Barangays in Malaybalay City

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### Abstract

*This study was conducted to determine the quality of health among marginalized barangays in Malaybalay City. The study aimed to identify and assess the morbidity rates of the following diseases: waterborne, vector borne, communicable and non-communicable; and assessed the health conditions of individuals in marginalized communities and correlate the incidence/cases of waterborne, vector borne, communicable and non-communicable diseases with the barangays' poverty index.*

*Regression analysis was used to correlate poverty and health. Findings revealed that poverty status has moderate positive relationship with the incidence of dengue, tuberculosis and diarrhea, while there is only slight positive relationship between poverty status and the occurrence of diabetes among the marginalized barangays.*

*Keywords: waterborne, vector borne, communicable and non-communicable, poverty and health*

### Introduction

Good health has long been regarded as the most valuable goal for people to achieve. In recent years, the concept of health has extended beyond the notion of not being sick. It has come to mean maintaining a good appearance, keeping fit, avoiding obesity and having regular medical checkups. But good health is not only valued as a right, it is also crucial to economic survival.

Healthy people are a prerequisite to national development and economic growth. World Health Organization (WHO) Commission on Macroeconomics and Health (2002) explicitly stated that wealth undoubtedly leads to health, but health should also be seen as a form of human capital and therefore an input into

the growth process, as well as an output. Countries with educated, healthy populations are in a better position to prosper, especially in a favourable policy environment. This shows that health is inextricably linked with development - a failing economy cannot provide adequate healthcare, and a sick population is unable to work productively and cannot boost the economy.

In an opposite image of the benefits of good health, millions of impoverished people die every year of conditions that can be prevented or treated. Under the worst-case scenario, majority of the populace is struggling to live healthily. This is simply because of limited or unavailability of health personnel, services and facilities.

Another factor is the inaccessibility of communities due to limited transportation system in cases of far-flung areas. Thus, when a person takes a decision to seek medical attention, it may take hours or even days to reach a health care facility. There are reports of patients brought to the hospital on improvised cart, bicycles, and motorcycles and physically carried on stretchers. When these patients arrive in hospitals, affordability of the available services becomes the issue. These scenarios are true to some parts of Malaybalay City and to the whole Philippines as well.

Improving the health of people is one responsibility among many in the fight against poverty. Two of the five key result areas/priorities of President Benigno Aquino in his PNoy's Social Contract are based from his 16-Point Agenda which are poverty reduction and empowerment of the poor and vulnerable. The agenda aim to provide health insurance to all, especially the poor through PhilHealth's "Z" Benefit Package. The emergence of the National Health Insurance Scheme - PhilHealth, may be a solution in sight. It aims to combat diseases that endanger thousands of children every year and to reduce out-of-pocket healthcare costs for catastrophic illnesses. Echavez and Bagaporo (2005) commended Bukidnon with its Provincial Indigency Health Program. It is a local health insurance program that enables the people to have unlimited access to out-patient services, like the free hospitalization in Bukidnon Provincial Health clinics and hospitals, from basic diagnostic tests to medicines.

However, it should be noted that although the Indigency Health Program is effective but the availability of medicines and supplies of most provincial hospitals becomes a serious challenge. Though the government recognizes health as an important asset but the budgetary allocations do not speak for its significance.

This is because in 2011 the National budget allocation for health was decreased to 2.35% from 2.6% in 2010, which is far beyond the 10% budgetary allocations in developed countries. WHO accentuates the role of health financing system viz, "These tragic deaths—and the enormous economic and social costs associated with them—reflect the basic fact that essential life-saving health services are out of reach to the hundreds of millions of the world's poor. And yet, without extending these life-saving interventions, poverty is likely to be exacerbated and to be passed to the next generation".

The Philippines is not an exception to this. Public Health Nursing in the Philippines (2007) reported that the Philippines has experienced considerable improvements in its health status for the past 50 years, as illustrated in the recent health status statistics from FHSIS (2007) showing infant mortality has dropped by two thirds, the prevalence of communicable diseases has fallen, and life expectancy has increased to over 70 years. However, even with better health outcomes in the management of many important diseases, the rate of decline is low; thus the country still lags behind its close neighbors in the Southeast Asian region.

It must be noted, however, that the Philippines like any other countries is experiencing an epidemiologic shift from infectious to non-communicable diseases over the years. This shows that the country is still contending with the burden of communicable diseases like tuberculosis and at the same time coping with the devastation brought about by non-communicable diseases like diabetes, vector-borne diseases like dengue and water-borne diseases like diarrhea.

Locally, diseases like tuberculosis, diabetes, dengue, and diarrhea pose a threat to health and create a magnitude of burden of ill health in Bukidnon. These diseases are prevalent and a major health

problem in some areas in Region X. Statistics shows that the province of Bukidnon is endemic of malaria, dengue, filariasis and other mosquito-borne diseases (Echavez & Bagaporo, 2005). Another health predicament encountered in the province is the increasing percentage of tuberculosis and diabetes, and high percentage of households with unsafe water supply.

In this research, effects of poverty to one's health could indicate sensitivity or the level to which changes in health practices and environment can affect the lives of the people living in semi-urbanized communities in Malaybalay City. Healthcare continues to pose a major challenge for developing countries. The successes of individual health programs remain overshadowed by the problems our nation faces in the 21st century.

There is a need to assess the quality of health and diseases among selected marginalized barangays in Malaybalay City due to high morbidity rates of the following diseases: diarrhea, dengue, tuberculosis, and diabetes as identified by the Malaybalay City Health Office.

### *Conceptual Framework*

This study is anchored on the concept of Health Sector Reform Agenda (HSRA). HSRA is formulated based on the following premise: although there has been a significant improvement in the health status of Filipinos for the past 50 years, the following conditions are still seen among the population: persistence of large variations in health status across population groups and geographical areas; high burden from infectious diseases; rising burden from non-communicable diseases; unattended emerging health risks from environmental factors; and burden of disease that is heaviest on the poor. According to DOH the reasons why these

conditions are still seen among the population can be explained by the following factors: inappropriate health delivery system as shown by an inefficient and poorly targeted hospital system; inadequate regulatory mechanisms for health services resulting to poor quality of health care, high cost of health care services and drugs; and poor health care financing and inefficient sourcing or generation of funds for health care.

HSRA addresses the problem in the way the Philippine health system delivers. It has embraced the vision of Health for All in the Philippines and takes it to the next level: translating the ideals into concrete actions that can be taken by a wide range of local organizations to bring about real and measurable improvements in health and wellbeing for people across the country.

We know that improving the health of people in marginalized communities is not something the government can do alone. Achieving the shared vision to improve the health of Filipino people is a collaborative effort. In doing this, HSRA articulates major policy framework and strategies to improve the way health care is delivered, regulated, and financed (Public Health Nursing in the Philippines, 2007). An implementation is defined through FOURmula ONE for health, which strategically focuses on interventions that create the most impact and generate partnership from both local government and non-government units.

FOURmula ONE is an overarching philosophy to achieve the end goals of better health outcomes, a responsive health system and equitable health care especially for the marginalized population. It is for people of all ages – children and young people, to adults and older people. It underlines the importance of reducing the financial burden placed on Filipinos by health care costs; ensuring quality and affordability of health services and goods;

improving and ensuring the accessibility and availability of basic and essential health care in both public and private facilities and services.

These concepts are important in determining the effects of poverty and the determinants of health, as factors that contribute to one's illness. This could be the basis in understanding the quality of health and health conditions of vulnerable individuals in marginalized communities.

### *Study Objectives*

The study was conducted to (a) identify and assess the morbidity rates of the following diseases: waterborne, vector borne, communicable and non-communicable diseases; (b) assess the health conditions of individuals in marginalized communities; and (c) correlate the incidence/cases of waterborne, vector borne, communicable and non-communicable diseases with the barangays' poverty index.

### *Review of Literature*

Analysts of the health society characterize and value health in a holistic sense, as a balance of physical, psychological, and community well-being. This view, consistent with the WHO definition of health as "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity" is remarkably consistent across age, gender, nationality and culture. Furthermore, the Council for Health and Development (2003) sees health as a social, economic, and political issue and above all a fundamental human right. Although this perspective is notable and has proven to be significant in promoting the quality of life among individuals worldwide, it is unfortunate that this resounding concept is often not heard—and too often overlooked—by many parts of the society.

Sadly, this basic human right is even more difficult to achieve if the magnitude of poor families increases overtime. NSCB (2006) estimated that 4.7 million families in the Philippines are poor, underserved, and underrepresented.

Poverty is not a simple fact; it is a way of looking at reality. Poverty threatens the developing countries with lingering problems like major diseases and the wide disparities that exist between the rich and the poor in terms of health care. Daunting challenges are faced by these countries such as rising costs of health care, fragmentation of health system, increasing demands for quality but affordable services, impact on increasing globalization on health, and the double burden of disease from both communicable and non-communicable diseases.

*Communicable Disease.* Communicable diseases are most often the leading cause of illness in the country today. One of the major public health problems in the Philippines and the world's deadliest communicable disease is tuberculosis (TB). Tuberculosis is a highly infectious chronic disease caused by the *tubercle bacilli*. It is primarily a respiratory disease and is common in children of underdeveloped and developing countries. WHO reported that out of 196 countries, the Philippines has the distinction of being included in the top 22 high-burden tuberculosis countries and ranked number nine worldwide. In the country, TB is the number six leading cause of death, with 73 Filipinos dying every day.

Locally, tuberculosis affects most vulnerable individuals in Bukidnon. Balistoy (2012) reported that TB is the eighth biggest cause of deaths in Bukidnon. With 131 deaths only 43 deaths or 33 percent of the cases were reported from rural health units. Based on the figures, 88 of the patients or 67 percent died without getting treatment. In addition, a survey conducted by City Health Office Malaybalay (2010) reveals that majority

or 60% of TB patients are from the lower (poor) class, while 30% of patients are from the middle class, and 10% are from the upper (rich) class. It also shows that seven out of ten TB clients in Malaybalay City are laborers and farmers, who are also breadwinners.

A study from Occupational Health Safety and Development revealed that 80% of TB patients once diagnosed with the disease are dismissed from their job. It shows that one family goes hungry for every TB patient. Based on the interview, TB in Malaybalay City creates a stigma that gives fear to all residents. Thus, some of the patients with TB opt not to go for treatment for fears of losing employment and discrimination.

Other factors associated with the increased TB cases are poor programme performance and the limited number of health practitioners. In Bukidnon, success of curing rate of TB is 89% while the cure rate is only 85%. The decrease in cure rate is associated with improper treatment and management of TB that leads to multi-drug resistance TB (MDRTB). This normally occurs when patients stop medication midway after feeling a bit better. MDRTB is a tragedy for individual patients and a symptom of poor programme performance. Although the Provincial and City Health Office utilized community health teams to evaluate every households with TB, it is still difficult to control TB considering the limited number of doctors, nurses and other health practitioners who will be directly observing patients' conditions and drug maintenance.

*Non-communicable disease.* The rapid rise in the prevalence of non-communicable diseases represents one of the major health challenges to global development in the coming century. Non-communicable diseases are broad classification of medical terms used for non-infectious infections. There are four major non-communicable diseases,

namely cardiovascular diseases, cancer, chronic obstructive pulmonary disease and diabetes mellitus.

Diabetes is a chronic disease marked by high levels of sugar in the blood. There are two types of diabetes: Type 1 occurs when the pancreas does not produce enough insulin to properly control blood sugar levels while Type 2, the most common form of diabetes, is marked by high levels of sugar in the blood when the body cannot effectively use the produced insulin. Those with diabetes are at high risk for a number of complications.

Diabetes has become one of the leading causes of death in Malaybalay City. In a survey conducted by the Commission on Population-Region X, Malaybalay's crude death rate has increased from 5.1% in 2009 to 5.6% in 2010. This is attributed to the increase incidence of non-communicable diseases, and one of the top 10 diseases identified is diabetes. As observed by Ulep, Go, Aldeon, Duante, Ortiz, Gonzales, Mendoza, Reyes and Eldo (2012) in their study on the inequities in non-communicable diseases, the urban poor has the higher prevalence of diabetes compared to their counterparts in rural areas. This is due to factors like obesity and consumption of unhealthy diet leaning towards the richer population while their poorer counterparts have several factors like high consumption of salt and saturated fat. It was also noted that the prevalence of diabetes increases as socioeconomic status and educational status increase. This shows that diabetes is more rampant in urban areas, where people can afford and tend to binge more on unhealthy foods. Therefore, it is right to label diabetes as a lifestyle disease, but it does not imply that the poor and underserved communities are not at risk of having this disease.

*Vector-borne Disease.* Among the many vector borne diseases, dengue is one of the most serious viral diseases that

affects the human race. Dengue fever, including dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) is the most significant anthropod-borne viral disease worldwide. It occurs in over 100 countries and territories and threatens the health of over 2500 million people in tropical and subtropical regions. Dengue fever is a severe disease with epidemic potential. An estimated 500,000 patients of which 90% of them below the age of 15 are hospitalized with DHF/DSS every year.

Regional statistics revealed mostly the same scenario. Bukidnon's dengue cases rose nearly 10 times, from 116 during the same period in 2009, to 1,087 in 2010. Based on figures from the PHO (*Mindanews*, 2010), Kalilangan has the highest number of dengue cases in the province of Bukidnon with 248 cases and has a morbidity rate of 643 in every 100,000 population. *Mindanews* reported that Kalilangan posted more cases of dengue since the area has a flat terrain where water often stagnates. The areas where dengue mosquitoes thrive are those where people store water due to lack of water system or where there is water rationing, or where dirty water is stored.

In Bukidnon for the last five years, it obtained an average of 400 suspected cases per year with an average of 1.4 % case fatality. Usually cases begin to rise during the start of the rainy season and peak during the later months of July. The usual cycle of the disease in the province is a rise in every two years which coincides with the rest of the country (Bukidnon Annual Operation Plan, 2012). The rise is due to the geographical location of Malaybalay City where springs, ponds, wet grounds and many plants are found in the vicinity. These areas are the breeding grounds of mosquitoes.

Furthermore, when population growth outpaces the existing infrastructure,

wastewater treatment systems are unable to cope with the influx and garbage. Sanitation facilities cannot contain the increased refuse and access to clean and treated drinking water may not be available. All of these conditions contribute to the possibility of excess water pooling, which creates the perfect environment for disease-causing mosquitoes to breed (Sergo 2007). When drinking water is unavailable through a community system (either wells or through a home tap), it must be carried and stored near the home. Uncovered containers of stored drinking water are also perfect habitat for breeding mosquitoes.

A survey conducted by the City Health Office (2009) shows that 45% of individuals in a population-based survey (23,970 households) don't know what action to take when their children are diagnosed with dengue or what they should do for prevention. It is thus assumed that barangays with higher incidence of dengue may have poor sanitation and inadequate knowledge in the prevention and early detection of the disease.

*Water-borne disease.* It is a well-known fact that clean water is absolutely essential for healthy living. Adequate supply of fresh and clean drinking water is a basic need for all human beings, yet it has been observed that millions of people worldwide are deprived of this basic need. This is evident with the increasing number of cases from water-borne diseases.

Water-borne diseases are infectious diseases spread primarily through contaminated water. Though these diseases are spread either directly or through flies or filth, water is the chief medium for spread of these diseases. Diarrheal diseases are a collection of diseases caused by multiple viral, bacterial, and parasitic organisms that share the common symptom of diarrhea, defined as

the passage of three or more loose or liquid stools per day. This can lead to severe dehydration or even death when left untreated.

The United Nations' World Health Organization estimates that more than 3 billion cases of illness and five million deaths—the majority children—can be attributed annually to unsafe water. The death rate for children alone is estimated at one every eight seconds. The Center for Disease Control Prevention (2011) added that eighty-eight percent of diarrhea cases worldwide are linked to unsafe water, inadequate sanitation or insufficient hygiene. These cases result in 1.5 million deaths each year, mostly in young children. The usual cause of death is dehydration. According to WHO, most cases of diarrheal illness and death occur in developing countries because of unsafe water, poor sanitation, and insufficient hygiene. Repeated episodes of diarrheal disease makes children more vulnerable to other diseases and malnutrition.

The Philippines is not an exception to this diarrheal disease. Department of Health (2007) ranked acute watery diarrhea as the second leading cause of disease in the country. The Field Health Service Information System (2007) reported acute watery diarrhea as the fourth leading cause of disease in Region X. In addition, Northern Mindanao has an increasing infant mortality cases from 8.14% to 11.62%. One of the major causes of this as reported by Echavez and Bagaporo (2005) is malnutrition and diarrhea resulting from poverty and poor health practices, which include the absence of sanitary toilets and potable water supply. According to Health Research Agenda of Mindanao, among the provinces of Region 10, Lanao del Norte and Bukidnon have high rates of unsanitized toilets. In addition, Public Health Nursing in the

Philippines (2007) conducted a health survey which revealed that there is under utilization of sanitary toilet facilities because mothers still allow their children to move their bowel elsewhere despite the presence of toilets in their own homes. This shows that the majority of diarrheal diseases in Bukidnon are contributed to unavailability of sanitary sewage disposal system and/or unsanitary toilet facilities.

Aside from toilet facilities, obtaining safe water supply in Bukidnon remains an important health challenge in the province. Recent survey conducted by City Health Office and Malaybalay City Water District (MCWD) in 2011, showed that 65% of the total household population has access to safe potable water, while the remaining 35% have doubtful sources like undeveloped springs, rivers, and creeks. A closer look at those with access to safe potable water reveals that only 20% of the total household population is on Level III connections, which means that the population has a water source, a reservoir, a piped distributor network and household taps. This level is advantageous since it requires a minimum treatment of disinfection. While the rest of the household population in Bukidnon has Level I water supply facility, accounting to 12% and 33% used Level II water supply facility. Both levels of water supply need intensive water treatment and disinfection. In addition, the MCWD serves only 14 out of 46 barangays of the entire city. The areas served are concentrated in the 11 urban barangays and three of the urbanizing barangays. It can be inferred that water coming from marginalized barangays in Malaybalay City has doubtful sources.

### *Methods and Design*

This study is a descriptive research. It studied the morbidity rates of the top 11

barangays in Malaybalay City. Based on the data gathered at City Health Office-Malaybalay City, the following diseases were purposively identified: waterborne (diarrhea); vector borne (dengue); communicable (tuberculosis); and non-communicable (diabetes).

The City Based Monitoring System (CBMS) of Malaybalay City was used to determine the Poverty Index (unmet needs) of the barangays with the following indicators: health, nutrition, housing, water and sanitation, basic education, income and employment. Proportion of diseases was calculated using the number of cases over the total population of the barangay.

Focus group discussion was conducted to the Barangay Health Workers and City Health Nurses regarding the incidence rates of the top 11 barangays. The Pearson correlation coefficient was used to determine the relationship of poverty and the occurrence of the diseases: vector borne: dengue; non-communicable: diabetes; communicable: tuberculosis; and waterborne: diarrhea. Different models were used until a significant result and a greater  $r^2$  was obtained. Models used were: Logarithmic Model and Fitted Line Plot Cubic Model.

## Results and Discussion

### Vectorborne Disease (Dengue)

Figure 1 illustrates the top 11 barangays with highest morbidity rates of dengue in Malaybalay City. According to CBMS-Malaybalay City, the higher the unmet needs the poorer the barangay. Results further show that the proportion of dengue cases increases as the unmet needs of the barangay increased. Moreover, Figure 2 shows the logarithmic model with coefficient of determination  $r^2 = 29.8\%$ , and correlation coefficient  $r$  of 0.55. This means that the poverty status has moderately positive relationship with the incidence of dengue. The model is given by the equation:

$$\log_{10}(\text{dengue}) = 14.10 + 51.3 \log_{10}(\text{index1}) + 65.4 \log_{10}(\text{index1})^{**2} + 26.73 \log_{10}(\text{index1})^{**3}$$

In examining the micro point of view of the barangays with increased rate of dengue, there are many unique factors aside from poverty that contribute to the morbidity rate in Malaybalay City. In the

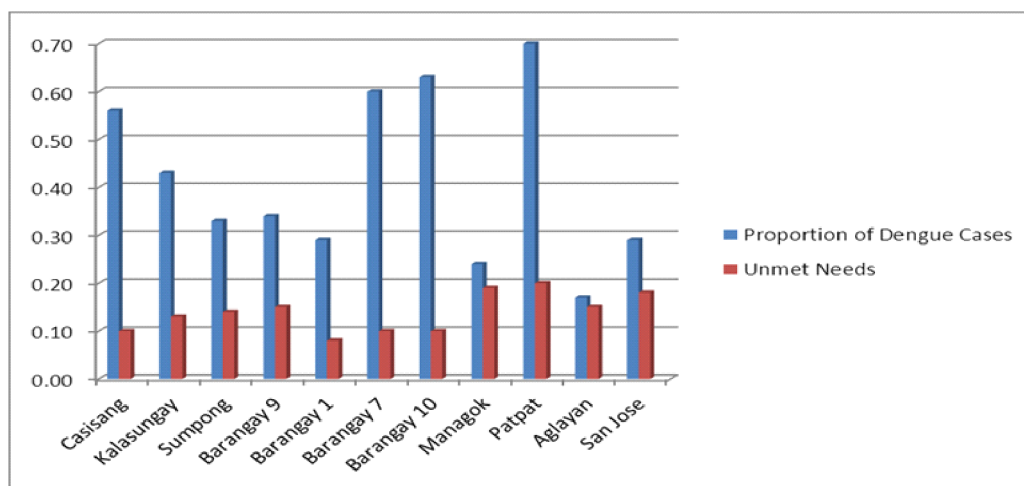


Figure 1. Comparison on the proportion of dengue cases and unmet needs of the barangays for 2010-2011.

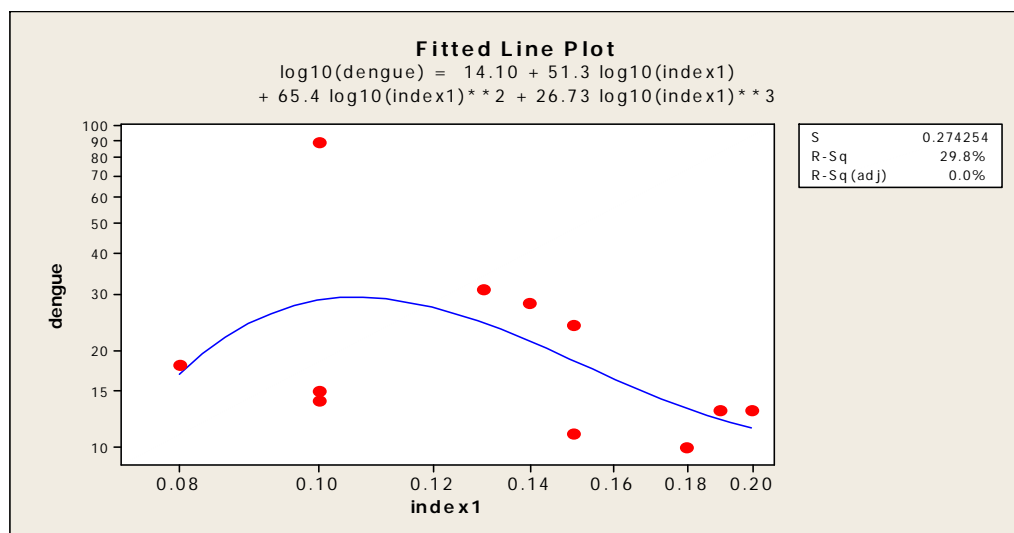


Figure 2. Logarithmic model: Vector borne: dengue versus poverty index.

graph, Barangay Patpat has the highest incidence rate of dengue cases. One reason is many households have no access to clean water. The barangay's main source of water supply is deep well, while some residents get their domestic water supply from nearby springs. As observed, majority of the residents store their water in artificial containers. Uncovered artificial containers of stored drinking water are also the perfect habitat for breeding mosquitoes and a suitable environment for laying eggs. These practices can contribute to the incidence of dengue. Sergio (2007) confirms that inaccessible clean and treated water can contribute to the possibility of excess water pooling, which creates the perfect environment for disease causing mosquitoes to breed.

Another factor that may contribute to the high incidence of dengue cases is many households have no sanitary toilets. According to the City Planning and Development Office (CPDO)-Malaybalay City, approximately 30% do not have sanitary toilets. Based on the interviews, there is also under utilization of sanitary toilet facilities in the communities which means that even with the presence of toilet

facility rural folks especially farmers defecate anywhere. Such practices can contribute to an increase of insects and rodents and may contribute to the increase incidence of vector-borne diseases.

The presence of poultry and piggery farms may also be a factor. In the CPDO-Malaybalay City report, Barangay Patpat is a host of eight poultry farms and five piggery farms. Residents frequently complain of foul smelling odor due to the presence of these farms in their barangay. These pollutants harbour more insects and rodents and can contribute to the increase incidence of dengue.

Educational attainment may also be a factor in Barangay Patpat. According to CPDO majority (41.04%) of the residents are grade school undergraduates and most are unskilled laborers and farmers. It is observed that residents have inadequate knowledge about dengue. In a survey conducted by CHO (2009), data show that 45% of individuals in a population-based survey do not know what action to take when their children are diagnosed with dengue or what they should do for prevention.

It may be surmised that aside from poverty, poor access to safe water, poor toilet facilities, presence of pollutants such as piggery and poultry farms and low educational background are factors that contribute to the increase incidence of dengue.

#### *Non-Communicable Disease (Diabetes)*

Figure 3 shows that the proportion of diabetes cases is inversely proportional to the percentage of unmet needs of the 11 barangays in Malaybalay City. In real terms, most of the 11 barangays with the highest morbidity rates of diabetes have unmet needs lower than 10%, which means most are not poor barangays in Malaybalay City. Results further show that 10 out of 11 barangays are considered as urban communities as characterized by their population, infrastructure, modern technology/facilities, and educational facilities. It also reflects that Barangay 4 has the highest number of cases, doubled compared to the rest of the barangays in Malaybalay City. Consequently, Figure 4 shows the Logarithmic Model with

coefficient of determination  $r^2 = 14.0\%$ , and the correlation coefficient  $r$  of 0.374. This means that the poverty status has slight positive relationship with the incidence of diabetes. The model is given by the equation:

$$\log_{10}(\text{diabetes}) = -15.30 - 59.39 \log_{10}(\text{index4}) - 69.7 \log_{10}(\text{index4})^{**2} - 26.96 \log_{10}(\text{index4})^{**3}$$

A closer look at Barangay 4 shows that most of the populace are business people consisting of 35%, and 26% are government employees (CPDO-Malaybalay). It may be surmised that diabetes affects those who can afford. Diabetes is known to be a lifestyle disease. It is observed that this disease is more rampant in urban communities, where people can afford to buy and eat unhealthy foods. Expostulating on this trend, it can be said that diabetes is more of an urban disease than a rural disease. In addition Ulep et al. (2012) confirmed in their study that factors like obesity and consumption of unhealthy diet are leaning towards the

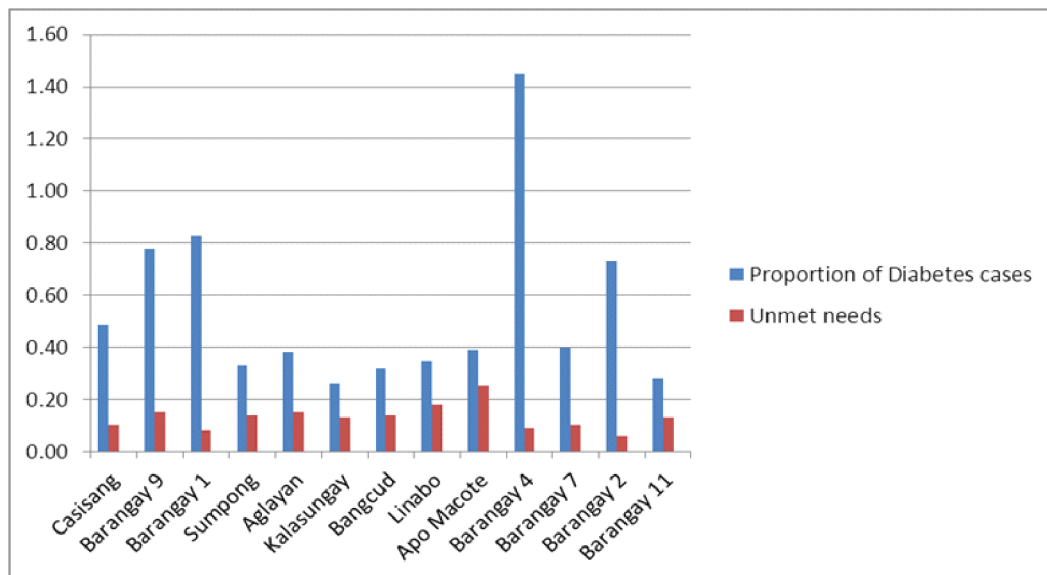


Figure 3. Proportion of diabetes cases and unmet needs for 2010-2011.

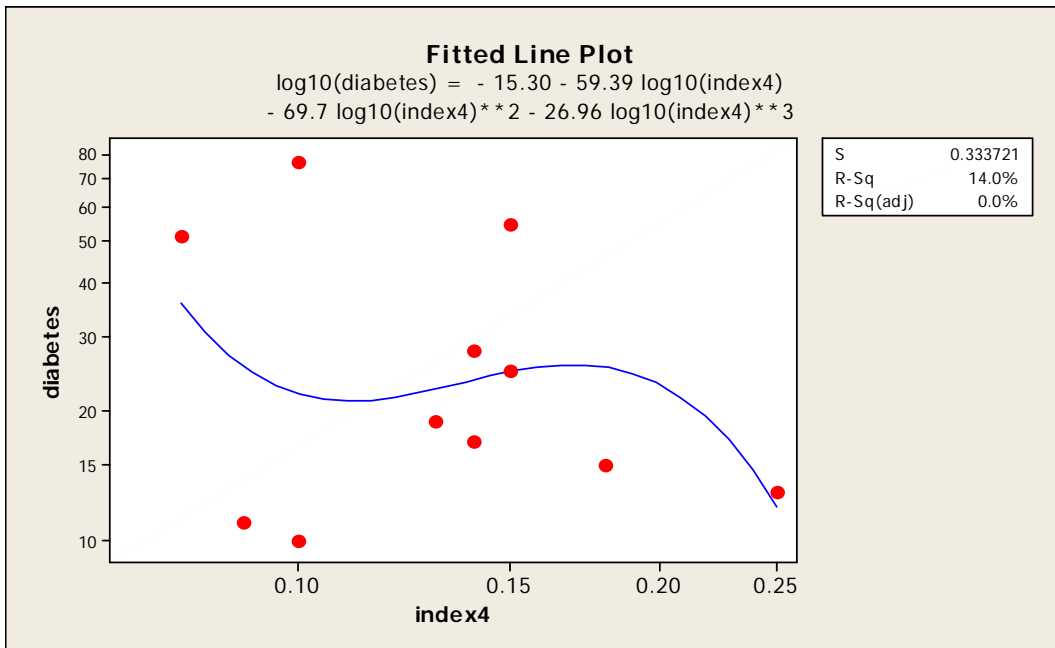


Figure 4. Logarithmic model: Non-communicable: diabetes versus poverty index.

richer population while their poorer counterparts have several factors like high consumption of salt and saturated fat. It was also noted that the prevalence of diabetes increases as socioeconomic status and educational status increases. The CHO (2009) affirmed these findings because most of their diabetic clients are office workers who do not have enough time to cook food but rather buy food from fast food chains.

The implication of these findings is that the incidence of diabetes in Malaybalay City affects business, office workers and individuals who can afford to eat on food that increase sugar levels in the body. In fact, incidence rate is more common in the poblacion and barangays which are near the fastfood facilities.

#### *Communicable Disease (Tuberculosis)*

Figure 5 shows that as the unmet needs of the barangays increase the proportion of TB cases increases. This means that the incidence of TB is affected by the

poverty status of the barangay. Result further shows that Barangay San Jose has the highest number of TB cases. Furthermore, Figure 6 shows the coefficient of determination  $R^2$  of 20.9% of the variances of tuberculosis with correlation coefficient of 45.7%. This value indicates that there is moderately positive association between the occurrences of tuberculosis and incidence of poverty. The regression equation is

$$\text{TB} = 233.2 + 874.3 \log_{10}(\text{index3}) + 1087 \log_{10}(\text{index3})^{**2} + 434.8 \log_{10}(\text{index3})^{**3}$$

A closer look at Barangay San Jose revealed many factors that cause an increased incidence of tuberculosis in their barangay. One is the income of their people which is below food threshold. CPDO reported 46.07% of the total number of households in Barangay San Jose have income below food threshold. This means that most of the households do not have enough money to buy food required to

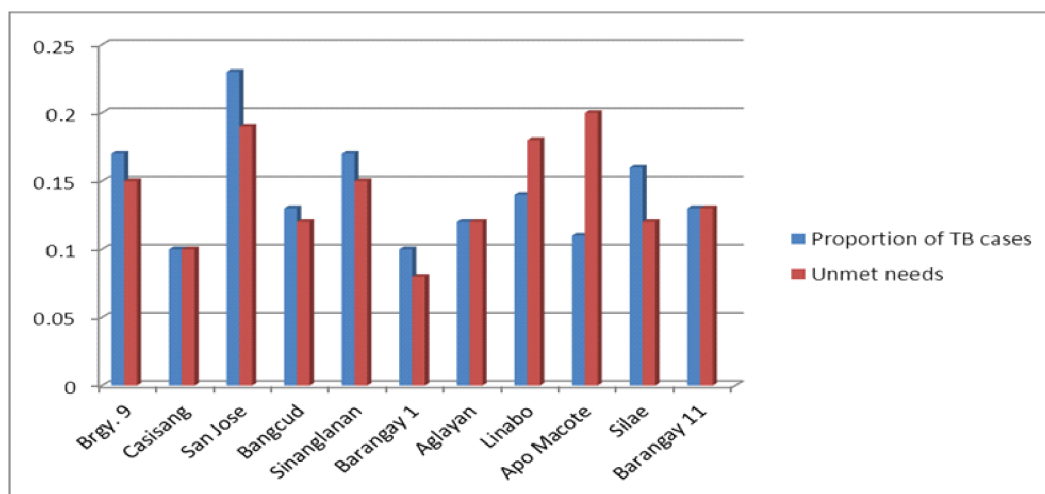


Figure 5. Proportion of tuberculosis cases and unmet needs for 2010-2011.

satisfy their nutritional requirements. As a result 23 children are identified as malnourished. WHO specifically identified malnutrition as an important risk factor for TB.

Another factor that may explain high TB incidence is the low educational attainment and occupation. According to the COPD, majority (41.07%) of the residents are grade school undergraduates. It also shows that 30% of the population is not attending school due to financial reason. It is also observed that most of the out-of-school children are working to help their family earn money to buy food. Occupation is another factor linked to TB. Majority or 36% of the residents are farmers. According to WHO, farmers are at risk of TB by breathing or inhaling air contaminated with the bacteria after an infected animal or infected person coughs or sneezes nearby.

Moreover, the CHO (2010) revealed that majority or 60% of TB patients are from the lower (poor) class, while 30% of patients are from the middle class, and 10% are from the upper (rich) class. It showed that seven out of 10 TB clients in Malaybalay City are laborers and farmers

who are also breadwinners. The Occupational Health Safety and Development conducted a study which revealed that 80% of TB patients once diagnosed with the disease are dismissed from their job. It shows that one family goes hungry for every TB patient. Based on the interview, TB in Malaybalay City creates a stigma that gives fear to all residents. Thus, some of the patients with TB chose not to go for treatment for fears of losing employment and discrimination.

It may thus be surmised that poverty is one factor associated to the cause and effect of the occurrence of tuberculosis. Other factors associated with the incidence of TB such as low income, malnutrition, low educational background, and occupation. TB also serves as a sensitive index of the nation's poverty since it can contribute to unemployment and discrimination.

#### *Waterborne disease (Diarrhea)*

Figure 7 shows the top 11 barangays with the highest morbidity rate of diarrhea. Majority of the barangays are poor communities in relation to their unmet

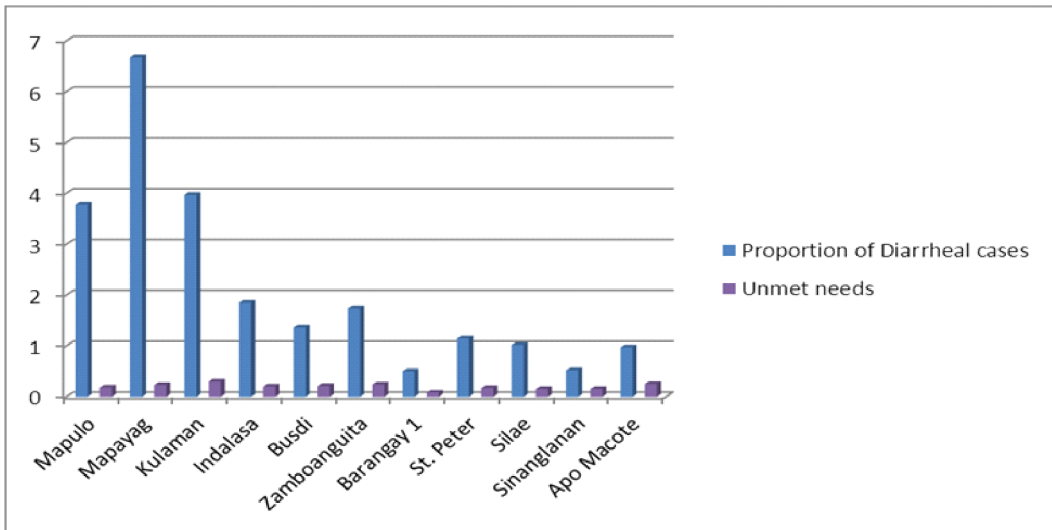


Figure 7. Proportion of diarrheal disease and unmet needs for 2010-2011.

needs as determined by CBMS composite indicator for poverty. It shows that as the unmet needs decrease, the proportion of diarrheal cases increases. On the other hand, Figure 8 shows the coefficient of determination  $R^2$  of 41.4% and correlation coefficient of 64.3%. This value indicates that there is moderately positive association between the occurrences of diarrhea and incidence of poverty. The regression equation is

$$\text{Log}_{10}(\text{diarrhea}) = -5.731 - 30.82 \log_{10}(\text{index2}) - 41.49 \log_{10}(\text{index2})^{**2} - 17.69 \log_{10}(\text{index2})^{**3}$$

Barangay Mapayag has the highest number of cases over population and is one of the poor communities in Malaybalay City. A closer look of the barangay reveals the following factors that may contribute to the increase rate of diarrheal diseases. One factor is that it has no access to portable water. According to CPDO, 96% of households in Purok 7 do not have access to potable water. This barangay is not reached by the current water system. As observed, residents get their water from nearby rivers, creeks and springs which

are still underdeveloped. Based on interviews, it was revealed that garbage is dumped and thrown in creeks by nearby residents. These creeks are known to be the playing grounds of children in the barangay. Thus, children are vulnerable to diarrheal diseases.

Another factor as observed is the inaccessibility of sanitary toilet facilities. According to CPDO, approximately 59.71% of the total households do not have access to sanitary toilet facilities. This means that most of the residents eliminate waste in an open field. It is also noted that an increasing number of children in the barangay are malnourished. This further predisposes children to diarrheal diseases.

Educational attainment may also a factor. The CPDO report shows that 66.28% of the total populace are elementary undergraduates with illiteracy rate of 17.65%. According to PHN (2007) limited literacy would impede one's access to health care and chronic disease management. This will lead to poor understanding on how to take medication or how to manage chronic disease, not to mention being unable to navigate through the complex health care system, causing

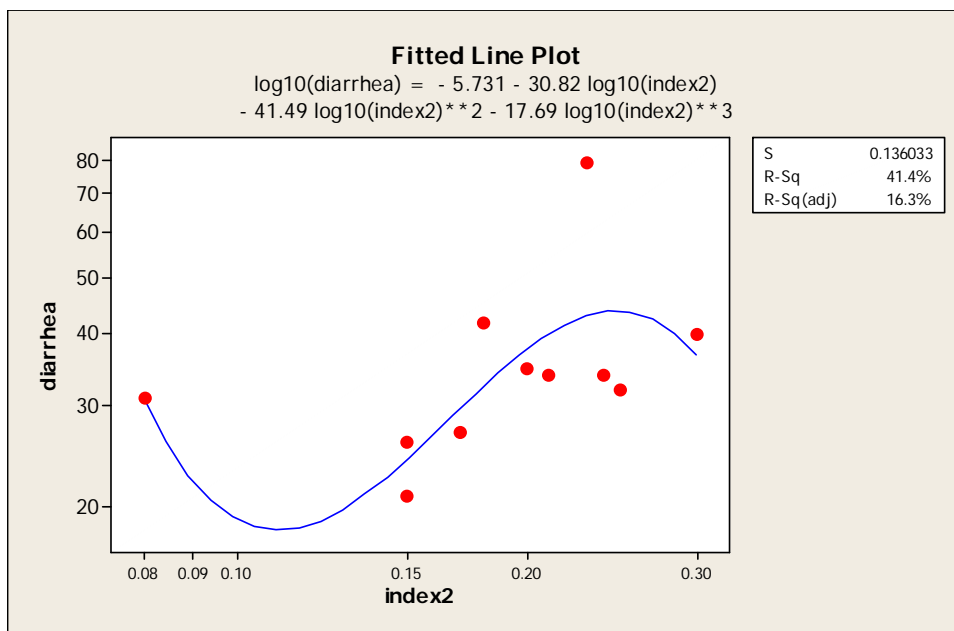


Figure 8. Logarithmic model: Waterborne: diarrhea versus poverty index

increased morbidity and mortality.

Another significant factor may be the presence of banana plantations and piggery farms in the barangay. These plantation and piggery farms can be a source of water pollution through contamination of the water system with chemicals and wastes they release. With rivers, creeks and other sources of water supply contaminated, residents are at risk of having diarrheal diseases.

It can be surmised that water borne disease like diarrhea are common among marginalized communities because of poor water quality/supply, inaccessibility of sanitary toilet facilities, low educational attainment, and presence of agricultural establishments.

### Findings

Based upon the analysis and interpretation, the findings are as follows:

1. The higher the unmet needs and the poorer the barangay, the higher the

morbidity rates.

2. The quality of health of the 11 barangays is affected by the prevalence of the following diseases: dengue, tuberculosis, diabetes, and diarrhea
  - a. Dengue - Factors that contribute to the increase incidence of dengue cases could be attributed to poor access to safe water, poor toilet facilities, presence of pollutants (piggery and poultry farms), and low educational background.
  - b. Tuberculosis - The incidence of TB in Malaybalay City is common among laborers and farmers. Low income, malnutrition, low educational background and occupation are among the factors associated with incidence of TB.
  - c. Diabetes - Majority of the barangays affected with diabetes are from the non- poor urban communities. It is common to businessmen, office workers and individuals who can afford to eat

unhealthy food which lead to unhealthy practices. The incidence rate is more common in the poblacion and barangay, which are near the fastfood chains.

- d. Diarrhea - Diarrhea is common among marginalized communities most likely because of poor water quality/supply, inaccessibility of sanitary toilet facilities, low educational attainment and the presence of banana plantations and piggery farms.
3. Poverty status has moderate positive relationship with the incidence of dengue, tuberculosis, diabetes, and diarrhea, while there is only a slight positive relationship with the occurrence of diabetes.

### *Conclusions*

In line with the findings of the study, the following conclusions were drawn:

1. Since the higher the unmet needs the poorer the barangay is, the higher the morbidity rates of the following diseases: dengue, tuberculosis, diabetes, and diarrhea. Therefore, incidence of poverty affects the quality of life of the marginalized communities.
2. Since the quality of health of the 11 barangays is affected by the prevalence of the following diseases: dengue, tuberculosis, diabetes, and diarrhea, then, the burden of disease is heaviest on the poor.
  - a. Dengue - Since the factors that contribute to the increase incidence of dengue cases could be attributed to poor access to safe water, poor toilet facilities, presence of pollutants (piggery and poultry farms), and low educational background, then, dengue is one of

the most serious viral diseases that affect the residents in Malaybalay City.

- b. Tuberculosis - Since the incidence of TB in Malaybalay City is common among laborers and farmers, then, it is possible tuberculosis may be a leading cause of their death.
  - c. Diabetes - Since majority of the barangays affected with diabetes are from the non-poor urban communities, therefore, diabetes is a lifestyle disease but it does not mean that the poor and underserved communities are not at risk from having this disease.
  - d. Diarrhea- Since diarrhea are common among marginalized communities because of poor water quality/supply, inaccessibility of sanitary toilet facilities, low educational attainment and the presence of banana plantations and piggery farms, then, diarrhea as infectious disease spreads primarily through contaminated water.
3. Since poverty status has moderate positive relationships with the incidence of dengue, tuberculosis, diabetes, and diarrhea, and only a slight positive relationship with the occurrence of diabetes, therefore, poverty and educational attainment may be the common factors associated with dengue, TB and diarrhea. Poverty has little effect in the incidence of diabetes.

### *Recommendations*

1. That the local government to strengthen and extend public health functions, other than health care, that create the basic conditions needed to achieve health like enforcing standards for major health determinants, including clean water and sanitation, food and drug safety, tobacco

- control, access to health-related education and information, and standards for safe working, housing, transport, and environmental conditions.
2. That the City Health Office of Malaybalay City prioritize the giving of health care services to the marginalized communities, where incidence of dengue, diarrhea and tuberculosis are prevalent.
  3. In areas where water system is out of reach to residents in far-flung barangays, the local government should quarterly assess their rivers, creeks, springs and other sources of water for the presence of microorganisms, since these areas are the source of their drinking water.
  4. The local government should implement strict ordinance on waste water management in areas where banana and pineapple plantations are present, as well as in areas where there are piggery and poultry farms.
  5. The government should provide safe accessible tap water to help in decreasing the morbidity rates of dengue. It should also strengthen house-to-house information campaign for the prevention and early detection of dengue in marginalized communities. Every barangay should practice frequent cleanliness drive to ensure that no breeding sites for dengue carrying mosquitoes are present.
  6. The city government should provide additional center for tuberculosis to cater to the increasing rate of TB. It should strengthen information dissemination and increase awareness to BCG immunization.
  7. The city government should provide piped lines in marginalized communities. If this is not possible, then there should be massive information dissemination on ways to make water safe to drink.
  8. The schools should take part in the strengthening of the information dissemination of the diseases affecting the marginalized barangays in Malaybalay City.

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