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Impact of Accessibility to Schools and Economic Centers

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Background and Rationale of the Study

In the Philippine provinces of Eastern Samar and Siquijor, more boys are employed than girls when both are of working age but are still expected to be studying while more girls are in school than boys in almost all age groups (Fillone et al., 2011). This is true regardless of access to school and economic centers. Is this finding also true in more urbanized areas of the country? This study would like to find out by getting more samples of provinces/cities with community-based monitoring system (CBMS) data. In this way, it is possible to statistically determine if this is true, and then if so, policy and program interventions in terms of skills training, livelihood, employment opportunities, and even the provision of roads could help the disadvantaged gender. Furthermore, incentives could also be provided or existing incentive mechanisms fine-tuned to encourage more children to go to school.

Several studies have shown some relation between poverty and access to jobs especially in the urban areas. Sanchez (2008) reviewed public transportation policies from 1960 to 2000 in the United States to highlight federal policies that affected urban areas during this period, especially in relation to low-income transportation mobility. Kalachek (1968) studied

the African-Americans' experience as central city residents and their high unemployment even in times when the overall demand for labor was strong and hiring standards were quite relaxed. The findings of the US Government Accountability Office (1998) revealed that existing public transportation systems could not always bridge the gap between where the poor live and where jobs are located. However, studies by Blackley (1990) and Hughes (1991) showed the relative impacts of employment accessibility resulting from public transportation services, and both recommended increased public transportation expenditures in addressing urban unemployment problems. Diaz Olvera et al. (2003) pointed out the major deficiencies in urbanization and transportation systems in Dar es Salaam, Tanzania's largest city, conditions they viewed to be reinforcing patterns of social and urban segregation. They pointed out that there were numerous obstacles to the daily travel of the city's inhabitants, notably the poor. The poorest individuals tend to retreat into their neighborhoods where low-quality urban facilities are unable to assist in the development of human and social capital and economic opportunities.

Meanwhile, in rural areas, Porter (2007) studied the experiences of women and female children residents in rural areas of sub-Saharan Africa with poor physical accessibility (to services and markets) because of poor roads and inadequate transport (in terms of regularity, reliability, and cost). She examined to some detail the following: access to education, access to health services, and access to markets. She concluded that physical remoteness and isolation often compound the effects of poverty and deprivation. She further emphasized the interconnectedness of deprivations associated with remoteness, women's and girls' poor access to transport, basic (health and education) services and markets, and gendered division of labor. Models in location theory are sometimes used to locate optimally social service infrastructures in the light of limited resources in a developing country. Heng et al. (2007) investigated an integrated model to design an optimal rural road network considering financial and spatial constraints. The rural road network and new multipublic facility locations are optimally designed simultaneously in order to achieve the least total cost spent by government and residents.

In the Philippines, Barrios (2008) discussed the economic vulnerability of rural households. He proposed that as a starting point to address this problem, there must be comprehensive improvement in accessibility through public investment in infrastructure, coupled with the use of user fees for the continuous provision of new infrastructures and maintenance of existing ones. A recent study termed as Integrated Rural Accessibility Program (IRAP) by the International Labour Organization (ILO, 2000) defined

accessibility as the ease or difficulty for rural folks to satisfy their access-related needs. It comprised a set of planning procedures and techniques that cut across sectors and can be used at the local government level for spatial access planning and at the village level for personal access planning. The interventions would mean either through improving people's mobility or by bringing goods and services closer to people. The former is done through improvements in the rural transport system, which includes rural road improvements, upgrading of village transport infrastructure (footbridges, footpaths, etc.), and improvement of low-cost means of transport and transport services. Access can also be improved through better siting of basic facilities such as water supplies, health centers, schools, and markets. IRAP is primarily applied at the municipal level. The application of IRAP at this level is primarily through capacity building of the planning and technical staff of the Municipal Planning and Development Offices (MPDO).

Hence, by expanding the number of samples to relate accessibility to poverty and gender issues in the Philippines, the significance of these relationships could be established. The availability of barangay-level CBMS data all over the Philippines could provide a great opportunity to explore the empirical link among accessibility, poverty, and gender so that policy recommendations could be developed to address the issue of providing equal opportunity to both genders.

Research Problem and Objectives

In less urbanized provinces like Easter Samar and Siquijor, regardless of access, more boys of school age are not in school compared to girls while more girls of working age are not working compared to boys (Fillone et al., 2011). It would be important to know whether this is also true in more urbanized provinces or cities. It is also important to know whether the general perception that boys are preferred more than girls in both the rural and urban areas is indeed true or false. The commonly held basis seems to be that boys are more economically useful as they can augment the household income through farm or factory work. By conducting a more detailed analysis of the impact of accessibility on several measures of poverty, significant relationships could be established among these variables and at the same time how these relationshipsaffect the gender issue can be determined.

Moreover, aside from using travel time to measure accessibility, another important variable is the cost of travel. It has been observed that some people in rural areas are constrained from traveling when money is scarce. It is then important to consider not only time spent per se, but also cost of travel in the accessibility measure, which we termed as the generalized cost (GC) of travel when measuring accessibility.

The following are the objectives of the study:

1. to determine the impact of accessibility to schools and economic centers on poverty and gender equity;
2. to use a generalized cost model to measure accessibility;
3. to develop regression models relating poverty and accessibility using the generalized cost function in the latter; and
4. to recommend policy measures to address gender bias especially in terms of employment opportunities and access to education.

Theoretical and Methodological Framework

The Simple Composite Index

As developed and defined by CBMS, the correlates of poverty using 14 indicators are embodied in the simple composite index (SCI) which at the barangay level, can be defined by the equation

$$SCI = \sum_{i=1}^{14} \left(\frac{Number\ of\ HH\ with\ unmet\ needs\ \textit{i}\ in\ the\ Barangay}{Total\ number\ of\ HH\ in\ the\ Barangay} \right)_i \quad \text{Eq. (1)}$$

The major advantage of this indicator is that it is simple and easy for local planners to apply. However, its main disadvantage is that it assigns equal weights to all components and this may distort the priority of each individual community in terms of resource allocation and planning. Nevertheless, as shown in Fillone et al. (2011), when SCI is regressed with accessibility measures, the relationship was significant at 0.464 for the integrated model (using both Siquijor and Eastern Samar data). When accessibility is better like in Siquijor, it is less significant compared to that of Eastern Samar where accessibility is still a problem. The same study also revealed on one hand that in the provinces of Eastern Samar and Siquijor, more males of school age are not in school compared to their female counterpart. On the other hand, in terms of employment, more females of working age are unemployed than males, and in general, this is regardless of access to the nearest school or economic center.

In the Philippines, facts have shown that inequality still exists between genders, for example, in terms of labor absorption and labor force participation rates (GSAPS, Kikuchi Project). However, with respect to access to education, the World Economic Forum reported that the Philippines

has reached gender parity in primary, secondary, and tertiary education enrollments, which suggests that there is no preferential treatment for sons with respect to education. By obtaining a representative sample of provinces/cities with CBMS data in terms of urbanization, the gender parity could be statistically tested if this finding is true or not across provinces/cities.

The Generalized Cost of Travel

In this study, accessibility would be first analyzed using variable travel time and then also using generalized cost. Using the road and path networks of sample provinces/cities connecting barangays to town centers, the poverty incidence of barangays as well as its gender composition would be related to respective travel times and generalized costs associated with the process of accessing schools and economic centers.

In addition to the existing CBMS data set of Eastern Samar and Siquijor, an additional eight provinces and cities were further analyzed. As much as possible, the full range of poverty levels among provinces and cities in the country should be represented. The degree of urbanization of provinces and cities in the Philippines should also be considered in the sample selection. All in all, a total of 10 samples (i.e. 7 provinces and 3 cities) were used in order that a statistical analysis could be conducted.

Notably, only travel time was used to measure accessibility in an earlier and related study by Fillone et al. (2011). If we use GC of travel to measure accessibility, we can use the following equation:

$$GC = C_t + T_t \text{ x } C \qquad\qquad \text{Eq. (2)}$$

where

> C_t = cost of travel from household to destination by public (i.e., fare) or private (i.e. fuel cost) mode, in Philippine peso (Php)
> T_t = estimated travel time from household to destination, in minutes
> C = cost of time/travel time savings of the individual (may be different for those going to school and those going to economic centers) in Php/unit of time

Since no primary data collection was conducted to estimate the cost of time of respondents, the study used the average daily wage or average monthly income in the sample areas to provide a rough estimate of the cost of time. This may be acceptable especially when it is considered that traffic congestion is insignificant in these places. Results from similar studies could

also be used, such as the one by IT Transport Ltd. (2005) in the rural areas of Bangladesh, Ghana, and Tanzania. The average base travel time saving values for rural travellers in these countries were Taka 3.50 per hour (US$ 0.06) for Bangladesh, Cedi 1,627 per hour (US$ 0.18) for Ghana, and TZS 195 per hour (US$ 0.18) for Tanzania. Base values were 51%, 64%, and 49%, respectively, of the rural wage rate in the study areas of Bangladesh, Ghana, and Tanzania. The study pointed out that the inclusion of time-saving benefits in appraising rural projects would help in (a) redressing the bias against rural infrastructure investment, and (b) supporting the case for more prorural and propoor infrastructure development. However, for cities where traffic congestion is prevalent, cost of time values could be estimated by using similar values obtained from other locations where cost of time is available.

Furthermore, purchasing power parity (PPP) could then be used to adjust the relative purchasing power between the Philippines and the countries with data on travel time savings. The *Manual for Co-Benefit Measurement in Transport Sector* by the Institute for Global Environmental Strategies (IGES 2010) recommends the use of PPP in estimating the cost of accidents in developing countries with no reliable estimates of costs traffic accidents by using comparative Japanese data.

By considering cost of time in measuring accessibility, a better accessibility model could be developed, especially one that considers different trip purposes of going to school and employment centers.

Statistics Analysis and Model Development

This research used the GC of travel as a measure of accessibility aside from travel time and road distance measures. Descriptive analysis, correlation analysis, and regression modeling were used to relate the accessibility and poverty variables in relation to gender. A statistical significance test may be performed, given that 10 sample provinces/cities were used. The sample areas include seven provinces, namely, Biliran, Camiguin, Eastern Samar, Marinduque, Romblon, Siquijor, and Southern Leyte, while the three cities are and the three cities include Puerto Princesa City, Pasay City, and Bogo City. The choice of samples was greatly dictated by the availability of CBMS data among these provinces and cities as well as the size of the province given the limited time and budget of the research.

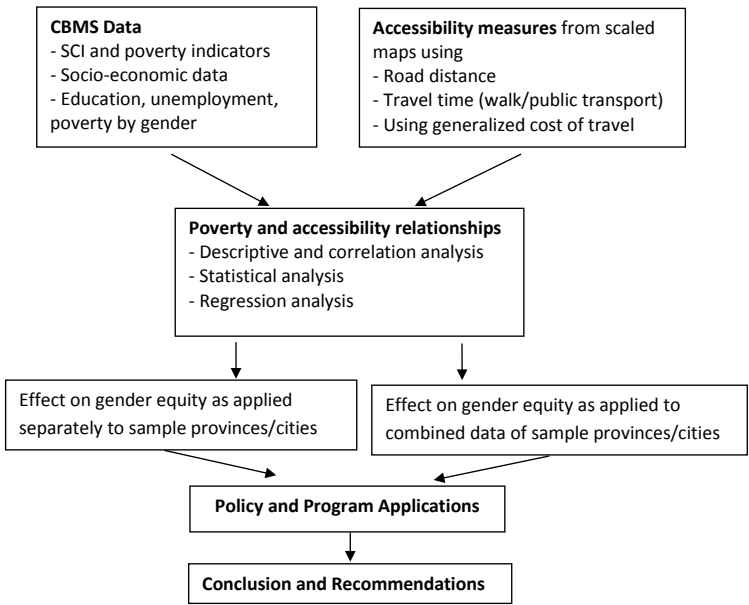Figure 2.1 shows the flowchart of the methodology of the study.

Figure 1. Flowchart of the study.

Regression models were developed by relating accessibility to poverty, unemployment, and school enrollment. Aside from using distance and time to determine accessibility, a generalized cost was also used to estimate accessibility.

Policy applications were then recommended to address the gender issue. Infrastructure programs, like the provision of roads, were also assessed with regard to their impact on employment and poverty at the barangay level while at the same time determining their effect on gender.

Descriptive Statistics

Characteristics of the Study Areas

A total of 10 locations consisting of 7 provinces (i.e., Biliran, Camiguin, Eastern Samar, Marinduque, Romblon, Siquijor, and Southern Leyte) and 3 cities (i.e. Bogo, Pasay, and Puerto Princesa) are included in this study. Initially, the island of Busuanga, composed of two towns, Busuanga and Coron (see Appendix B), was included but due to its incomplete CBMS data

was dropped from the areas to be studied. See Figure 3.1 for the geographic locations of these cities and provinces in the Philippines.
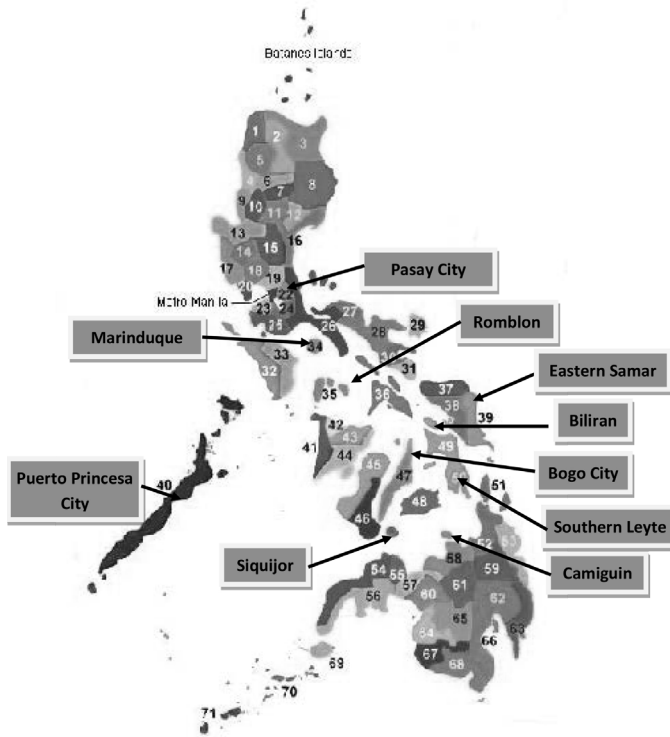

Figure 2. Geographic location of study areas.
Source: Philippine Travel Destination Guides.

Profile of CBMS Poverty Variables in the Study Areas

Since the primary focus of this study is the impact of school and economic center accessibility on poverty and gender equity, the following variables (by gender) were used:

- Children (by gender) not attending elementary school (6–12 years old)
- Children (by gender) not attending secondary school (13–16 years old)
- Households with income below the poverty threshold
- Households with income below the food threshold
- Households that experience food shortage

- Persons (by gender) in the labor force who are unemployed (15 years old and above)

Given the CBMS data, the primary work done to capture the accessibility variables going to schools and economic centers is to develop the road network of each province and city and locate with respect to the road network the schools, economic centers, and the centroid of populations at the barangay level. Table 1 shows the number of elementary and high schools in the study areas. In total, there are 1,305 elementary and primary schools and 246 high schools in the study areas. Eastern Samar has the highest number of elementary schools with Pasay City having the fewest with 19. Eastern Samar also got the highest number of high schools with 49, and both Bogo and Pasay cities had the fewest with 9 high schools. The exact locations in space of these schools were determined and plotted on the road network using a transport planning software for easy processing of accessibility variables.

Table 1. Number of *primary, elementary,* and high schools in the study areas

Province/City	No. of Elementary Schools	No. of High Schools
Biliran	125	16
Bogo City, Cebu Province	22	9
Camiguin	54	10
Eastern Samar	462	49
Southern Leyte	92	39
Marinduque	181	44
Pasay City	19	9
Puerto Princesa City	75	20
Romblon	215	37
Siquijor	60	13
Total	1,305	246

In the same manner, major economic and activity centers in each of the provinces and cities were identified and also plotted on the network. Included were city centers, town centers, airports, and major ports, among others, that are verifiable attractors of economic activities and employment. Table 2 summarizes this number of major economic centers per province or city. For example, in the case of Biliran as shown in Figure 3, there are three

major economic centers located in Caibiran, Naval, and San Roque. Naval Town is the major trading and economic center of the province and also where the major port is located. The Caibiran and San Roque town centers are also economic centers but not as big as that of Naval Town. In the case of Romblon, where there are three main islands (i.e., Romblon, Sibuyan, and Tablas islands), there are five major activity centers: (1) Odiongan, (2) San Agustin, and (3) Alcantara (where the Tablas airport is located) in the biggest island of Tablas; (4) Romblon in the island of Romblon; and (5) Magdiwang in the island of Sibuyan. The inter island parts are located in Odiongan, San Agustin, and Magdiwang. Figure 3.3 shows these major economic centers in Romblon Province.

Table 2. Number of major economic centers in the study areas

Province/City	No. of Major Economic Centers	Location
Biliran	3	Caibiran, Naval,[1,2] Biliran[2]
Bogo City, Cebu Province	1	Bogo City[2]
Camiguin	3	Mambajao,[1,2] Mahinog,[2] Guinsiliban[2]
Eastern Samar	3	Guiuan,[1,2] Oras, Borongan[1]
Marinduque	3	Boac,[2] Buenavista, Gasan[1]
Pasay City	∞	The whole city is a major economic center.
Puerto Princesa City	1	Puerto Princesa City[1,2]
Romblon	5	Romblon,[2] Magdiwang,[1] Odiongan,[2] Alcantara,[1] San Agustin[2]
Southern Leyte	4	Maasin,[1,2] Sogod,[2] Hinunangan, Liloan[2]
Siquijor	3	Siquijor,[1] Lazi,[2] Larena[2]

Note. [1]with airport; [2]with port.

Connectivity to Schools and Economic Centers

Biliran Province

The island province of Biliran has a total of 125 elementary and 16 high schools. It has a very good circumferential road that is also a national road, as shown in Figure 2. One can go around the island using this circumferential road in around three hours.

Bogo City, Cebu Province

Bogo City had a total population of 82,237 in the year 2013 (NSO). With 18,295 households, the average household size in Bogo City is 4.50 members. There are 22 elementary and primary schools and 9 high schools in the city. Figure 3 shows the major road network of the city as well as the location of schools and economic centers.
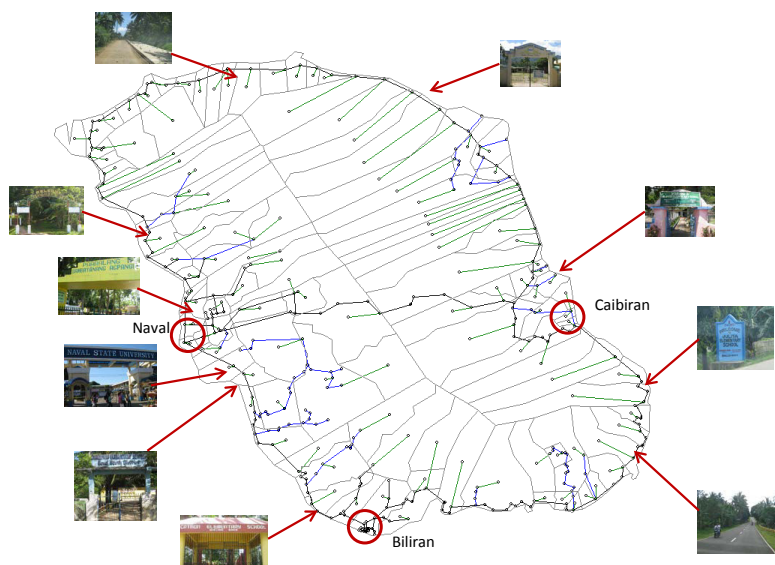

Figure 2. Map of Biliran Province showing the location of schools and economic centers.

Camiguin Province

The island province of Camiguin has 54 elementary schools and 10 high schools distributed throughout the province, and most can be accessed through its circumferential road. This road can be considered as very satisfactory, made mostly of cement and asphalt concrete. One can go around the island in two hours while driving leisurely. Figure 4 shows the road network of Camiguin, modes and its condition, and selection of elementary and high schools located throughout the Camiguin province. Also shown are available modes of transport in Camiguin Province.
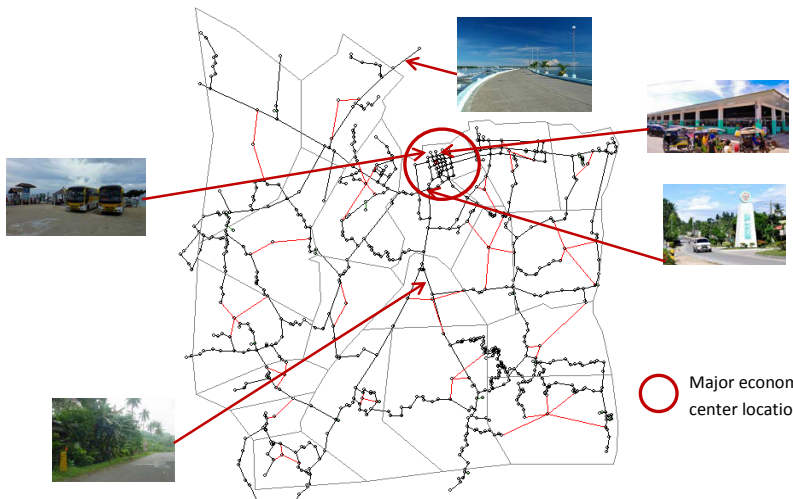
Figure 3. Map of Bogo City, Cebu, showing the location of schools and market centers.

Eastern Samar

In the case of Eastern Samar, there is a total of 462 elementary and 48 high schools in the province (Figures 4, 5, 6).

Although the national road spans the whole province of Eastern Samar, vehicles have to frequently slow down because of ongoing road maintenance work and also because of the rough roads that resulted due to lack of maintenance work. There are stretches of roads that are well paved with asphalt and concrete cement surfaces. Table 3 shows the representative and observed travel speeds depending on the road condition being used. There would be limited emphasis on the road surface condition's effect on accessibility as the presence or absence of public transport service is considered more important in this study. Along the national road that stretches from the north of Eastern Samar in the town of Arteche going south towards the town of Guiuan, the national road that passes through the southern towns of Balangiga, and Quinapondan and joins at the junction, the national road that traverses along the mountainous area going towards Calbayog, the frequency of public transport service like the jeepneys, air-conditioned vans, and air-conditioned and non–air-conditioned buses has such regularity that would allow one to travel on a daily basis. All the more, with destination choices such as Pasay and Cubao in Metro Manila, Tacloban City, and Calbayog City for areas in the north as well as intertown travel, the problem of access when one is along the national roads is considered not

to be a problem. The problem is access from interior towns and hinterland barangays towards the national roads. For this reason, Eastern Samar is blessed with big river systems, and the people have taken advantage of this and major inland boat terminals are located in Oras, Dolores, and Llorente towns. In particular, the Dolores inland boat terminal that the major entry point going to the town of Maslog. There are also several island barangays separated from the mainland of Eastern Samar, and these include the Homonhon, Suluan, Manicani, and Sulangan island barangays for Guiuan Town; the Divinubo and Ando island barangays for Borongan Town; the Butig and Maliwaliw island barangays for Salcedo Town; the San Vicente island barangay for Sulat Town; the Mina-anod island barangay for Lllorente Town; and the Santa Monica island barangay for Oras Town. Depending on the population of these island barangays, the frequency of boat trips to the mainland varies with big islands like Homonhon, which is composed of eight barangays, having a high frequency of scheduled trips while for small islands, boat trips would depend on demand, which is costly at times for ordinary people.
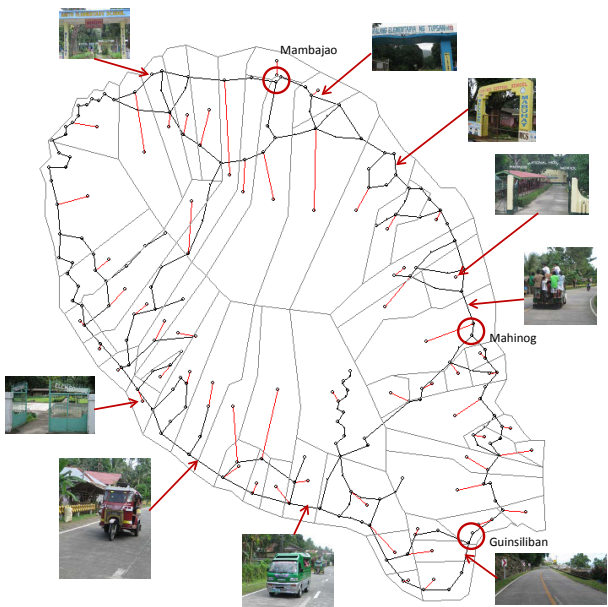

Figure 4. Map of Camiguin Island province showing the location of schools and economic centers.
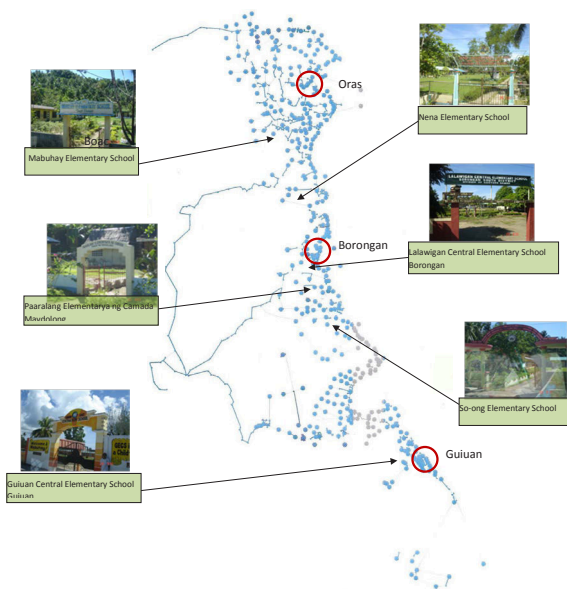
Figure 5. Map of Eastern Samar showing the estimated location of public elementary schools in Eastern Samar.
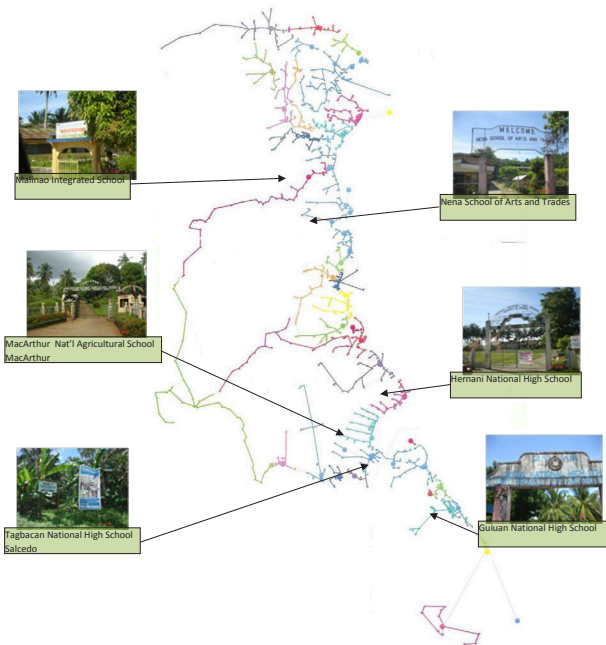
Figure 6. Estimated location of public high schools in Eastern Samar.
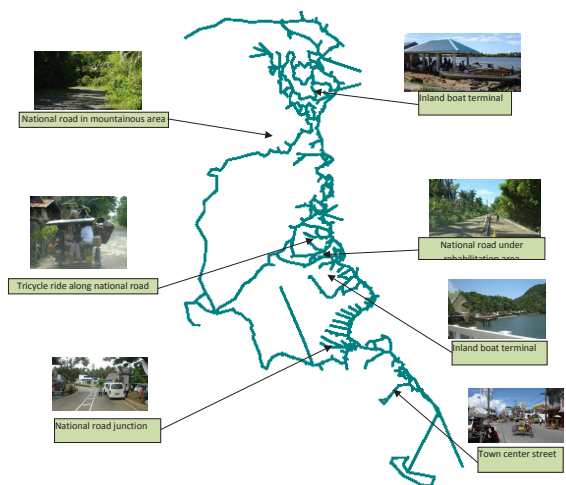
Figure 7. Transport network in Eastern Samar.

Marinduque

The island province has a total of 181 elementary and 44 high schools (Figure 8). The major market center is located in Boac, which is also the capital town. Other economic and employment centers considered are the airport in Gasan Town and the port in Mogpog Town; these two points are the main access to Marinduque Province.

Figure 8. Map of Marinduque and location of schools and market centers.

Pasay City

Pasay City is one of the most urbanized areas included in the study; it was selected to ensure a more varied sample set in terms of rural and urban mix. The city hosts 19 elementary and 9 high schools (Fig. 9). The whole area can be considered as a major economic/market center within a few minutes of walking or riding a public transport from one's home, a person can easily take part in any of the major activity/economic centers located in the city.
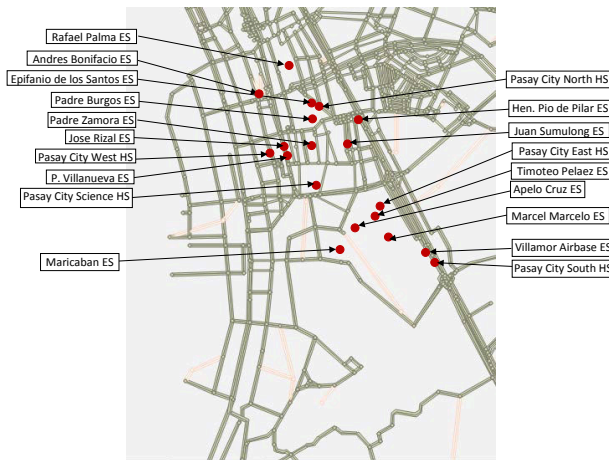
Figure 9. Map of Pasay City showing the location of schools.

Puerto Princesa City

Puerto Princesa City is the capital of Palawan Province. There are a total of 75 elementary and 20 high schools within the city. The major market centers are also located therein, including the port and international airport. The major modes of transport within the city are tricycles, multicabs, and jeepneys. Figure 10 shows photos of elementary schools as well as roads conditions, especially near the city center.

Romblon Province

Figure 11 shows the seven dispersed islands of Romblon and its three major islands, namely, Tablas, Romblon, and Sibuyan. There are 215 elementary and 37 high schools in the province. The seven islands have both elementary and high schools, so students do not have to cross the sea to go to school.

Figure 10. Map of Puerto Princesa City showing the location
of schools and market centers.

Figure 11 Map of the province of Romblon and location of schools and market centers.

Siquijor Province

In the case of Siquijor, there are a total of 60 elementary schools and 13 high schools available on the island. The major market centers were as previously identified in the study by Fillone et al. (2010). There are also three
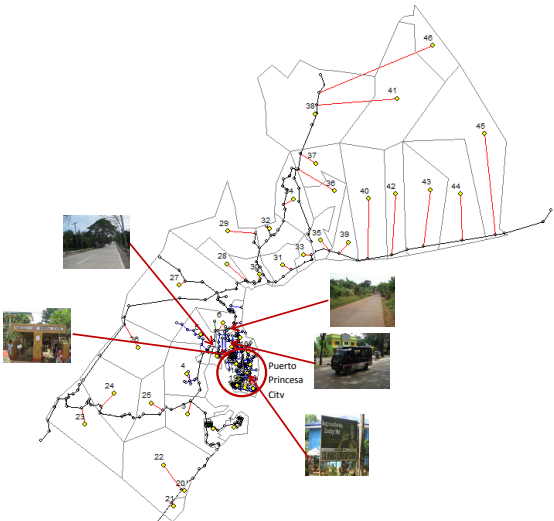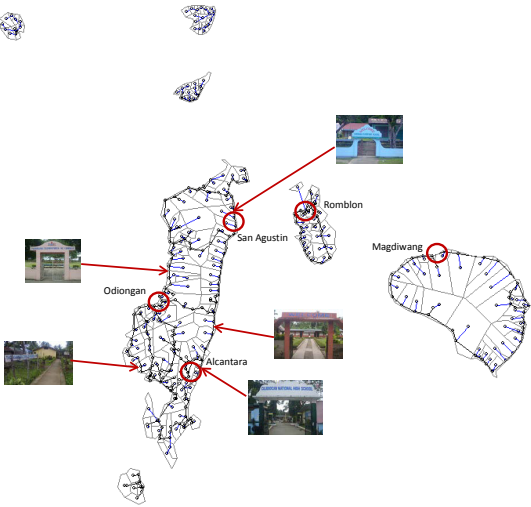
major ports in the island province. These are located in the towns of Siquijor, Larena, and Lazi. For boat trips going to or coming from Dumaguete City, the port of entry is either Siquijor or Larena, while for trips coming from or going to Mindanao, the port of entry is usually the port of Lazi (Fig. 3.12).

The island of Siquijor is still considered by most Filipinos as an island full of myths and mysteries. However, the more visible source of awe and wonder is the intertwining road network that covers the whole island as shown in Figure 3.12. In fact, it is one of the few provinces in the Philippines whose barangays are all accessible by road. From the updated road map provided by the province, the roads are basically classified as national, provincial, and barangay roads. Public transport modes available in the island, aside from personal vehicles, are minibuses, jeepneys, or smaller multicabs, tricycles, and the motorcycles, the latter being operated illegally since this mode is not allowed under current government regulations.
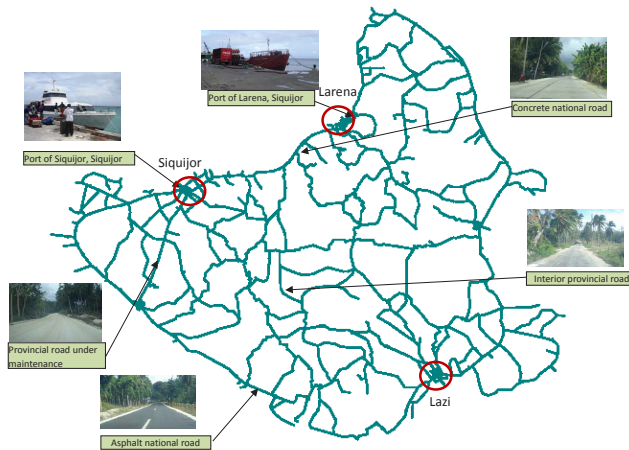
Figure 12. Transport network in Siquijor Island.

Figures 13 and 14 show the location of some of the elementary and high schools, respectively, in the island province of Siquijor.
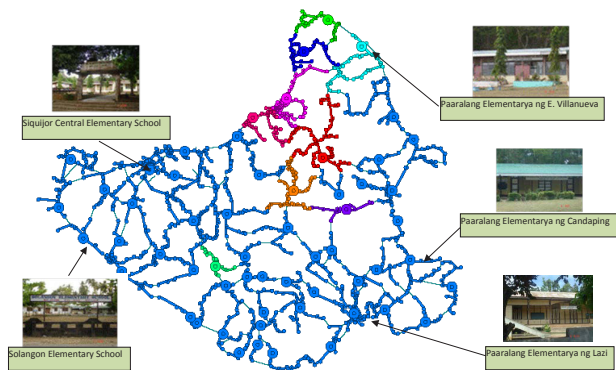
Figure 13. Estimated locations of public elementary schools in Siquijor province.
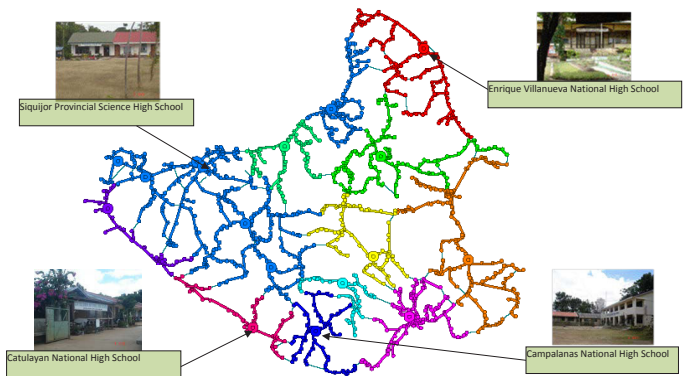
Figure 14. Estimated locations of public high schools in Siquijor Province.

Southern Leyte

In the case of Southern Leyte (Fig. 15), there are 296 elementary and 39 high schools spread throughout the province. Most of these schools are located along national roads as observed during the ocular survey. The major market centers are located in Maasin City, which is its capital, in the town of Sogod as well as that in Liloan, the latter being the jump-off point going to Mindanao island. However, since no official information was obtained regarding the list of both elementary and high schools in Maasin City, it was decided not to include the city in the study. Another town in Southern Leyte that has no CBMS data was also disregarded without much effect on the final outcome of this study.
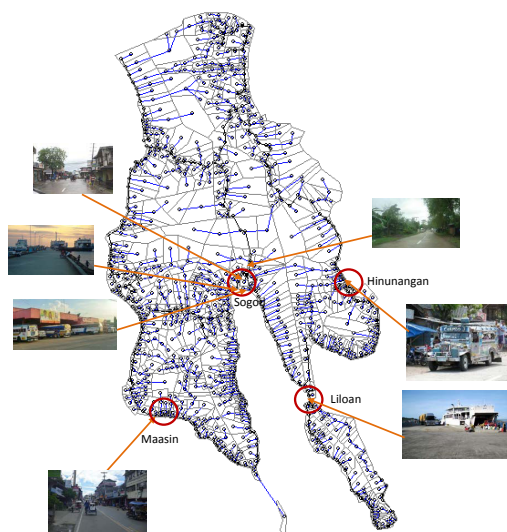
Figure 15. Map of Southern Leyte showing the location of schools
and economic centers.

For data analysis, the study used similar assumptions in Fillone et al.
(2010) on accessibility measures:

1. The pupil or student in the household attends the school nearest to
    his/her house. Elementary school children would prefer to walk to
    school than ride a particular transport mode.
2. A household member that is either school or work bound will have
    the first option to use the transport mode available in the household.
    If there is no available transport mode, he/she will use the most
    common transport mode available to reach his/her destination.
    When the destination is within the barangay, he/she will most likely
    walk to reach his/her destination.
3. High school students may also be already wage earners. This is used
    in the cost of time computation of high–school-aged students.
4. The marginal farmer or fisherfolk would most likely use public
    transport to sell his/her produce to increase his/her profit margin by
    minimizing transport costs of.
5. Following the topography of the land, barangays are connected to
    other adjacent barangays as well as to town centers when roads are
    not available. It is then assumed that people would walk when going

to/from the center of the town when roads are not available.
6.   In the case of island barangays, these were connected to the mainland
by considering the location of the ports or to the coast adjacent to
the town while using motor boats as mode of transport. Barangays
adjacent to inland rivers especially when road access is not present
would also use boats to directly access the town center or disembark
on the nearest road link then from there ride a public transport
going to the destination.

Travel Time Using the Available Transport System

All observations about land and sea transport in the provinces and cities
being studied and actual experience of riding were taken into consideration.
Using the representative speeds of the transport modes given in Table 3.3
for both land and sea transportation, Table 4 provides the estimated time
equation as provided previously in Eq. (1).

Table 3. Average travel speed by transport mode in the study areas

Purpose and Destination of Travel	Prevalent Transport Mode	Average Speed by Road Type (kph)			Water Transport (kph, knots)	
		National Road	Provincial Road	Barangay Road	Inland water	Ocean Water
Elementary school	Tricycle	25	20	15	8	12
High school	Tricycle, multicab	25	20	15	8	12
Market/economic centers	Jeepney, multicab, minibus	30	25	20	8	12

Travel time surveys, such as onboard-vehicle and car-following travel
time surveys, were also conducted to obtain the average travel speeds of
available modes. However, only the prevalent transport mode was used in
the analysis of accessibility, depending on the destination of the individual.
For example, if town-to-town travel was being analyzed, the prevalent road
public transport mode would be the jeepney or multicab. Except for the
island towns of Jipapad and Maslog in Eastern Samar, Maripipi in Biliran,
the seven dispersed islands of Romblon, and some other smaller islands

where one has to use the boat for access and island barangays, all other towns accessible by road use the tricycle, multicab, jeepney, or minibus to travel between towns.

Table 4 Travel time equations for the study areas.

Purpose/Destination of Travel	Prevalent Transport Mode on Land	Travel time equation (min)				
		National Road	Provincial Road	Barangay Road	Water transport	
					Inland water	Ocean Water
Elementary School	Tricycle	2.4S	3.0S	4.0S	7.5S	5.0S
High School	Tricycle, jeepney	2.4S	3.0S	4.0S		
Market/Economic Centers	Jeepney, multicab, minibus	2.0S	2.4S	3.0S		
	Walking	20.0S				

Generalized Cost of Travel in the Study Areas

The average annual family income in the study areas was obtained from the Philippine Statistics Authority (PSA 2013) website. (See Appendix C for the sample computation). The values as plotted are shown in Figure 16. These values were then interpolated for those years that the CBMS data were obtained in a particular city or province. The average annual family income was used to obtain the average monthly, daily, and hourly incomes in a particular study area. These computed values are shown in Table 5.

The average hourly rate by study area (as shown in Table 5) was used in the cost of time computation to obtain the generalized cost of travel which was previously presented in Eq. (2).
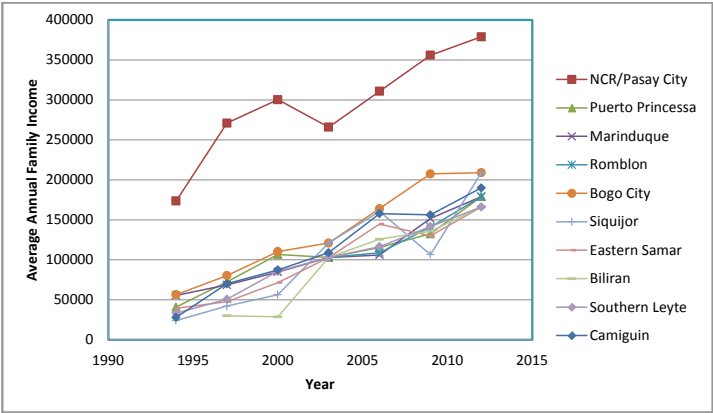
Figure 16. Average annual family income in the study areas

Table 5. Wage rates in the study areas for year 2012 (NSCB)

Region	Province/City	Year	Average Annual Income (Php)	Average Monthly Income (Php)	Average Daily Wage (Php)	Average Hourly Rate (Php)
NCR	Pasay City	2011	371,333	30,944	944	118
IVB	Puerto Princessa	2009	132,640	11,053	337	42
	Marinduque	2008	136,496	11,375	347	43
	Romblon	2007	119,631	9,969	304	38
VII	Bogo City	2009	207,478	17,290	527	66
	Siquijor	2006	160,616	13,385	408	51
VIII	Eastern Samar	2006	144,649	12,054	368	46
	Biliran	2006	125,731	10,478	320	40
	Southern Leyte	2008	133,218	11,102	339	42
X	Camiguin	2010	167,507	13,959	426	53

SCI Variable of the Study Areas

The average SCI variables of the study areas are shown in Table 3.6. Eastern Samar has the highest mean barangay SCI at 2.72, and its standard deviation is also highest at 1.03. This means that the barangay SCI of Eastern Samar is

quite spread out among the barangays due to the extent of the land area of the Eastern Samar province. Pasay City being in Metro Manila has the lowest SCI of 0.52, in an area where highly urbanized socioeconomic services are easily accessible to its constituents.

Table 6 Average barangay SCI of the study areas

Province/City	No. of Barangays	SCI	
		Average Barangay SCI	SCI S.D.
Eastern Samar	596	2.72	1.03
Biliran	132	2.53	0.644
Romblon	218	2.16	0.631
Bogo City	27	2.12	0.737
Southern Leyte	484	2.01	0.638
Camiguin	58	1.49	0.449
Siquijor	134	1.49	0.511
Marinduque	218	1.42	0.665
Puerto Princesa City	66	1.32	0.862
Pasay City	201	0.52	0.456
Total	2,134		

Gender Comparison of Elementary and High School Enrollment

Population data by gender of elementary and high school students in the provinces and cities studied are shown in Table 7 below. The data show that there are more males than females whether of elementary school or high school ages in all the study areas. The highest absolute difference at 2,422 between the two genders occurred in Eastern Samar Province, which also has the highest population of both genders in the elementary level. However, in the case of high school aged segment, the highest difference occurred in Southern Leyte Province at 1,799. Meanwhile, the smallest difference in population between genders of elementary school age occurred in Siquijor Province at 154. For high-school-ages, the smallest difference occurred in Puerto Princesa City at 6. Overall, the population difference between genders stands at 10,566 for elementary school ages and 6,850 for high school ages, consistently in favor of males.

Table 7. Population by Gender of Elementary and High School
Ages in the Study Areas

Province/City	Elementary School, Ages 6–12 Years Old			High School, Ages 13–16 Years Old		
	Male	Female	Difference	Male	Female	Difference
Biliran	14,331	13,714	617	7,846	7,050	796
Bogo City	3,670	3,364	306	2,364	2,096	268
Camiguin	6,121	5,882	239	3,485	3,176	309
Eastern Samar	38,923	36,501	2,422	19,877	18,864	1,103
Marinduque	20,207	19,083	1,124	11,332	10,352	980
Romblon	26,278	24,178	2,100	14,076	12,843	1,233
Pasay City	18,206	17,510	696	9,977	9,605	372
Puerto Princesa City	15,064	14,175	889	7,911	7,905	6
Siquijor	5,837	5,683	154	3,620	3,546	74
Southern Leyte	29,396	27,377	2,019	17,033	15,234	1,799
Grand Total	178,033	167,467	10,566	97,521	90,671	6,850

Going over the enrollment levels in elementary school by gender, the province of Biliran has the highest mean difference between male and female at 3.76, followed by Eastern Samar at 3.1 and Southern Leyte by 2.34. It is important to note that all these three provinces are located in Region 8. Table 8 shows the complete list of the provinces in terms of the mean difference between the proportion of males and females not enrolled in the elementary level. In the City of Bogo, Marinduque, and Siquijor, more females are not enrolled than males, as shown by the negative mean difference.

The three provinces with the biggest difference in the mean proportions between males and females not in elementary schools are Biliran (3.76), Eastern Samar (3.1), and Southern Leyte (2.34). It so happened that these provinces are in Eastern Visayas, while the three provinces with the lowest differences in the mean proportions are Bogo City (−1.98), Marinduque (−0.15), and Siquijor (−0.07). Figure 17 shows the spatial distribution of the mean proportions of males and females 6–12 years old who are not in elementary schools in Biliran Province, where we got the highest difference in the mean proportions of not in elementary between genders.

Figure 18 shows the graphical presentation of these mean differences.

Table 8. Mean Proportions of males and females 6–12 Years Old Not in Elementary
School at the Barangay Level

Province/City	Mean Proportions of 6- to 12-Year-Olds Not in Elementary School, Barangay Level				Difference in Means
	Male		Female		
	Mean	S.D.	Mean	S.D.	
Biliran	24.70	7.02	20.94	6.72	3.76
Bogo City	18.99	6.28	20.97	5.71	≈1.98
Camiguin	21.76	7.09	21.18	7.49	0.58
Eastern Samar	25.36	12.23	22.26	11.08	3.10
Marinduque	17.32	6.42	17.47	6.23	≈0.15
Romblon	23.12	7.57	21.69	6.95	1.43
Pasay City	18.35	7.86	17.09	7.54	1.26
Puerto Princesa City	22.01	8.87	20.01	6.02	2.00
Siquijor	18.57	10.05	18.64	10.13	≈0.07
Southern Leyte	23.69	10.75	21.35	9.72	2.34
Mean	21.39		20.16		1.23

LEGEND:

🟨 Male not in ES

🟩 Female not in ES

Figure 17. Mean proportions of males and females 6–12 years old
not in elementary school in Biliran province.

In the case of Siquijor Province, Figure 19 shows that there are more 6- to 12-year-olds not in elementary school in the right portion of the province, which is in the town of Maria, regardless of gender.

Figure 18. Mean proportion of males and females 6–12 years old not in elementary school at the barangay level.

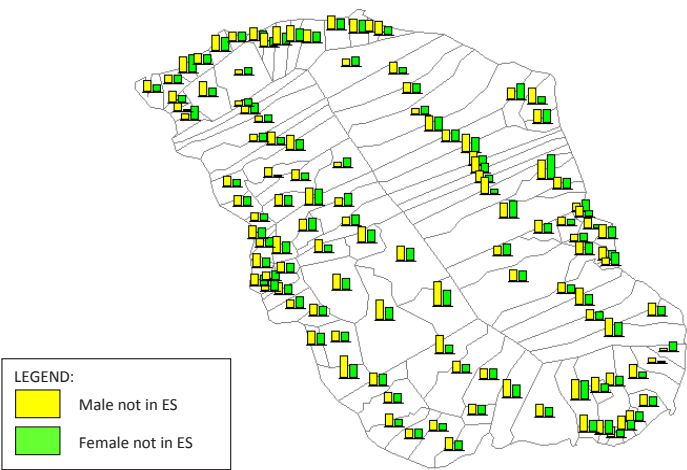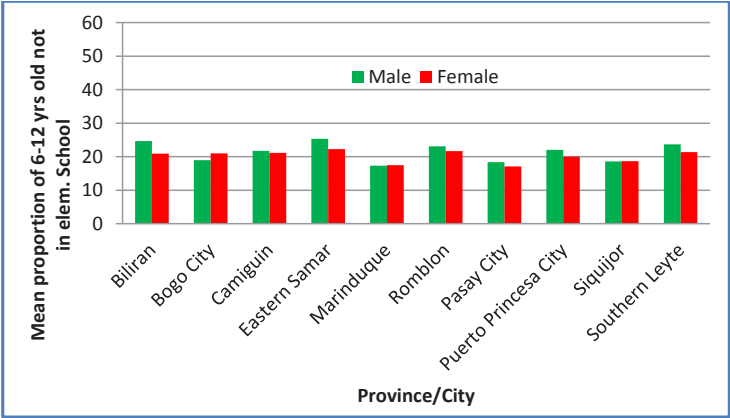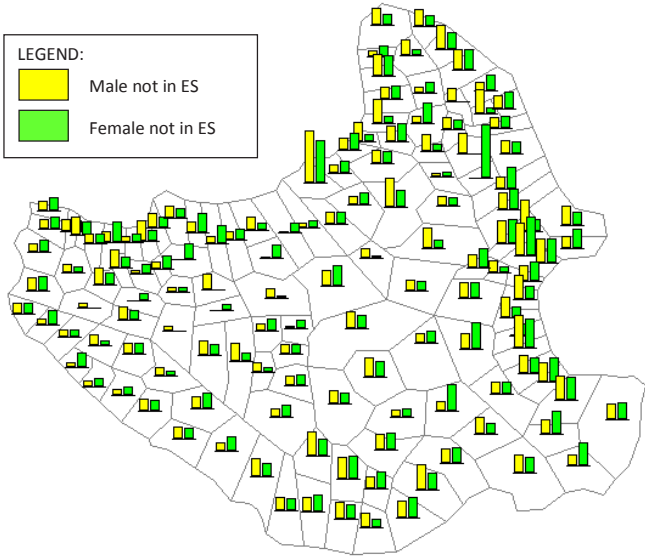

Figure 19. Mean proportions of males and females 6–12 years old not in elementary school (barangay level, Siquijor Province).
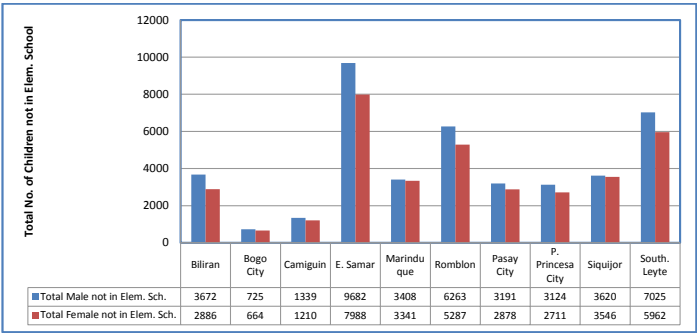
Figure 20. The total number of males and females of ages 6–12 years old
not in elementary school.

As shown in Figure 20 above, there are more males (42,029) than females (36,473) who are not in elementary school in all the study areas, with a total difference of 5,556. Although as shown previously in Table 8, Bogo City, Marinduque, and Siquijor are areas where the mean proportion of females not in elementary schools is higher than males; in terms of the actual number of those not in elementary schools, there are still more males than females in all these areas.

Table 9. Mean proportions of males and females 13–16 years old
not in high school at the barangay level

Province/City	Mean Proportions of 13- to 16-Year-Olds Not in High School				Difference in Means
	Male		Female		
	Mean	S.D.	Mean	S.D.	
Biliran	52.48	14.18	34.93	13.32	17.55
Bogo City	38.54	9.38	37.59	8.46	0.95
Camiguin	39.08	11.9	30.37	10.06	8.71
Eastern Samar	53.83	22.72	38.4	22.19	15.43
Marinduque	35.83	15.07	26.01	13.23	9.82
Romblon	42.52	16.28	29.86	12.28	12.66
Pasay City	31.7	11.81	30.84	12.41	0.86
Puerto Princesa City	42.18	14.11	33.76	11.28	8.42
Siquijor	33.54	15.2	26.12	12.97	7.42
Southern Leyte	45.23	17.43	32.02	15.86	13.21
Mean	41.49		31.99		9.50

Between the mean proportions of males and females not in high school (Table 9), the difference is still consistent among the three provinces mentioned previously for those who are not in elementary school and these have even increased. Biliran still gets the highest difference of 17.55%, followed by Eastern Samar at 15.43% and Southern Leyte at 13.21%. This would mean that the proportion of those who are not in school increased as they move from the elementary level up to the high school level.

	Biliran	Bogo City	Camiguin	Eastern Samar	Marinduque	Romblon	Pasay City	P. Princesa City	Siquijor	S. Leyte
Total Male not in HS	4050	939	3485	10084	4056	6159	3132	3168	1219	7549
Total Female not in HS	2457	773	3176	6662	2593	3911	2846	2585	908	4763
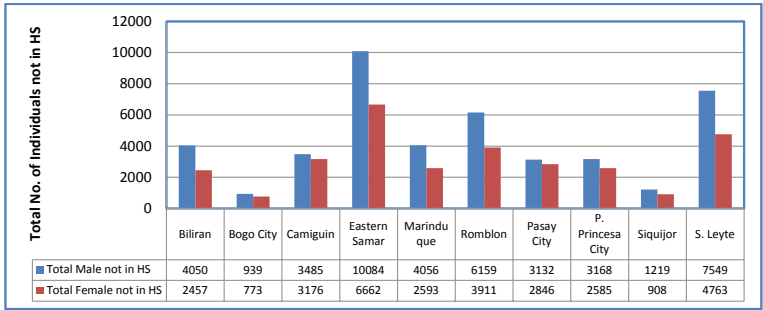
Figure 21. The total number of males and females of ages 13–16 years old not in high school.

In terms of the actual number of males and females at ages 13–16 years old who are not in high school (Fig. 21), there are more males (43,841) than females (30,670) in all the areas, with a difference of 13,171. This result is consistent with the mean proportions of males, which are higher than those of females not in high school, as previously shown in Table 9.

In Table 10, the positive values of the seven provinces like in Biliran (3.76), Eastern Samar (3.1), and so on, with regard to their difference in mean proportions between male and female not in elementary school would mean that more males are not in elementary school than females. There are only three areas—Bogo City, Marinduque, and Siquijor—where more females than males are not in elementary school as shown by the negative values of the differences. Regarding the comparison between the differences between means of those males and females going to high school and elementary school, all areas except Pasay City have increasing differences in mean proportions. This would mean that the difference between males and females not going to school is increasing as they move from elementary school to high school. Hence, this means that more males than females are dropping out of school as they move up from elementary to high school.

Table 10. Comparison of the difference in mean proportions between males and females in the elementary and high school levels

	Difference in Mean Proportions Between Males and Females Not Going to Elementary Schools	Difference in Mean Proportions Between Males and Females Not Going to High School	Difference in Mean Proportions Between Males and Females Not in School
	Mean Difference		
Biliran	3.76	17.55	13.79
Bogo City	−1.98	0.95	2.93
Camiguin	0.58	8.71	8.13
Eastern Samar	3.1	15.43	12.33
Marinduque	−0.15	9.82	9.97
Romblon	1.43	12.66	11.23
Pasay City	1.26	0.86	−0.40
Puerto Princesa City	2.00	8.42	6.42
Siquijor	−0.07	7.42	7.49
Southern Leyte	2.34	13.21	10.87
Grand Mean	1.23	9.50	8.28

In terms of the proportion of males and females of ages 6–12 years old who are not in elementary school, more barangays have a bigger proportion of females than males when the proportion of males and females who are not in elementary school is 20% or less. For a proportion of males and females higher than 20%, more barangays have a bigger proportion of males than females who are not in elementary school. Figure 22 shows this graphical presentation.

In the case of high schools, more barangays have a bigger proportion of females than males who are not in high school when the mean proportion of males and females who are not in high school is 30% or less. Beyond 30%, more barangays have males that are not in high school than females (Fig. 23).
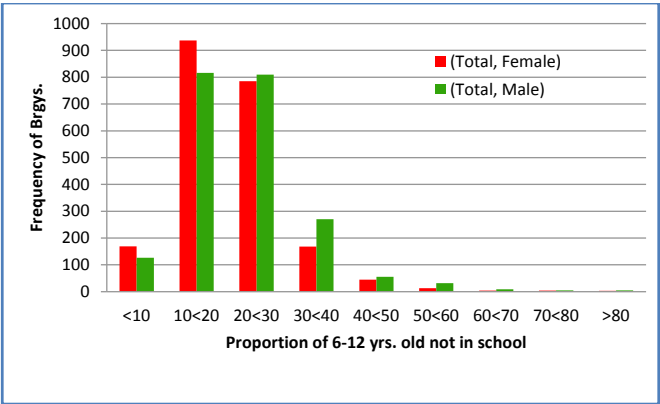
Figure 22. Frequency of barangays with proportion of 6- to 12-year-olds not in elementary school.
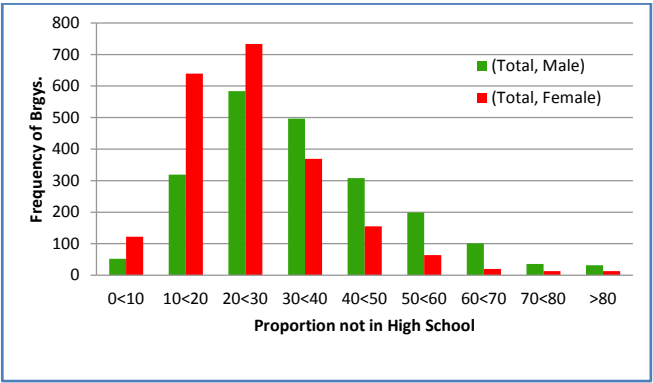
Figure 23. Frequency of barangays with proportion of 13- to 16-year-olds not in high school.

Gender Comparison on Unemployment

There is a big disparity in terms of working-age population between genders in all the provinces and cities being studied, in favor of the males. In total, there are 443,864 males compared to 227,399 females of employment age. In terms of the unemployed, the number of unemployed males (38,824) is more than the number of unemployed females (38,245) in the study areas with a difference of 579. Table 11 shows that it is only in the two provinces of Biliran and Eastern Samar and the city of Puerto Princesa where there are more unemployed females than males; the rest have more unemployed males than females. Eastern Samar has the highest number of unemployed

females at 15,027 compared to 12,963 unemployed males with a difference of 2,064, while there were only 46 more unemployed males than females in Bogo City.

Table 11. Population of employment age and unemployed by gender
in the study areas

Province/City	Population of Employment Age			Population of Unemployed		
	Male	Female	Difference	Male	Female	Difference
Biliran	34,206	16,921	17,285	5,339	6,069	-730
Bogo City	10,493	5,099	5,394	150	104	46
Camiguin	15,869	6,979	8,890	314	205	109
Eastern Samar	93,274	46,190	47,084	12,963	15,027	-2,064
Marinduque	41,822	21,812	20,010	801	443	358
Romblon	46,112	22,972	23,140	956	611	345
Pasay City	59,134	38,864	20,270	891	593	298
Puerto Princesa City	39,391	20,098	19,293	2,933	3,098	₱165
Siquijor	21,827	10,235	11,592	2,961	2,243	718
Southern Leyte	81,736	38,229	43,507	11,516	9,852	1,664
Grand Total	443,864	227,399	216,465	38,824	38,245	579

Table 12. Mean barangay population of unemployed by gender

Province/City	Mean Barangay Population of Unemployed by Gender		
	Male	Female	Difference
Biliran	40.45	45.98	−5.53
Bogo City	5.56	3.85	1.71
Camiguin	5.41	3.53	1.88
Eastern Samar	21.75	25.21	−3.46
Marinduque	3.67	2.03	1.64
Romblon	4.39	2.80	1.59
Pasay City	4.43	2.95	1.48
Puerto Princesa City	44.44	46.94	−2.50
Siquijor	22.10	16.74	5.36
Southern Leyte	23.74	20.31	3.43
Grand Mean	17.59	17.03	0.56

Looking at the mean barangay population of the unemployed between genders, Table 12 is consistent with the values in Table 11 since we simply divided the values in the latter by the number of barangays in the study areas. However, if we look at the proportion of unemployment between genders, we can see in Table 13 that all differences are negative, which may mean that more males are employed than females in all provinces, which contradicted the previous findings, but this may not be the case. Biliran (−21.25%), Eastern Samar (−17.14%), and Southern Leyte (−11.35%) are again the top three with big differences between male and female unemployment while those with very small differences are Pasay City (−0.05%), Marinduque (−0.14%), and Puerto Princesa City (−0.62%). There is nothing strange about this result however, since in the first place there are fewer females of employment age than males (from Table 11), resulting to a higher proportion of unemployment for the former.

Table 13. Mean proportions of unemployed by gender at the barangay level

| | Unemployed | | | | Mean Difference |
| | Male | | Female | | |
	Mean	S.D.	Mean	S.D.	
Biliran	15.72	8.97	36.97	20.37	-21.25
Bogo City	1.54	2.41	2.29	3.06	-0.75
Camiguin	2.51	4.39	3.88	5.52	-1.37
Eastern Samar	13.74	10.13	30.88	19.33	-17.14
Marinduque	1.96	1.74	2.1	2.28	-0.14
Romblon	2.19	3.48	3.61	7.54	-1.42
Pasay City	1.36	1.96	1.41	2.1	-0.05
Puerto Princesa City	1.24	1.1	1.86	1.9	-0.62
Siquijor	13.3	7.31	22.29	12.5	-8.99
Southern Leyte	13.43	10.11	24.78	16.71	-11.35
Mean	6.70		13.01		-6.31

Figure 24 is a map of Biliran province showing the proportion of unemployment by gender at the barangay level. There is indeed a disproportionate number of unemployed females compare to males across the province. This is not the case for Pasay City, where in some barangays the proportions of unemployed males are higher than the unemployed females as shown in Figure 25.
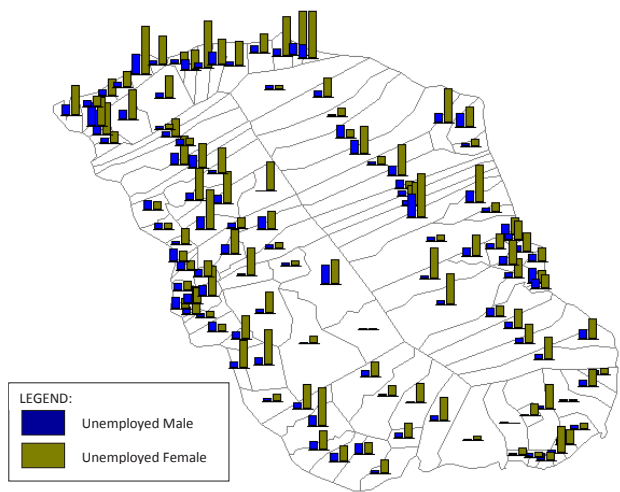
Figure 24. Graphical presentation of the proportion of unemployed
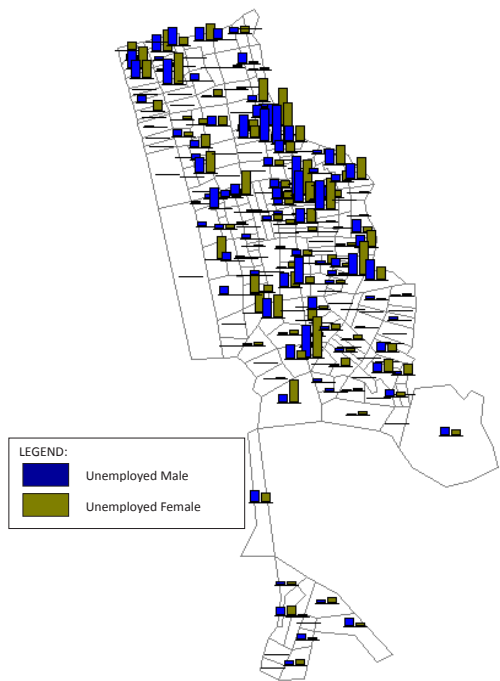between genders at the barangay level in Biliran Province.

Figure 25. Graphical presentation of unemployed between genders in Pasay City.
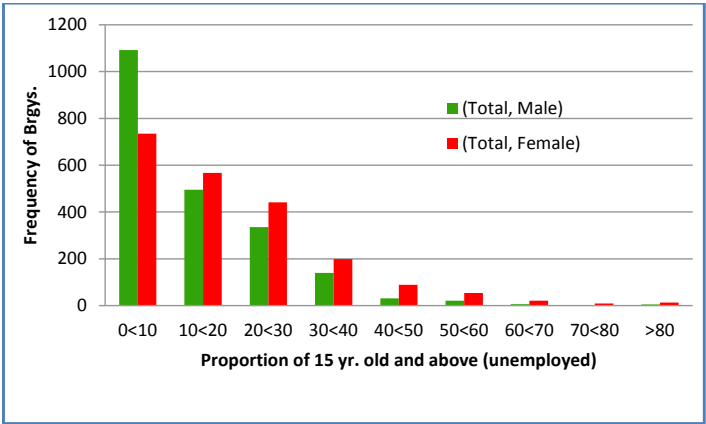
Figure 26. Frequency of barangays with proportions of 15-year-olds
and older by gender who are unemployed.

When the proportion of the unemployed in the barangays is low, like 10% or less for both males and females, more barangays have a bigger proportion of males who are unemployed compared to females. Beyond 10% unemployment in the barangay, more barangays have a bigger proportion of females than males who could not find employment (Fig. 26).

Gender Comparison on Income Below the Poverty Threshold

In terms of the population by gender of those who felt their income is below the poverty threshold, Table 14 shows that more males (569,047) than females (532,700) felt they are poor. It is only in Pasay City where there are more females than males who felt that they are poorer. The mean barangay population in poverty by gender in the other half of Table 4.9 is also consistent with this result.

However if we look at the mean proportion by gender of those in poverty at the barangay level in Table 15, it is only in Puerto Princesa City where the proportion of females in poverty is higher than that of the males by 0.10%.

Table 14. Population Whose Income Falls Below the Poverty Threshold by Gender

Province/City	Total Population in Poverty by Gender			Mean Barangay Population in Poverty by Gender		
	Male	Female	Difference	Male	Female	Difference
Biliran	52,476	49,113	3,363	397.55	372.07	25.48
Bogo City	17,224	16,702	522	637.93	618.59	19.34
Camiguin	25,787	24,078	1,709	444.50	415.14	29.36

Table 14 continued...

Eastern Samar	139,847	128,128	11,719	234.64	214.98	19.66
Marinduque	59,828	56,602	3,226	274.44	259.64	14.8
Romblon	89,732	85,436	4,296	411.61	391.91	19.7
Pasay City	24,422	24,618	₱196	121.50	122.48	-0.98
Puerto Princesa City	24,967	23,360	1,607	378.29	353.94	24.35
Siquijor	17,822	17,330	492	133.00	129.33	3.67
Southern Leyte	116,942	107,333	9,609	241.12	221.31	19.81
Grand total	569,047	532,700	36,347	3,274.58	3,099.39	175.19

Table 15 Mean Proportion of Poverty Between Genders in the Study Areas

Province/City	Proportion in Poverty				Difference in the Mean
	Male		Female		
	Mean	S.D.	Mean	S.D.	
Biliran	75.41	14.3	73.6	15.05	1.81
Bogo City	71.83	20.82	70.57	21.59	1.26
Camiguin	69.71	17.47	68.42	17.74	1.29
Eastern Samar	72.25	21.22	71.57	21.87	0.68
Marinduque	56.67	18.24	54.99	18.81	1.68
Romblon	71.03	14.44	69.66	14.88	1.37
Pasay City	18.98	13.48	18.72	13.8	0.26
Puerto Princesa City	34.92	23.91	35.02	24.2	₱0.1
Siquijor	49.02	23.87	47.99	23.66	1.03
Southern Leyte	71.59	16.39	70.34	17.04	1.25
Mean	59.14		58.09		1.05

Figure 27 shows the frequency of barangays in the study areas in terms of the mean proportion of males and females who felt that their income is below the poverty threshold. Figure 28 shows the proportion of those in poverty between genders at the barangay level in the island province of Biliran while Figure 29 shows that of Puerto Princesa City. The mean difference of 1.81% in the mean proportion between genders who felt that their income is below the poverty threshold in Biliran Province is not that discernible as is the case when the mean difference is −0.10% for Puerto Princesa City.
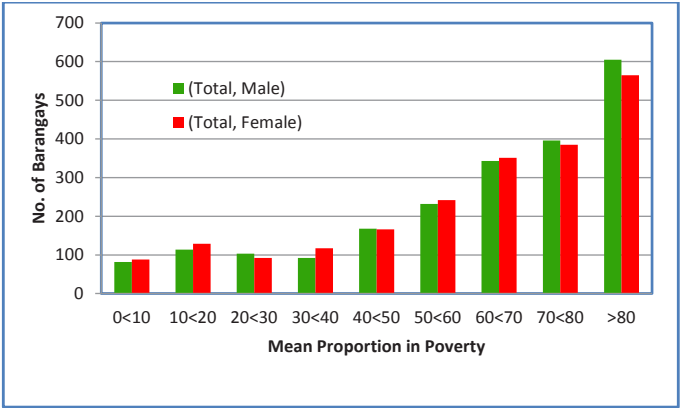
Figure 27. Mean proportion of poverty in the barangays by gender.
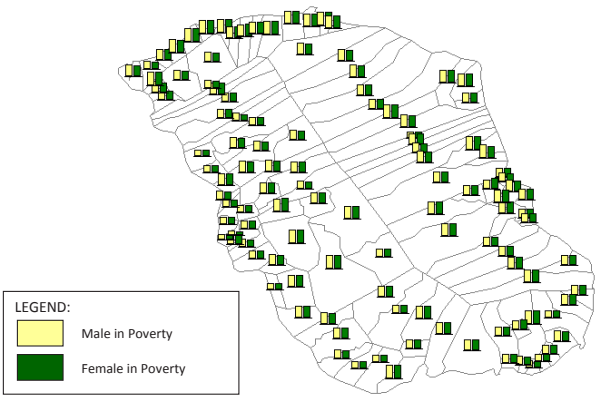
Figure 28. Proportion of those in poverty between genders in Biliran province.

Gender Comparison on Income Below the Food Threshold

The males again dominate the females in terms of their income being below the food threshold in all the provinces and cities studied as shown in Table 16. Overall, 455,017 males felt their income falls below the food threshold compared to 423,492 females. In terms of the mean barangay population by gender whose income falls below the food threshold, Camiguin Province has the highest difference between males and females at 25.17 followed by Biliran Province (22.85) and Romblon Province (18.09).
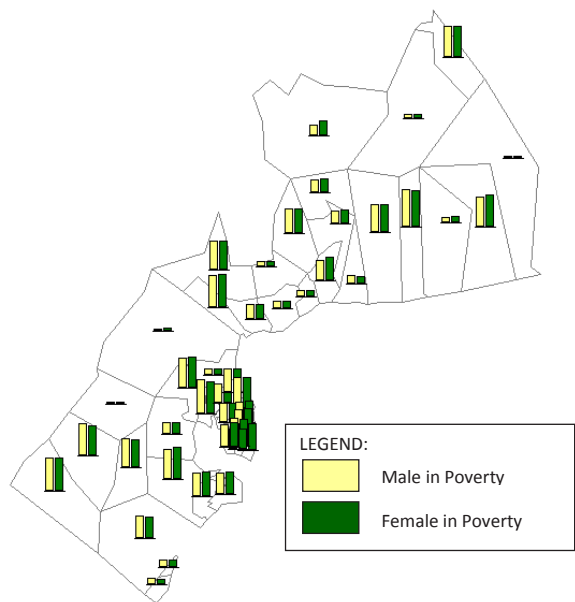
Figure 29. Proportion of those in poverty between genders in Puerto Princesa City.

Table 16. Population whose income is below the food threshold by gender

Province/City	Income Under Food Threshold by Gender			Mean Barangay Population by Gender With Income Below the Food Threshold		
	Male	Female	Difference	Male	Female	Difference
Biliran	43,901	40,884	3,017	332.58	309.73	22.85
Bogo City	15,128	14,662	466	560.30	543.04	17.26
Camiguin	20,672	19,212	1,460	356.41	331.24	25.17
Eastern Samar	119,667	109,543	10,124	200.78	183.80	16.98
Marinduque	43,965	41,247	2,718	201.67	189.21	12.46
Romblon	74,080	70,137	3,943	339.82	321.73	18.09
Pasay City	13,325	13,246	79	66.29	65.90	0.39
P.Princesa City	14,393	13,342	1,051	218.08	202.15	15.93
Siquijor	13,381	12,979	402	99.86	96.86	3.00
Southern Leyte	96,505	88,240	8,265	198.98	181.94	17.04
Grand Total	455,017	423,492	31,525			

Table 17. Mean proportion of income below the food threshold
between gender in the barangay

	Proportion With Income Below the Food Threshold				Difference in the Mean
	Male		Female		
	Mean	S.D.	Mean	S.D.	
Biliran	65.04	18.17	63.27	18.49	1.77
Bogo City	63.47	24.97	62.53	25.20	0.94
Camiguin	56.97	19.88	55.63	20.24	1.34
Eastern Samar	62.42	23.27	61.88	23.72	0.54
Marinduque	41.61	18.38	40.14	18.58	1.47
Romblon	58.99	16.87	57.69	16.95	1.3
Pasay City	8.55	5.94	7.53	5.69	1.02
Puerto Princesa City	22.00	19.69	22.43	20.07	-0.43
Siquijor	36.58	21.49	35.83	21.63	0.75
Southern Leyte	59.81	19.39	58.75	19.83	1.06

As shown in Table 17, it is only in Puerto Princesa City where there is a greater mean proportion of females than males with income below the food threshold at the barangay level. When the proportion is less than 50%, there are more barangays whose females have income below the food threshold. On the other hand, when the proportion is more than 50%, there are more barangays with more males whose income is below the food threshold.

Gender Comparison on Experience on Food Shortage

As Table 18 would show, more males (73,604) than females (66,613) experience food shortage in the study areas. This is also consistent with the mean barangay population who experience food shortage as also shown in Table 18. In terms of the total number of those who experience food shortage, it is Eastern Samar that has the highest difference between males (29,107) and females (26,295) at 2,812. But in terms of the mean number of population at the barangay level, it is the province of Biliran that has the highest mean between males (80.72) and females (75.06) at 5.72.

Table 18. Population experiencing food shortage by gender

Province/City	Population in Food Shortage by Gender			Mean Barangay Population With Food Shortage by Gender		
	Male	Female	Difference	Male	Female	Difference
Biliran	10,663	9,908	755	80.78	75.06	5.72
Bogo City	291	260	31	10.78	9.63	1.15
Camiguin	155	123	32	2.67	2.12	0.55
Eastern Samar	29,107	26,295	2,812	48.84	44.12	4.72
Marinduque	6,338	5,560	778	29.07	25.50	3.57
Romblon	4,020	3,616	404	18.44	16.59	1.85
Pasay City	2,154	2,101	53	10.72	10.45	0.27
Puerto Princesa City	3,035	2,814	221	45.98	42.64	3.34
Siquijor	1,495	1,417	78	11.16	10.57	0.59
Southern Leyte	16,346	14,519	1,827	33.70	29.94	3.76
Grand Total	73,604	66,613	6,991			

In terms of the mean proportion at the barangay level, however, only Puerto Princesa City has the highest proportion of females (4.99) to males (4.96) who experienced food shortage as shown in Table 19. Eastern Samar Province has the highest mean proportion at the barangay level of both males (15.47) and females (15.27) who experience food shortage.

Table 19. Mean proportion who experienced food shortage
between gender in thebarangay

	Proportion Who Experienced Food Shortage				Difference in the Mean
	Male		Female		
	Mean	S.D.	Mean	S.D.	
Biliran	14.05	19.17	13.59	18.93	0.46
Bogo City	1.03	2.09	0.96	2.03	0.07
Camiguin	0.41	0.88	0.35	0.71	0.06
Eastern Samar	15.47	22.34	15.27	22.21	0.2
Marinduque	5.60	10.07	5.03	9.08	0.57
Romblon	2.80	6.84	2.63	6.52	0.17

Table 19 continued...

Pasay City	1.48	3.92	1.37	3.49	0.11
Puerto Princesa City	4.96	6.89	4.99	6.93	≪0.03
Siquijor	4.22	9.04	4.01	8.67	0.21
Southern Leyte	9.97	17.03	9.58	16.72	0.39

Figure 30 below shows a very high number of barangays with both genders having experienced less than 10% of food shortage. Compared to the previous data on males and females who have incomes below the poverty and food threshold, those who experienced food shortage are quite low.
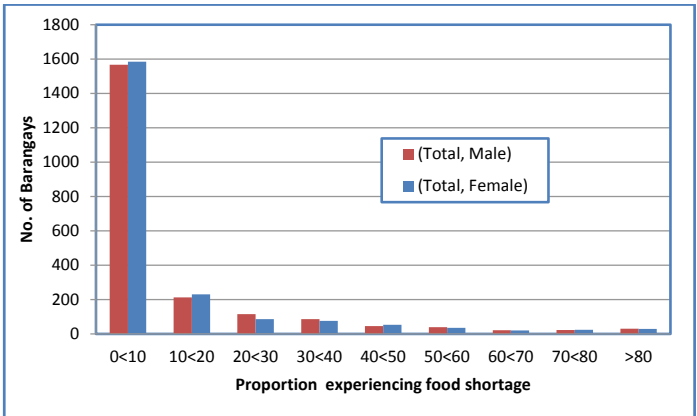
Figure 30. Mean proportion in the *barangays* experiencing food shortage by gender in the study areas.

Poverty, Accessibility, and Gender Relationships

Correlation of Poverty Variables and Gender

Figure 31 shows (a) a graphical presentation of the total number of males and females who are unemployed, (b) whose income falls below the poverty threshold, (c) whose income falls below the food threshold, and (d) who experience food shortage in all the provinces and cities studied. There are more males than females who are unemployed and whose incomes fall below the poverty threshold and food threshold. There is, however, fewer males and females who are suffering from food shortage compared to the other poverty measures.
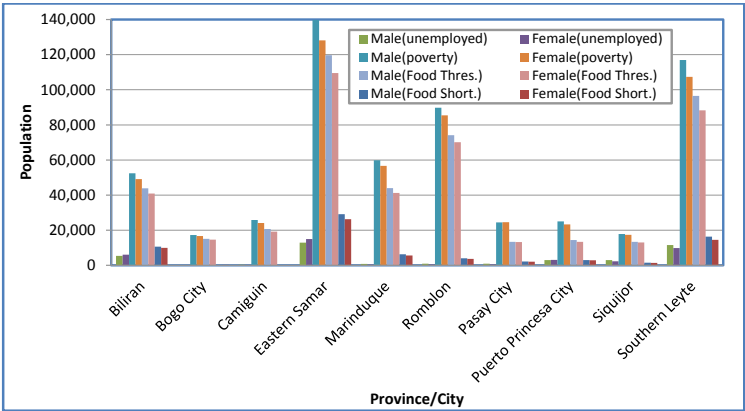
Figure 31. Comparison of unemployment and poverty variables
with gender population.

Table 20. Correlation of Barangay SCI and Poverty Variables by Gender Population

	Barangay SCI	Male (Unemployed)	Female (Unemployed)	Male (Poverty)	Female (Poverty)	Male (Food Threshold)	Female (Food Threshold)	Male (Food Shortage)	Female (Food Shortage)
SCI	1								
Male (unemployed)	0.5649	1							
Female (unemployed)	0.6140	0.9828	1						
Male (poverty)	0.6209	0.8120	0.8018	1					
Female (poverty)	0.6157	0.8001	0.7898	0.9997	1				
Male (Food Threshold.)	0.6693	0.8185	0.8123	0.9971	0.99613	1			
Female (Food Threshold)	0.6693	0.8088	0.8029	0.9970	0.9965	0.9998	1		
Male (Food Shortage)	0.6289	0.9306	0.9619	0.8879	0.8799	0.8924	0.8860	1	
Female (Food Shortage)	0.6303	0.9297	0.9629	0.8829	0.8749	0.8878	0.8814	0.9998	1

Figure 32 shows that the province with the highest mean number of unemployed at the barangay level is Bogo City, while the lowest is Pasay City. Using the average number of unemployed by gender at the barangay level, the correlation between the barangay SCI and the poverty variables of the population (Table 21) is less significant as compared to the correlation between the barangay SCI and the actual count of the population with these poverty characteristics (Table 20).

Table 21. Correlation of barangay SCI and poverty variables
by gender population at the barangay level.

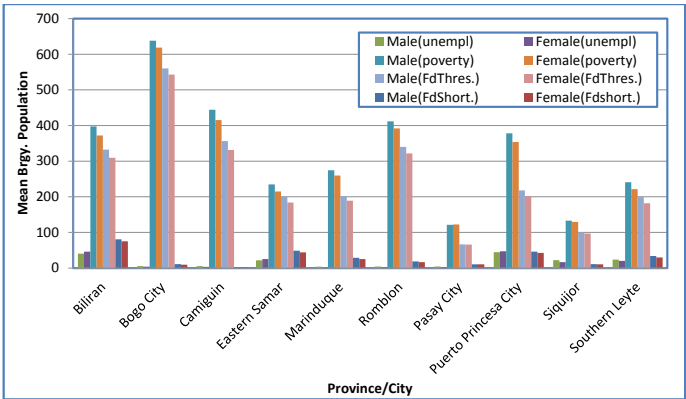|	Barangay SCI	Male (Unemployed)	Female (Unemployed)	Male (Poverty)	Female (Poverty)	Male (Food Threshold)	Female (Food Threshold)	Male (Food Shortage)	Female (Food Shortage)
Barangay SCI	1								
Male (unemployed)	0.2725	1							
Female (unemployed)	0.3243	0.9881	1						
Male (poverty)	0.3883	-0.0752	-0.0244	1					
Female (poverty)	0.3691	-0.0979	-0.0484	0.9990	1				
Male (Food Threshold.)	0.4951	-0.1641	-0.1132	0.9742	0.9754	1			
Female (Food Threshold.)	0.4780	-0.1812	-0.1319	0.9719	0.9749	0.9992	1		
Male (Food Threshold.)	0.5407	0.7758	0.8398	-0.0045	-0.0291	-0.0280	-0.0495	1	
Female (Food Threshold.)	0.5289	0.7841	0.8479	-0.0056	-0.0298	-0.0310	-0.0520	0.9995	1

Figure 32. Comparison of unemployment and poverty variables with gender population at the barangay level.
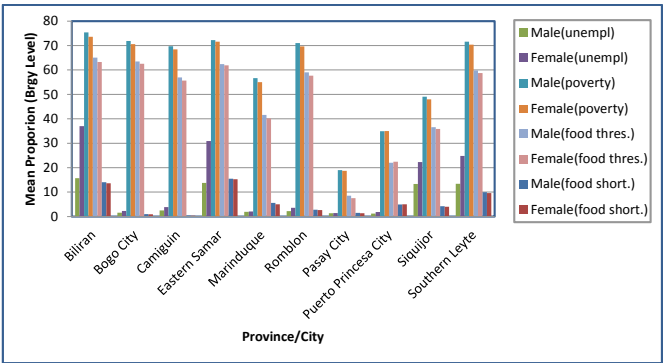
Figure 33. Mean proportion of the poverty variables by gender at the barangay level

However, if we consider the proportion of both genders with regard to their poverty characteristics at the barangay level (Fig. 33) and to the barangay SCI, their correlation is quite high as shown in Table 22.

Table 22. Correlation of barangay SCI and mean proportion of poverty variables by gender at the barangay level

	Barangay SCI	Male (Unemployed)	Female (Unemployed)	Male (Poverty)	Female (Poverty)	Male (Food Threshold)	Female (Food Threshold)	Male (Food Shortage)	Female (Food Shortage)
Barangay SCI	1								
Male (unemployed)	0.5786	1							
Female (unemployed)	0.6500	0.9828	1						
Male (poverty)	0.8734	0.4101	0.4507	1					
Female (poverty)	0.8787	0.4110	0.4523	0.9998	1				
Male (Food Threshold.)	0.8905	0.4217	0.4678	0.9955	0.9961	1			
Female (Food Threshold.)	0.8968	0.4226	0.4686	0.9947	0.9958	0.9996	1		
Male (Food Threshold.)	0.6743	0.8077	0.8720	0.3977	0.4021	0.4055	0.4099	1	
Female (Food Threshold.)	0.6768	0.8059	0.8715	0.3927	0.3977	0.4021	0.4071	0.9995	1

The correlation analysis also shows that the food shortage variable may not be a good indicator of poverty. Being in poverty may not necessarily mean that there is food shortage regardless of gender. Also, the average barangay SCI is more positively correlated with the average barangay proportion of the gender population in terms of their poverty characteristics than the average barangay population. Hence, in the subsequent analysis, the accessibility variables would be analyzed using the proportions of the poverty variables of both genders and not the actual number of the population having these poverty variables.

Effect of the Presence of a National Road on Unemployment by Gender

A good road (i.e., a national road) passing through the barangay ensures year-round access compared to earth roads that usually serve interior barangays in a locality. It then follows that employment opportunities in the locality could improve with good roads. As the trend would show in Table 23, the effect on unemployment, regardless of gender, of a national road passing through the barangay is mixed. The grand mean of unemployment is even higher for males when there is a national road passing through the barangay. This may mean that employment opportunities in the barangay are not dictated by the availability of a national road. However, it is clear that a higher proportion of females compared to males, regardless of the location of the barangay with respect to the national road, are unemployed. Note that in the case of Pasay City, all barangays are passed by national roads.

Table 23. Effect of barangay location with respect to national road
on unemployment by gender

Province/City	Barangay Location With Respect to National Road	Gender Proportion on Unemployment (Barangay Level)	
		Male	Female
Biliran	Not along national road	13.55	37.00
	Along national road	16.36	36.96
Bogo	Not along national road	0.20	0.00
	Along national road	1.60	2.38
Camiguin	Not along national road	4.03	5.68
	Along national road	2.02	3.30
Eastern Samar	Not along national road	11.33	30.99
	Along national road	16.21	30.76

Table 23 continued...

Marinduque	Not along national road	1.87	2.07
	Along national road	2.13	2.16
Puerto Princesa	Not along national road	1.29	1.82
	Along national road	1.18	1.90
Pasay	Not along national road	—	—
	Along national road	1.36	1.41
Romblon	Not along national road	2.17	3.93
	Along national road	2.29	2.70
Siquijor	Not along national road	12.46	20.79
	Along national road	15.58	26.37
Southern Leyte	Not along national road	12.15	25.25
	Along national road	15.03	24.19
Grand Mean	Not along national road	8.55	19.27
	Along national road	10.18	18.44

Effect of the Presence of a National Road on Poverty by Gender

In the case of the effect of a national road on barangay poverty, Table 24 shows that when a national road passes through the barangay, less poverty is experienced regardless of gender. However, overall there is only a slight difference in poverty measures between genders, with less females experiencing poverty than males.

Table 24. Effect of barangay location with respect to national road on poverty by gender

Province/City	Barangay Location With Respect to National Road	Gender Proportion in Poverty (Barangay Level)	
		Male	Female
Biliran	Not along national road	76.42	74.17
	Along national road	75.11	73.44
Bogo	Not along national road	76.00	73.70
	Along national road	71.64	70.45
Camiguin	Not along national road	64.77	64.04
	Along national road	71.28	68.42

Table 24 continued...

Eastern Samar	Not along national road	79.63	79.45
	Along national road	64.66	63.47
Marinduque	Not along national road	58.33	56.86
	Along national road	53.30	51.20
Puerto Princesa	Not along national road	26.64	25.94
	Along national road	43.71	44.66
Pasay	Not along national road	—	—
	Along national road	18.98	18.72
Romblon	Not along national road	70.67	69.23
	Along national road	72.04	71.00
Siquijor	Not along national road	52.14	51.08
	Along national road	40.53	39.57
Southern Leyte	Not along national road	74.43	73.51
	Along national road	68.03	66.40
Grand Mean	Not along national road	69.44	68.53
	Along national road	56.41	55.26

Correlation of Poverty Measures and Accessibility by Gender

Four types of accessibility measure were used in this study: (a) the road distance (in kilometers) from the barangay (using a hypothetical center) to the school or economic center location, (b) walking time (in minutes) from the barangay to the school or economic center location, (c) the travel time (in minutes) by public transport to the school or economic center location, and (d) generalized cost using Eq. (2), which uses the travel time result and the cost of time values in Table 5 by province plus the cost of fare using public transport. For accessibility to elementary schools, accessibility definitions (a) to (c) were used since the cost of time among children who are not yet wage earners were considered 0. In the case of accessibility to high schools and to economic centers, accessibility definitions (b) to (d) were used. It was assumed that high school aged students may also be already wage earners.

Table 25. Correlation between the proportion of children 6–12 years old not in school by gender at the barangay level with accessibility to elementary schools

Province/City	Proportion of 6-to 12-Year-Olds Not in School by Gender	Accessibility Variables		
		Road Distance to Elementary School	Walk Time to Elementary School	Travel Time by Public Transport to Elementary School
Biliran	Male	0.173	0.173	0.173
	Female	0.219	0.219	0.219
Bogo	Male	-0.080	-0.080	-0.080
	Female	-0.124	-0.124	-0.124
Camiguin	Male	-0.042	-0.042	-0.042
	Female	-0.088	-0.088	-0.088
Eastern Samar	Male	0.071	0.071	0.070
	Female	0.095	0.095	0.095
Marinduque	Male	-0.000	-0.000	-0.000
	Female	0.111	0.111	0.111
Pasay City	Male	-0.021	-0.021	-0.021
	Female	0.015	0.015	0.015
Puerto Princesa City	Male	-0.013	-0.013	-0.013
	Female	-0.300	-0.300	-0.300
Romblon	Male	0.174	0.174	0.174
	Female	0.096	0.096	0.096
Siquijor	Male	-0.003	-0.003	-0.008
	Female	0.084	0.094	0.099
Southern Leyte	Male	-0.028	-0.028	-0.028
	Female	-0.032	-0.032	-0.032

Considering now the relationship between accessibility variables and the proportion of children 6–12 years old who are not in elementary school, Table 25 above would show that their correlations are quite low for both genders. This may be due to the fact that most of the barangays in the study areas already have elementary schools and access to these elementary schools is not a problem. In other words, a barangay having a high proportion of children 6–12 years old not in elementary school is not attributable to the accessibility of the schools.

In the case of the proportion of 13- to 16-year-olds not in high school, it can be seen in Table 26 below that the accessibility variables are quite

significantly correlated with the proportion of males and females aged 13–16 years old who are not in high school especially in the provinces of Marinduque, Romblon, and Biliran; it is not significant in the cities of Pasay and Bogo since accessibility is not a problem in the latter cities. When the area has good road connectivity like in Puerto Princesa City and Siquijor and hence less accessibility problems, the correlation of the accessibility variables with the proportion of males and females 13–16 years old who are not in high school at the barangay level is also not significant. Hence, it can then be said that accessibility of high school locations to some extent affects the proportion of males and females aged 13–16 years old who are not studying in the barangay level.

Table 26. Correlation between the proportion of persons 13–16 years old not in school by gender in the barangay level with accessibility to high schools

Province/City	Gender	Accessibility Variables		
		Walk Time to High School	Travel Time to High School	Generalized Cost to High School
Biliran	Male	0.409	0.409	0.391
	Female	0.365	0.365	0.378
Bogo City	Male	-0.034	-0.034	-0.013
	Female	0.131	0.131	0.105
Camiguin	Male	0.333	0.333	0.365
	Female	0.065	0.065	0.083
Eastern Samar	Male	0.387	0.387	0.389
	Female	0.401	0.401	0.405
Marinduque	Male	0.458	0.458	0.462
	Female	0.361	0.361	0.375
Pasay City	Male	0.016	0.016	0.016
	Female	0.014	0.014	0.014
Puerto Princesa City	Male	0.212	0.212	0.189
	Female	0.064	0.064	0.048
Romblon	Male	0.421	0.421	0.402
	Female	0.458	0.458	0.448
Siquijor	Male	0.116	0.136	0.135
	Female	0.032	0.097	0.101
Southern Leyte	Male	0.292	0.292	0.288
	Female	0.258	0.258	0.272

As for the impact of economic center locations on the proportion of those in poverty and unemployed (Table 27), the proportion of poverty by gender in the barangay is affected more by accessibility to economic centers than the proportion of unemployed by gender. This may be due to the fact that in most of these provinces and even cities, employment can be found near their homes. Several of these employment opportunities can be considered self-employment, such as farming and fishing. Considering now the data set of all the provinces and cities studied, Table 28 shows the correlation of the education and economic variables by gender and accessibility. For the relationship between accessibility variables and the proportion of children 6–12 years old who are not in elementary school, Table 4.9 shows that their correlations are quite low for both genders. Accessibility to high school, however, whether by walking, using the public transport, or the general cost measure, would greatly influence the number of males and females who are 13–16 years old in going to high school with correlation ranging from 0.414 to 0.418 for males and 0.386 to 0.389 for females.

Access to market and economic centers is more positively correlated with the proportion of poverty in the barangay regardless of gender compared to the proportion of unemployed. As earlier mentioned, location of employment can be closer to home especially for fishermen and farmers, more particularly in the provinces. Looking at the correlation of poverty and employment, male unemployment has a very low correlation with gender poverty (male or female), while female unemployment to some degree is correlated to gender poverty (male or female). We can surmise here that even with the male being employed, poverty still exists, while if the female is employed poverty may not exist in the household.

Table 27. Correlation between the proportion people of working age
(15 Years Old and Older) by gender at the barangay level with accessibility
to market/economic centers

Province/City	Poverty and Unemployment	Gender	Accessibility Variables		
			Walk Time to Economic Centers	Travel Time to Economic Centers	Generalized Cost to Economic Centers
Biliran	Poverty	Male	0.276	0.276	0.265
		Female	0.273	0.273	0.261
	Unemployment	Male	-0.129	-0.129	-0.115
		Female	-0.090	-0.090	-0.102

Table 27 continued...

Bogo	Poverty	Male	0.369	0.369	0.414
		Female	0.357	0.357	0.401
	Unemployment	Male	0.117	0.117	0.192
		Female	0.019	0.019	0.110
Camiguin	Poverty	Male	0.103	0.103	0.097
		Female	0.100	0.100	0.095
	Unemployment	Male	0.267	0.267	0.270
		Female	0.335	0.335	0.337
Eastern Samar	Poverty	Male	0.312	0.312	0.312
		Female	0.328	0.328	0.328
	Unemployment	Male	-0.225	-0.225	-0.226
		Female	-0.078	-0.078	-0.079
Marinduque	Poverty	Male	0.060	0.060	0.049
		Female	0.072	0.072	0.060
	Unemployment	Male	-0.088	-0.088	-0.083
		Female	-0.047	-0.047	-0.049
Pasay City	Poverty	Male	-0.001	-0.001	-0.001
		Female	-0.005	-0.005	-0.005
	Unemployment	Male	0.134	0.134	0.134
		Female	0.144	0.144	0.144
Puerto Princesa	Poverty	Male	0.795	0.795	0.796
		Female	0.802	0.802	0.802
	Unemployment	Male	-0.160	-0.160	-0.160
		Female	0.109	0.109	0.107
Romblon	Poverty	Male	0.192	0.192	0.184
		Female	0.189	0.189	0.180
	Unemployment	Male	-0.005	-0.005	-0.007
		Female	0.005	0.005	0.002
Siquijor	Poverty	Male	0.161	0.198	0.196
		Female	0.183	0.224	0.221
	Unemployment	Male	-0.038	-0.039	-0.038
		Female	-0.061	-0.127	-0.128

Table 27 continued...

Southern Leyte	Poverty	Male	0.202	0.202	0.194
		Female	0.207	0.207	0.199
	Unemployment	Male	0.036	0.036	0.038
		Female	0.022	0.022	0.019

Table 28. Correlation between academic and economic variables
in the barangay level with accessibility by gender (aggregated data)

Gender Characteristics	Access to Elementary School		
	Road Distance to Elementary School	Walk Time to Elementary School	Travel Time by Public Transport to Elementary School
Proportion of males 6–12 years old not in elementary school	0.065	-0.006	-0.007
Proportion of females 6–12 years old not in elementary school	0.067	0.002	0.001
	Access to High School		
	Walk Time to High School	Travel Time to High School	Generalized Cost to High School
Proportion of males 13–16 years old not in high school	0.402	0.398	0.396
Proportion of females 13–16 years old not in high school	0.387	0.386	0.389
	Access to Market/Economic Centers		
	Walk Time to Economic Centers	Travel Time to Economic Centers	Generalized Cost to Economic Centers
Male (poverty)	0.340	0.334	0.332
Female (poverty)	0.351	0.345	0.342
Male (unemployed 15 years old and older)	-0.026	-0.010	-0.048
Female (unemployed 15 years old and older)	0.078	0.101	0.044

There is also some correlation between the gender (male or female) being in poverty when the male is not in high school more than the female (Table

4.10). It can be surmised that when the female household member is not in high school, it does not necessarily mean that the household is poor because the female household member may be working. But if the male household member is not in high school even though he is working, the household is most likely poorer than when the female household member is not in high school.

Table 29. Correlation of education, poverty, and unemployment variables

	brgy_ ntElem612 _Male_Prop	brgy_ ntElem612 _Female_ Prop	brgy_ ntHS1316 _Male_Pro	brgy_ ntHS1316 _Female_ Prop	brgy_ MemPovp _Male_ Prop	brgy_ MemPovp _Female_ Prop	brgy_ Unempl15ab _Male_Prop	brgy_ Unempl15ab _Female_ Prop
brgy_ntElem612 _Male_Prop	1							
brgy_ntElem612 _Female_Prop	0.545954	1						
brgy_ntHS1316 _Male_Prop	0.44709	0.366193	1					
brgy_ntHS1316 _Female_Prop	0.440096	0.361589	0.646534	1				
brgy_MemPovp _Male_Prop	0.237757	0.158377	0.480217	0.307355	1			
brgy_MemPovp _Female_Prop	0.246765	0.16294	0.494809	0.326038	0.992049	1		
brgy_ Unempl15ab _Male_Prop	0.101433	0.082333	0.024668	-0.02556	0.178088	0.167085	1	
brgy_ Unempl15ab _Female_Prop	0.165425	0.13056	0.262968	0.173097	0.363278	0.362374	0.700159	1

Regression Models

Clearly, the relationship between children 6–12 years old not in elementary schools and access time by walking to elementary schools is not well established (Figure 34). This result is consistent with what was previously stated that due to the presence of elementary schools in most barangays in the study areas, accessibility is not a problem anymore except for a few barangays in the interior parts of Eastern Samar and Southern Leyte provinces.
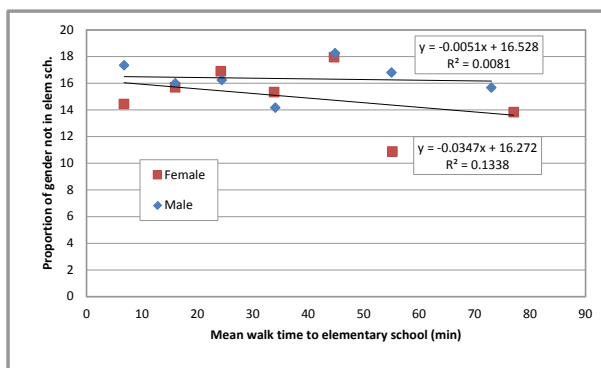
Figure 34. Regression models of proportion of children not in school
by gender against walk time to elementary school.

In the case of the relationship between the proportion of children 13–16 years old not in high school by gender against the general cost of travel in pesos to high school, a polynomial regression model was developed with good fit as shown in Figure 35. The polynomial regression models have an adjusted R^2 of 0.9874 and 0.9261 for the boys and girls models, respectively. The curves suggest that more boys than girls are likely to be not in high school when the generalized cost of travel is about less than Php20 when the school is near their households. As the generalized cost of travel becomes higher than Php 20, a higher proportion of girls of high school age are most likely not in school than boys.

As the curves would suggest, for most part of the accessibility concern to economic centers where there are employment opportunities, in terms of the generalized cost of travel in pesos, a higher proportion of females are unemployed than males as shown in Figure 36.
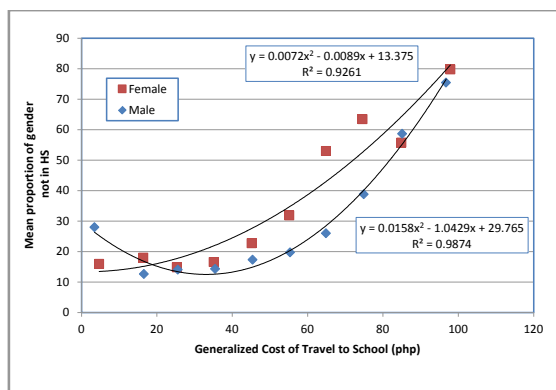

Figure 35. Polynomial regression models of the proportion of children 13–16 years old
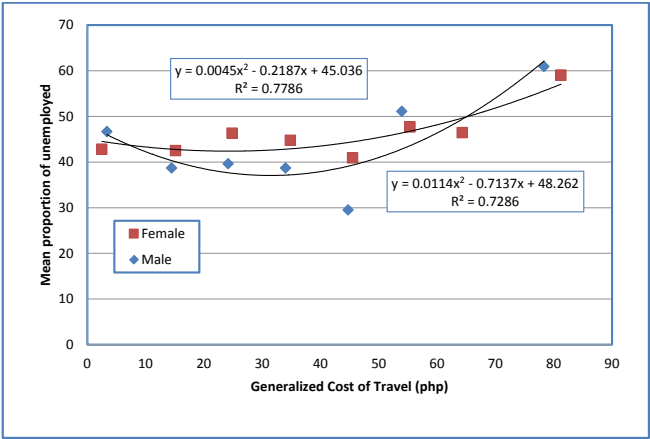not in high school by gender against general cost of travel (in Php) to high school.

Figure 36. Polynomial regression models of the mean proportion of individuals ages 15 and older who are unemployed by gender against general cost of travel (in Php) to economic centers.
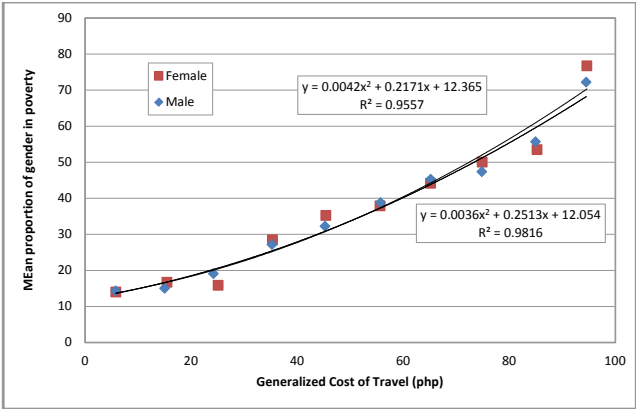

Figure 37. Polynomial regression models of the mean proportion of individuals whose income is below the poverty threshold by gender against the generalized cost of travel (in Php) to economic centers.

Figure 37 provides a best-fit relationship between the mean proportions of those who experience poverty regardless of gender versus accessibility to economic cernters using the generalized cost of travel in pesos. These economic centers are those areas where employment opportunities are available as well as where one can get involved in economic activities like

selling of farm and fishery products. Most often, these are where social services are also located.

Summary of Findings and Conclusion

In terms of gender and education, there were more males than females of corresponding school ages in both the elementary and high school levels in all the provinces and cities studied. There were 10,566 more males than females at the elementary level, while there were 6,850 more males than females at the high school level. The proportion of both genders at the barangay level of those who are not in school increases as the expected school-age population moves up from elementary to high school. However, the proportion of males is much higher than females as this school-age population moves up from elementary to high school. It is therefore safe to say that more males are dropping out of school than females as they move up from elementary to high school. In the case of the actual number of school-age population, more males are not in high school (43,841) than in elementary school (42,029) while the opposite is true for females with 30,670 not in high school compared to 36,473 not in elementary school.

For the actual number of unemployed in the study areas, there were more males (38,824) than females (38,245) who are unemployed. However, in terms of the mean proportion of unemployed at the barangay level by gender, that of the males is consistently lower than that of the females in all the provinces and cities studied. This is understandable since in the first place there are fewer females of employment age than males resulting to the higher proportion of unemployment in the former.

Comparing the population by gender of those who felt that their income is below the poverty threshold, there are more males (569,047) than females (532,700) who felt that they are poor. In terms of the mean proportion by gender of those who felt that their income is below the poverty threshold, all except Puerto Princesa City have more males than females who felt that they are poor.

The results regarding income below the food threshold and those who experienced food shortage between genders are also consistent with the result of those whose income is below the poverty threshold. However, those who experienced food shortage are consistently lower than the other two measures of poverty. The variable on food shortage experience is not a good indicator of poverty as the correlation analysis would show. Being poor may not necessarily mean that there is food shortage, regardless of gender, compared to the other measures of poverty.

There is no significant relationship between accessibility to the nearest elementary school, whether by walking to school or using a public transport, and the proportion of children 6–12 years old regardless of gender who are not in elementary school. This may be due to the fact that most barangays in the study areas already have elementary schools and their access to those schools is not a problem. There is however a significant relationship between accessibility to the nearest high school, whether by using public transport or the generalized cost of travel, and the proportion of males or females 13 to 16 years old who are not in high school. This is more pronounced in provinces where some of the barangays have poor accessibility due to poor roads or where public transport is not available. It can be concluded that accessibility to high schools to some extent affects the proportion of males and females 13 to 16 years old who are not studying at the barangay level.

The proportion of those who felt that their income is below the poverty threshold by gender in the barangay level is affected by accessibility to economic centers, while the proportion of those unemployed by gender at the barangay level is not. This may be due to the fact that employment can be found near their residences, especially among those who are self-employed like farmers and fishermen in the provinces. It can therefore be concluded that access to market and economic centers is more positively correlated with the proportion of those in poverty at the barangay level regardless of gender, but not the proportion of unemployed regardless of gender.

There is some correlation between genders (male or female) being in poverty when the male is not in high school more than the female. It can be concluded that when the female household member is not in high school, it does not necessarily mean that the household is poor because it is possible that the female household member may be working. But if the male household member is not in high school even though he is working, the household is most likely poorer than when the female household member is not in high school.

The effect on unemployment regardless of gender of a national road passing through the barangay is not clear. Unemployment is even higher for males when there is a national road passing through the barangay. This may mean that employment opportunities in the barangay are not dictated by the availability of a national road. However, it is clear that a higher proportion of females compared to males regardless of the location of the barangay with respect to the national road is unemployed. On the other hand, when a national road passes through the barangay, less poverty is experienced regardless of gender. However, overall there is only a slight difference on poverty expressed between genders, with less females experiencing poverty than males.

The developed polynomial regression models showed that there is a very significant relationship between the mean proportions of those who experience poverty regardless of gender versus accessibility, using the generalized cost of travel, to economic centers. While the polynomial regression model between the proportion of children 13–6 years old not in high school by gender against accessibility in terms of the generalized cost of travel to high school suggests that more boys are likely to not be in high school when the generalized cost of travel is less than Php 20 than girls. As the generalized cost of travel increases above Php 20, a higher proportion of high school age are more likely not in school than boys.

Recommendations

With the use of aggregated data of CBMS at the barangay level, it was shown that accessibility concerns especially going to high school and to economic centers greatly affected the poverty situation at the barangay level regardless of gender. A more disaggregated data especially on accessibility could be further obtained regarding the actual modes of transport used and the corresponding service characteristics by people of different genders at the barangay level going to high school and economic centers. It will improve further establish the relationships among these variables. The CBMS questionnaire survey forms could be modified to include questions related to accessibility concerns going to high schools and economic centers.

From the four measures of poverty, regardless of gender, namely, the barangay SCI, the households with income below the poverty threshold, the households with income below the food threshold, and the households who experience food shortage, it was the households who experience food shortage which are less correlated to the other three measures of poverty. If one has a choice of expressing poverty at the barangay level, households who experience food shortage should not be used.

The government policy of putting up elementary schools in every barangay has a very significant impact on the accessibility issue of children going to these elementary schools and in fact the study showed that it is not a concern anymore. However, in the case of children 13 to 16 years old who are not going to high schools, the accessibility problem is very much a concern. Since not all barangays could be provided with high schools because of the minimum number of enrollees required, the optimal location of high schools, especially if a new one would be put up, should be studied carefully with regards to its catchment area (i.e., which barangays have a high number of children of high school age) and also in relation to the existing location of high schools in the province or city.

Employment opportunities in the barangay are not dictated by the availability of a national road that passes through the barangay. Meaning, if you build a good road like the national road, the availability of jobs does not necessarily follow. However, it is clear that a higher proportion of females compared to males, regardless of the location of the barangay with respect to the national road, are unemployed. The policy and programs of providing jobs in a locality does not end with the provision of a good road but should try to identify livelihood opportunities especially for women and helping them look for markets (given the good roads) to sell their products.

Since not all provinces and cities were visited, the definition of the major economic centers in some cases was based on the population and intensity of development, with major port or airport infrastructure, and are as seen from internet-based maps. There may be a need to provide a more refined definition of a major economic center in a province.

References

Barrios, E. B. (2008). Infrastructure and rural development: Household perceptions on rural development. *Progress in Planning 70*, 1–44.

Blackley, P. R. (1990). Spatial mismatch in urban labor markets: Evidence from large US Metropolitan Areas. *Social Science Quarterly 71*, 39–52.

Diaz Olvera, L., Plat, D., & Pochet, P. (2003). Transportation conditions and access to services in a context of urban sprawl and deregulation. The case of Dar es Salaam. *Transport Policy 10*, 287–298.

Fillone, A., Goce-Dakila, T., & Roxas Jr., N. (2011). The geographic profiling of poverty and accessibility: The case of two provinces in the Philippines. *DLSU Business & Economics Review 20*(2), 45–65.

Heng, S., Hirobata, Y., & Nakanishi, H. (2007). An integrated model of rural infrastructure design in developing countries. *Journal of the Eastern Asia Society for Transportation Studies 7*, 269–282.

Hughes, M. A. (1991). Employment decentralization and accessibility: A strategy for stimulating regional mobility. *Journal of the American Planning Association 57*, 288–298.

I.T. Transport Ltd. (2005). *Valuation of travel time savings: Empirical studies in Bangladesh, Ghana and Tanzania and a practical model for developing countries, undertaken with Department for International Development, UK, financial support.* (Knowledge and Research Grants, 2001-5).

Integrated Rural Accessibility Planning (IRAP). (2000). *Second expert groups' meeting, International Labour Organization, hosted and organized by ASIST Asia-Pacific, September 5–6, 2000, Bangkok, Thailand.*

Kalachek, E. (1968). *In ghetto dwellers transportation employment: Conference on transportation and poverty, Brookline, MA.*

Manual for Co-Benefit Measurement in Transport Sector by the Institute for Global Environmental Strategies (IGES). 2010.

Porter, G. (2007). *Transport, (im)mobility and spatial poverty traps: issues for rural women and girl children in sub-Saharan Africa, a paper prepared for the international workshop "Understanding and addressing spatial poverty traps: An international workshop."* March 29, 2007, Spier Estate, Stellenbosch, South Africa.

Sanchez, T. W. (2008). Poverty, policy, and public transportation. *Transportation Research Part A 42*, 833–841.

US General Accounting Office (GAO). (1998). *Welfare reform: Transportation's role in moving from welfare to work.* (GAO/RCED-98-161). Washington, DC.
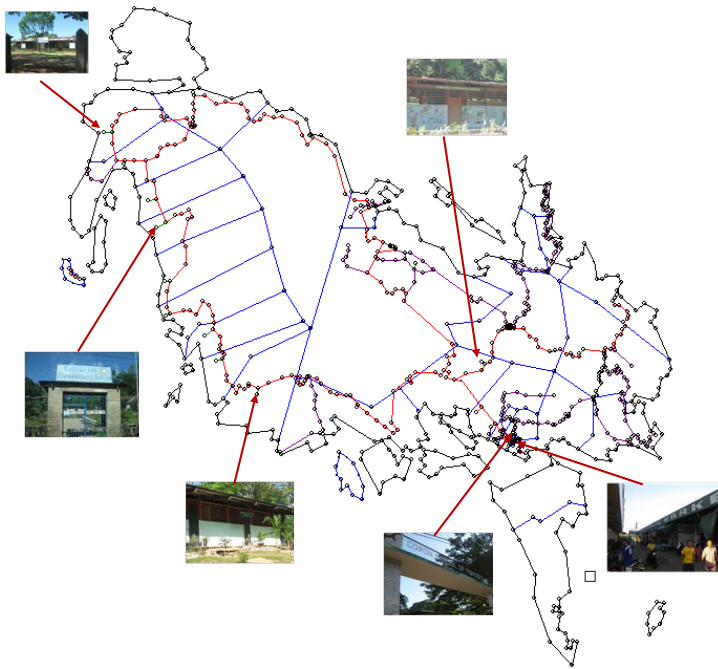
Appendix A

CBMS Poverty Indicators

Table A.1. The CBMS 14 Poverty Indicators and Their Decision Variables

Poverty Variables	Binary Choice/Description
1. HH_wMaln05	0—without malnourished children 0-5 years old/without children between 0-5 years old 1—with malnourished children 0–5 years old
2. HH_wDeath05	0—without child death 0–5 years old/without children 0–5 years old 1—with child death 0–5 years old
3. HH_wDeathPreg	0—without death due to pregnancy related causes/not applicable (no pregnancy in the household) 1—with death due to pregnancy related causes
4. HH_Squat	0—formal settler 1—informal settler
5. HH-MSH	0—not living in makeshift housing 1—living in makeshift housing
6. HH_ntSWS	0—with access to safe water 1—without access to safe water
7. HH_ntSTF	0—with access to sanitary toilet 1—without access to sanitary toilet
8. HH_wntElem612	0—all members 6–12 years old attending elementary/no members 6–12 years old 1—with members 6–12 years old not in elementary
9. HH_wntHS1316	0—all members 13–16 years old attending high school/no members 13–16 years old 1—with members 13–16 years old not in high school
10. HH_povp	0—nonpoor household 1—poor household
11. HH_Subp	0—subsistently non-poor 1—subsistently poor
12. HH_Fshort	0—did not experience food shortage 1—experienced food shortage
13. HH_wUnemp15ab	0—all members in the labor force are employed 1—with unemployed members of the labor force
14. HH_wVictcr	0—no victims of crime 1—with victims of crime

Appendix B

Busuanga Island

Busuanga Island is composed of two towns, Busuanga and Coron. There are 44 elementary and 4 high schools in Busuanga Island. The major market center is located in Coron as shown in Figure 3.2, which is open every day of the week. There are no other major markets in the island. Due to the incomplete CBMS data of the two towns of Busuanga and Coron in Busuanga Island, this study area was dropped from the accessibility analysis.

Map of Busuanga Island and the Location of Schools and Major Markets.

Appendix C

For Daily-Paid Employees

The following formula may be used in computing the EMR of different groups of daily-paid employees for purposes of entitlement to minimum wages and allied benefits under existing laws:

a) For those who are required to works everyday including Sundays or rest days, special days and regular holidays.

$$\text{EEMR} = \frac{\text{Applicable daily rate} \times 393.50 \text{ days}}{12}$$

Where 393.50 days =   298.00 days—ordinary working days
24.00 days—12 regular holidays × 200%
67.60 days—52 rest days × 130%
<u>3.90 days</u>—3 special days × 130%
393.50 days—total equivalent no. of days in a year

Source: http://www.nscb.gov.ph/secstat/d_income.asp