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## Influence of Transportation Services in the Socio-Economic Development: The case of North Cotabato Province

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**Abstract:** Transportation services in a province can significantly influence its socioeconomic status. This study was aimed to establish the relationship between transport services and the poverty incidence among families in North Cotabato Province. This study aims to determine if (a) the road access and access to public transportation have relationships to the total enrollment of public elementary and secondary schools; (b) what transport variables can influence the socioeconomic development of the province. Analysis showed the significant influence of distance of public elementary schools to its enrollment. Access to basic services can significantly influence the poverty level of the province. Furthermore, the quantity of road access needs to grow parallel with the population to lessen the poverty incidence among families. These results are useful in future planning to alleviate poverty in the province.

**Key Words:** Transport; Socio-economic profile; shortest path; road density; road pavement

### 1. INTRODUCTION

The province of North Cotabato is located in Region XII composed of 17 municipalities and one city with a total of 543 barangays. With a population of 1,379,747 (Phil. Statistics Office, Census of Population and Housing, 2010) and an increase of 12% from 2010, home of various tribes with diverse cultures, the province is continuously aspiring to be the best province in the region. The province is an agricultural-based community producing rice, corn,

banana, rubber, oil palm and vast variety of fruits such as mangosteen, durian, lanzones, rambutan, water melon and pomelo. Famous tourist destinations in the province include the Majestic Mount Apo, the Asik-asik Falls, Pisan Caves and New Israel Eco-Park. However, the poverty incidence among families almost doubled from 25.6% in 2006 to 44.8% in 2012 (Province of Cotabato Socio-economic Profile, 2015).

Poverty can be attributed to several factors. Factors being considered are the availability of public transportation, quality and quantity of road access,

and location of basic services such as education, health and economic centers in terms of access distance. Transportation is vital in the socio-economic development of the province. This study aims to determine the influence of transportation services in the province on its socio-economic status by developing a regression model to establish the variables that are significant in alleviating poverty in the province.

## 2. METHODOLOGY

Mode of transportation and available public transportation were gathered through field surveys, interviews as well as actual observation in the field. The shortest path to public elementary schools and secondary schools were estimated using the transportation modeling software, EMME4. Maps were generated using QGIS.

Significant relationships between variables were determined using Chi-square Test and Linear Regression Model.

## 3. RESULTS AND DISCUSSION

### 3.1 Mode of Public Transportation

The mode of public transportation differs with the location of schools. Schools located near the Davao-Cotabato National Highway are accessible by bus, L300 van, PUJ and tricycle. Local name for PUJ is multicab, and tricycle is a motorcycle with a cab attached on its side.

While the common public transportation in barangays is habal-habal/skylab, a motorcycle with attached wooden piece at the back as an extension to carry more passengers. In mountainous areas that are not accessible by motorcycles, horses were used to transport students, while in lowland areas they are using motorized boats. Motorized boats are locally called pump boat.



Fig. 1. Public transportation. (a) Bus, (b) PUJ or Multicab, (c) Tricycle, (d) Habalhabal or Skylab, (e) Motorized boat or Pump boat.

### 3.2 Enrollment in public schools

The total enrollment in public elementary schools is significantly affected by the distance of the school to population centers. Most of the school with less than 200m path to school has the highest enrollments and least enrollment in schools with more than 500m distance.

The total enrollment in secondary schools was not affected by the distance of school to population centers.



Table 1. Correlation between the shortest path to public elementary and secondary schools and enrollment

	Elementary Schools			Secondary Schools		
	Value	df	Asym. Sig. (2-sided)	Value	df	Asym. Sig. (2-sided)
Pearson Chi-Square	51.821	36	.043	25.893	28	0.579
Likelihood Ration	37.627	36	.395	27.584	28	0.487
Linear-by-Linear Association	0.482	1	.488	1.433	1	0.231
N of Valid Cases	18			18		

Significance at 5% Level

### 3.3 Shortest path to public secondary schools

Statistical analysis reveals that distance of public secondary schools has a significant contribution to improve the poverty incidence of the province. Most secondary schools in municipalities with “Mildly Poor” poverty incidence are within 3km from barangays, while in those municipalities with “Moderately Poor” poverty incidences are within 5km distance.

Table 2. Correlation between the shortest path to public secondary schools and poverty incidence.

	Value	df	Asym. Sig. (2-sided)
Pearson Chi-Square	10.768	4	.029
Likelihood Ration	12.674	4	.013
Linear-by-Linear Association	7.307	1	.007
N of Valid Cases	18		

Significance at 5% Level

### 3.4 Shortest path to hospitals

Correlation between the shortest path from population centers to hospitals shows significant difference on poverty incidence. Municipalities with poverty incidence of “Mildly Poor” are located within 15 km from hospitals as compared to those with

poverty incidence of “Moderately Poor” that are located 15-30 km away from hospitals.

Table 3. Correlation between the shortest path to hospitals and poverty incidence.

	Value	df	Asym. Sig. (2-sided)
Pearson Chi-Square	7.571	2	.023
Likelihood Ration	8.260	2	.016
Linear-by-Linear Association	4.690	1	.030
N of Valid Cases	18		

Significance at 5% Level

### 3.5 Shortest path to economic centers

Economic centers in this study were identified as municipalities with significant number of business and commercial establishments in the province. There are four (4) municipalities identified: Midsayap, Kabacan, Mlang and Kidapawan City. Analysis reveals that the shortest path to economic centers significantly influenced the poverty level of the province. Municipalities with “Mildly Poor” poverty incidence are located within 20km from economic centers while those with poverty incidence of “Moderately Poor” are located within 20-30km away from economic activities.

Table 4. Correlation between the shortest path to economic centers and poverty incidence.

	Value	df	Asym. Sig. (2-sided)
Pearson Chi-Square	12.600	6	.050
Likelihood Ration	16.184	6	.013
Linear-by-Linear Association	6.227	1	.013
N of Valid Cases	18		

Significance at 5% Level

### 3.6 Road pavement and road densities

Road pavement in this analysis was classified as concrete, asphalt, gravel and earth and road densities were computed based on the land area and population. Regression analysis was done to develop a regression model on the influence of road pavement in terms of its length and road densities



based on land area and population to the poverty incidence of the province. The results of the regression analysis implied that road pavement and road densities highly influence, at 5% level of significance, the poverty incidence among families in the province.

Table 5. Regression analysis between poverty incidence of 2012 and road pavement

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	54.140	4.112		13.165	.000
Concrete	.012	.066	.066	.184	.857
Asphalt	-1.116	.787	-.507	-1.418	.180
Gravel	-.032	.013	-.486	-2.403	.032
Earth	.010	.018	.113	.538	.600

Significance at 5% Level, R<sup>2</sup>=0.506

$$PovertyIncidence = 0.012Concrete - 1.116Asphalt - 0.032Gravel + 0.010Earth + 54.14$$

Table 6. Regression analysis between poverty incidence of 2012 and road densities

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	60.448	4.1822			.000
RD_Area	-8.524	.745	-.622	14.455	.007
RD_Population	-10.173	10.943	-.186	-3.105	.067

Significance at 5% Level, R<sup>2</sup>=0.530

$$PovertyIncidence = -8.524RDLandArea - 10.173RDPopulation + 60.448$$

#### 4. CONCLUSIONS

The farther the school to population centers, the lesser the enrollment in public elementary schools. The total enrollment in secondary schools was not affected by the distance of school to population centers.

The distance of population center from

secondary public secondary schools, hospitals and economic centers have significant influence in the socio-economic development of the province.

Road pavement and road densities contributes to the reduction of poverty incidence in the province.

Poverty incidence tends to decrease if there is increase in asphalted or graveled roads. Increase in access roads with respect to land area and population will yield to lower poverty incidence.

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