Estimating the Economic Value of Health Walk on the Accra-Aburi Mountains Walkway in Ghana: An Individual Travel Cost Approach

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***Abstract*: The study evaluates the economic benefits that the Accra-Aburi Mountain walkway in Ghana provides to the health of hikers by employing the Individual Travel Cost Method (ITCM). The underlying principle was to specifically determine the economic value of the Mountain and what determine visits to the site. The tenet of the ITCM is that the travel costs borne by a hiker to get to a recreational centre rely on factors such as the costs of driving and the cost of time sacrificed to travel to the site. The findings reveal the total value that hikers place on the Accra-Aburi Mountain walkway was valued as GH₵13,654,693($3,034,376.22) in 2018 based on a yearly visitation rate of 145,340 hikers. The results from the generalised poison regression method indicate that travel cost, gender, average income, cardiovascular diseases, family history and blood pressure are the determinants of visitation to the mountain for health walk. We recommend to the government not to substitute the Accra-Aburi Mountains walkway for any other use since hikers valuation of the walkway is GH₵13,654,693($3,034,376.22) in 2018 which is quite high.**

***Key words*: individual travel cost method, health walk, Accra-Aburi Mountains.**

I. INTRODUCTION

Physical activity is regarded as the best way of preventing common health conditions in most countries. Daily physical exercise has positive impacts on health by offering similar impacts to drug interventions [33]. In the absence of mechanical intervention, walking is the principal method by which humans move from place to place. Walking at an intensity of 3–5 m/h (5–8 km/h) improves energy and is regarded an easiest and cheapest way of meeting physical exercise recommendations [51]. Critical assessments show that walking or hiking provides health benefits like increasing cardiovascular health, improving muscle strength, decreasing blood sugar level, burning calories, reducing body fat, boosting immune functioning, providing stronger bones, increasing life expectancies and reducing the cost of health care [3; 7; 8].

The health benefits of physical activity are well documented and explained. Public suggestions indicate that adults and older adults should participate in at least 150 minutes of moderate or vigorous activity within a week to promote and maintain health [26; 33]. Health experts often advised that exercise is one of the main antidotes for painful joints and also has the tendency to facilitate control of one's weight. Moderate exercise can reduce pain and help you control your weight whilst not exercising will worsen your condition. Promoting physical activity as an integral part of lifestyle has become a central aim of public health policy [50]. Walking also does not require special equipment and has low risk of injuries. Group walking has become an increasingly popular form of promoting physical activity in many countries, especially among sedentary people and people with chronic diseases. For example, walking for health is an initiative, which has established group walks across England with the aim to encourage more people to be physically active [51].

The absence of exercise raises concern for the high incidence and prevalence rates of NCDs and the general well-being of individuals across the globe [27; 45]. Moreover, lack of exercise leads to economic cost as the government of Ghana is compelled to commit more funds into the country's health care system (health facilities, health professionals, health policies) to prevent or manage the incidence and prevalence of the diseases [55]. Evidence show that there have been studies into physical activity programmes [1; 7; 8; 22; 42; 43; 44; 45; 55; 56; 57; 64; 65]. [41] did a study to estimate the benefits of vaccination against cholera in Beira, Mozambique using the TCM to compare both the CVM and the travel cost analyses but not in physical activity. [9] used fertility-control model to estimate the sensitivity of demand for abortion to travel cost variations using county-level data on the state of Texas.

However, the same cannot be said about physical activity like health walk or hiking as neither the TCM nor the CVM have been used to economically value the benefits of health walk in Ghana. This assertion is supported by [22] that few studies have been done on health walks in developing countries like Ghana. The lack of studies into valuing health walk or hiking influenced this study to employ the ITCM to estimate the economic value as well as the factors that determine visits to the Accra-Aburi Mountains walkway.

II. LITERATURE REVIEW

A. Theoretical Literature

The RPM is seen as one of the most suitable techniques for valuing environmental resource studies. This approach explains individuals demand for non-market goods by emphasising the demand for similar goods such as substitutes or complements. Additionally, this approach examines markets in which prices reflect varied levels of quality of the non-market goods. The HPM is often used in health applications because individuals frequently involved in treating, fighting or managing behaviours when negatively affected by health issues [29, 41]. The TCM is a RPM, developed in accordance with the fact that the consumption of non-market goods may be connected with demand for complementary private goods such as time and transportation.

The TCM was initially propounded by Hotelling and later developed by Clawson [40]. Hotelling then presented a letter to the US Department of Interior's Park Service to help value benefits from non-market goods such as recreational sites. The TCM assumes that though access to sites has a minimal or no market value, individuals' travel costs, including transportation, lost wages, time can be used to estimate the surrogate prices for their use [40]. The TCM approach assesses peoples' WTP to visit a site that can be evaluated depending on the frequency of trips they make at varied travel costs [49; 44]. [50; 51; 54] regards TCM as one of the positive outcomes of non-market valuation and also plays a role in the applied research programmes of resource and environmental economists.

The use of the TCM requires principles of the nature of the trip involved and the costs incurred in travelling to the site. The basic principle is that visitors react to changes in travel costs to the site in the same manner they would react to changes in an entry fee. This implies that the number of trips to a recreation site should decrease with increases in distance travelled and other dimensions that add to total travel cost. The socio-economic dimensions of the individual, information pertaining to substitute sites and environmental quality indicators could also be added in the demand function. The TCM is based on the premise that the costs that individuals incur when travelling to visit a site indicate the price of access to the site [1; 41]. This means individuals' WTP for the site is reliant on the frequency of trips the person makes to the site. Most literature focus on the zonal and the individual TCMs in the calculation of visits cost, explanatory variables and models. The zonal is applied by collating information on the frequency of visits to the site from different distances [1]. This then leads to estimating the economic benefits of visiting the site. The individual TCM explains the dependent variable as the frequency of site visits made by each person over a given period.

[64; 65] regards TCM as one of the positive outcomes of non-market valuation and also, plays a major role in the applied research programmes of resource and environmental economists. This has been explained by [68] as being the case because estimates are generally suitable with Consumer Demand Theory (CDT). The author further argues that TCM provides a utility suitability and strong methodology which helps to explain factors that significantly explains variance in valuation outcomes. The TCM tends to generate higher value estimates than other approaches in environmental valuation studies. The reasons why TCM generate higher values than the other approaches are grouped into framing and methodological issues. The three framing issues that cause value differences are different decision points, substitute sites and strategic answers [55; 56]. The methodological issues that affect value estimates include the estimation of travel costs, treatment of multi-destination and multi-purpose trips, treatment of travel time and onsite time, type of functional and statistical analysis used [55].

The main objections to the limited use of the TCM in urban contexts are related to the supposedly large number of substitute sites, alternative means of transport, and consequently, the low costs associated with visiting recreational sites within cities [31]. If visitors reach the site by free means of transport, their estimation of the recreation site cannot be captured by the TCM, such that the calculated consumer surpluses may be underestimated. Contrarily, implementing the TCM also creates many difficulties; that is quantifying the time spent traveling in monetary terms, and in addressing the endogenous nature of transportation mode choices [41].

B. Theoretical Framework

In recreation studies, the costs that the person incurs to visit a site constitute the "price" that they are willing to pay for using that site. Based on the estimated demand relationship, it is possible to determine the individual measures of consumer surplus derived from a particular visit. The basic principle of the TCM is that the travel costs incurred by a hiker to get to a recreational centre rely on factors such as costs of driving, entrance fees to the site, and the opportunity costs of the time spent travelling to the site. The number of visits is then a function of travel costs to site, costs of travel to other substitute sites and characteristics of the hiker. The travel demand model is estimated using count data regression techniques. The count data models emphasise the positive integer nature of data on the number of trips taken and are useful when the counts are small [24].

The Poisson regression model was first used by [59]. This model has subsequently been used in a number of recreational demand analyses when estimates are compared to different count data models for deer hunting data in California [20]. [30; 31] used the standard and truncated Poisson and negative binomial models to estimate the demand for fishing in Alaska. Simulation results are given to explain the magnitude of the bias that may result from the failure to account for over-dispersion in truncated samples. [25] on the other hand designed a long-run recreational demand model to estimate

hiking trails in the Pacific North West. [21] employed a count data TCM to estimate the demand for salmon and economic value of salmon angling in Ireland. [37] used count data on travel cost study to analyse wildfire effects on hiking and biking demand in New Mexico, Donegal, Ireland. [11] also used count to analyse recreational benefits from a marine protected area located in the Bristol Channel, United Kingdom.

[37] outline the theoretical foundation for the adoption of count data to model demand. In making decisions, the decision whether to embark on a trip or not can be modelled with a binomial distribution. As the number of choices rises, the binomial asymptotically converges to a Poisson distribution. A Poisson distributed random variable N with parameter l is designed for all positive integer numbers 0, 1 and 2. However, data on the number of trips are often over-dispersed or under-dispersed. That is, the variance is larger than the mean for the data for the first case or the variance is smaller than the mean for the data. This is because a few visitors make many trips while most visitors make only a few. This makes the Poisson model overly restrictive [37]. The standard Poisson and negative binomial regression models are the two most widely used models for a study like this one.

However, this is not true as these models have shown to be limited in some instances. Using the Poisson regression model compels the conditional mean and variance of the dependent variable to be the same (equidispersion) for each observation. In reality, this principle is not always true because the variances can either be larger or smaller than the mean thus; making claim for both over-dispersion and under-dispersion in count data. If the variance and the mean are unequal, the estimates in Poisson regression models are still consistent but inefficient. Therefore, the inference premised on the estimated standard errors becomes invalid. There is more flexibility in the negative Binomial regression model and is frequently used to study count data with over- dispersion as compared to the standard Poisson model [10; 34; 35].

C. Empirical Literature

The use of TCM in economic valuation is predominant in the developed countries and also, more on recreation but limited to issues of health [5; 11] did a study on the economic value of hiking on opportunity cost of time in recreational demand models by conducting a survey of 185 respondents on Grandfather Mountain which is a privately owned mountain from 1993 to 1994. The results using the ordinary least squares depict a better fit for the models with the elicited value of individual consumer's time than for the models with the more traditional hourly earnings (wage rates).

[41] employed the TCM to estimate the benefits of vaccination against cholera in Beira, Mozambique. The study estimates travel cost models of the revealed demand for cholera vaccines among informed households of the trial using information collated in in-person interviews. A standard and zero-inflated household count models for all household members and dichotomous choice models for the head of the household were all estimated. The analysis shows that the quantity of vaccines obtained by households and their involvement reduced as travel cost in time and transport expenses increased. The estimates of per capita willingness to pay for the two required doses of vaccines against cholera are valued at $0.85. These estimates are reactive to the assumed value of time spent on acquiring the vaccines. One of the weaknesses of the count models usage is that they compel the travel cost (and thus also the opportunity cost of time) of all persons of the household to be equal, however, this is not always realistic. This is due to the fact that the household include infant, children, school children, and more or less the working group.

[58] did a study on cost-benefit analyses of walking and cycling track networks in three Norwegian cities. The cost-benefit analyses looked into the benefit of minimised insecurity and the health benefits of the improved fitness in the use of non-motorized means of transport in 2003. In addition to minimising health costs, the analyses also look into a change from travelling by car to cycling or walking as a means of reducing external costs, motorized traffic and parking costs. The benefits of investing in cycle networks are valued to be at least 4-5 times the costs. The results help to determine the benefits accrued to societies that are not ascertained because motorized traffic deters visitors from bicycling or walking as much as they would have preferred.

[39] used a TCM to test the effects of wild and prescribed fire on visitation by hikers and mountain bikers in New Mexico. The results show that the mountain bikers take a net benefit of $150 per trip as well as taking an average of 6.2 trips per year. On the other hand, Hikers take a net benefit of $130 per trip as well as taking an average of 2.8 trips per year. This suggests that fire and recreation managers cannot expect recreation users to respond similarly to fire across recreation activities, or different geographic regions. This signifies that cost-effective approach in one setting may not necessarily work in another setting. Therefore, different policies must be applied in different settings and regions to achieve optimum results.

[9] applied a fertility-control model to estimate the sensitivity of demand for abortion to travel cost variations using county-level data on the state of Texas. The result shows that abortion rates as well as pregnancy rates tend to be responsive to the availability-induced variations in the travel cost of abortion services. It further reveals that greater provider availability minimises the travel cost associated with demand for abortions. The results mean that residents in counties with longer travel distances to the nearest abortion provider have lower abortion rates and lower pregnancy rates than residents in counties with shorter travel distances.

[4] did a survey of 1,648 urban households in Accra, Ghana to estimate the economic value of reliable piped-water supply using competing methods to provide validity checks for the estimates. The results from the TCM show that the average

amount that households are willing to pay per month is GH₵22.72 ($7.25). These amounts were equal to 3%-8% of households' income. This provides a case of the economic viability of the private sector engagement in potable water production in Ghana. The estimates can inform managers and policy makers when making decisions on reliable piped-water production.

[63] with the TCM did a study on 225 respondents to economically value the Kakum National Park, Ghana. The results show that a person spends an annual value of GH₵67.28 ($46.40) to the site which gives a yearly sum of GH₵8,481,653.20 ($5,849,416) in 2009. The use of the zero-truncated negative binomial method in the regression analysis demonstrate that travel cost, gender, knowledge of composite sites are the key determinants of visiting the Park.

[26] used the TCM to conduct a survey on economic valuation of visiting museum in Calabar, Nigeria. The result show that the visitors mean annual use value of the old residence ranges from 83,087($237.37) to 373, 206 ($1,066). This result far exceeds the annual average income of 331.67 ($0.95) individual pay to visit the building as entrance fee. From the survey, the study found it difficult to determine whether the visitors took a single purpose or multiple purpose trips to the museum.

However, these studies used the TCM in environmental activities especially in relation to recreational activities and have not focused into valuing walks. The lack of studies into valuing health walk influenced this study to employ the TCM in the context of Accra Aburi mountain walk way.

III. METHODOLOGY

A. Model Specification

Most studies employ functional forms such as linear, quadratic, semi-log and log-linear in estimating demand models empirically. In most cases, the linear and the semi-log functional forms are used for estimating demand functions. Basing on the findings of [20], this study employs the linear specification on the premise that its theoretical features are suitable. The use of specific econometric models helps to define the association between individual visits per month and the travel cost as well as other explanatory determinants. Most empirical studies use the individual observations instead of the traditional zonal averages to achieve greater efficiency gains in estimating outdoor recreation demand function [64; 65; 66].

However, using the individual observations has its issues as it can generate wrong Consumer Surplus (CS) estimates unless they are on a per capita basis. The most challenging issue that researchers face with estimating a travel cost relying on recreation demand function to unadjusted individual observation is that the procedure does not correctly accommodate cases where a lower percentage of the more distant population zones partake in recreational activity. When this happens, the estimated travel cost coefficient is biased. In the end, incorrect CS estimates are generated. Thus, for each observation to be adjusted on a per capita basis then the underlying demand function must be estimated correctly from the individual observations [63].

A typical trip model is defined as

$$V=f(C, X) \quad (1)$$

Where V is visits to the site, C is visit costs and X are other socioeconomic variables which are hypothesized to explain visits to the site due to individual differences. In choosing a procedur e to estimate the model, consideration was given to the fact that the dependent variable is truncated at a certain point and therefore Maximum Likelihood Estimate (MLE) is the best method suited for this type of data set. Specifically, we run a regression of visitation rate (Vij) on other explanatory variables using the generalized Poisson Model since non visitors were not sampled, meaning that each visitor will have a visitation rate of at least one and thus the model will be truncated from one. The truncated model for the recreation demand function was adopted from the general presentations by [32; 59]. We present a summary of the model here. Consider the trip generating function of an ITCM as:

$$V_{ij}=\beta X_i +\mathcal{E}_i \quad (2)$$

Where Vij is individual i's visit to site j, Xi is a vector of explanatory variables, β is a parameter vector to be estimated and $\mathcal{E}_i$ is an error term.

Expanding equation 2, yields the below

$$V_{ij}^{*} = \beta_0 + \beta_1 x_1 + \cdots . + \beta_n x_n + \varepsilon_i \quad (3)$$

Equation 3 gives us the linear equation to be estimated.

B. Model Variables

The dependent variable of the model is the number of visits to Accra-Aburi Mountains during a month along with fifteen independent variables. Among these variables; the travel cost is considered to estimate the return's trip cost incurred by the individual in visiting the mountain. The transportation fees constituting the travel costs were derived directly from the transport unions (Ghana Private Road Transport Union [GPRTU]) due to the expectation that the respondents would give inaccurate values. The determination of time spent in travelling is an issue in TCM studies [28; 38; 39; 48]. We used round trip to compute the time spent by hikers from their residence to the site and from the site back to their residence taking into account their opportunity cost of travelling to the site. It should be noted that integrating time into the full travel cost is necessary but not theoretically consistent unless time is also included in the income variable [48].

However, upon reviewing previous recreation demand analyses by applying an ad-hoc demand specification, the researcher acknowledges that a strong theoretical approach could be followed [28;29;47]. The estimated travel cost is added to the estimated opportunity cost of travel time to determine the total travel cost to the site. We calculated the

travel costs to reach Accra-Aburi Mountains based on the distances derived from the questionnaire. For non-public transportation cost, travel costs should include fuel costs and depreciation [61; 62]. To calculate for fuel costs, we divide the trip distance by 100km and multiply the result of this by the fuel consumption. Fuel consumption was determined by dividing fuel cost over distance covered. Then we multiplied this figure by the cost of fuel/ litre. We used a rate of 26% to capture indirect fuel cost which includes depreciation [2; 16; 19]. For those who used public transportation, we used the amount given by the respondents to calculate for the travel cost.

We did not compute for cycling and other means of getting to the site since it was termed as other means of transportation. Walking is assumed not to incur any costs. If respondents stated that they used more than one means of transport, the costs of each are equally weighed to calculate travel costs. At the Accra-Aburi Mountains, there is no entrance fee charged for accessing the site. Therefore, the total travel cost is given by the public transportation and non-public transportation costs of time.

C. Study Design

This study employs a survey design which permits the study to rely on research instruments such as questionnaires. The study uses the TCM to model the demand for hiking at the Accra-Aburi Mountains walkway as well as to determine the consumer surplus gained by the hikers. The TCM is a revealed preference approach which is premised that hikers must have been willing to pay as compared to what they did pay in order to visit the site. Moreover, the benefits of the visit must have at least exceeded this amount [12]. The demand function can be estimated by comparing the number of visits by hikers from different locations with varying travel costs. The number of visits is then a function of travel costs to the site, costs of travel to other substitute sites and other characteristics of the hiker.

D. Study Sample and Data Collection Instrument

The study used questionnaires to collect data from hikers at the Accra-Aburi Mountains walkway. We employed simple random sampling technique to select 800 hikers that visited the site with 701 hikers returning their questionnaires being completed representing 87.63% response rate. While admitting that a larger sample size would have been better, the sample size of 800 used was enough to bring out the benefits of health walk. The questionnaire was administered to the hikers through face-to-face interviews elicitation method. The hikers involved in the study were at least 18 years old and as they descended from the summit of the mountains. One in three passing hikers was approached between the hours of 5:00am-12:00pm GMT in order to capture all the necessary information. The questionnaire was made up of seven seconds, with a total of 59 questions. The questionnaire consisted of yes/no, multiple choice, open-ended and closed-ended questions. Section one outlines demographic characteristics of the hikers such as household income, working hours in a week, year of birth, educational level etc. Section two contains information on the site such as first time of visit to the site, how many times they go for hiking and hours spent on the site. Section three captures questions on hiking decisions such as visits to other sites, reasons to hike on the mountain. Section four deals with the impact of health walk on the hiker's health. Section five has questions on health conditions. Section six seeks information on expenditures. Finally, section seven examines questions on the WTP for improved health walk. Prior to going to the field to collect the actual data, pre-testing was done to check for the clarity of expressions and effectiveness of the questionnaire. The outcome was that hikers were unwilling to give out information on income and therefore, we used questions on expenditure as a proxy for income although there was still a question on income

Table 1: Measurement and Expected Signs of Variables

Variable	Explanation	Expected sign with the dependent variable	Empirical justification of variable
Vij	Total number of visits by hikers i to Accra-Aburi Mountains during a month		[11; 12; 63]
Cij	Total travel cost associated with a round trip to and from Accra-Aburi Mountains in cedis	A negative sign is expected since travel cost is considered as a proxy for price	[11; 63]
Yi	Average household income of hikers i	A positive sign is expected since income reflects the ability to pay for repeated trips to a site	[41; 42; 63]
Ai	Age of hikers i in years	A negative sign is expected since older people are relatively less interested in climbing mountains than the younger ones	[41;44]
Es	Number of years spent in school	A positive sign is expected because educated hikers are more likely to have recreation	[23; 24]
Gi	Sex of hikers included as a dummy, where 1 for male and 2 for female	No a priori expectation of the sign between the two variables	

Mi	Marital status of the hikers i	No a priori relationship between the two variables is expected	
Ni	Nationality of the hikers	No a priori relationship between the two variables is expected	
Hi	Hours of travel to the site	A positive or negative relationship depending on the location of the hikers	[12]
CAD	Presence of cardiovascular disease of the hikers	A positive or negative relationship between the variables and the hikers	[6; 21; 25; 52; 53]
BMI	Body mass index of the hikers	A positive relationship between the variables and the hikers	[43; 45]
BP	Blood Pressure of the hikers	A positive relationship between the variables and the hikers	[45; 46]

Source: Author's Construct, 2018

IV. RESULTS

A. Summary Descriptive Statistics of Hikers

At the Accra-Aburi Mountains walkway, it was discovered that hikers were mainly from six (6) different countries. Majority (92.1%) of the hikers are Ghanaians whereas a handful (3.3%) represents Nigerians. A few (1.6%) of the hikers are Togolese whilst 1.3% of the hikers hail from Benin. Moreover, 1.0% of the hikers are from Ivory Coast whiles 0.7% of the hikers represent Chinese.

The minimum age of the hikers is 18years and the maximum age of the hikers is 65years with the mean age of 34 years. Moreover, about 65% of the hikers lesser than the mean age are Ghanaians. This means that younger Ghanaians visit the site often. About 55% of the hikers are males whereas the remaining (45%) of the hikers constitute females.

With marital status, almost half (45.1%) of the hikers are single whereas about 50.6% are married. A few (1.4%) of the hikers are widowed and lastly, a handful (2.9%) of the hikers are divorced.

In terms of their reasons for visiting the site, majority (87.02%) of the hikers visit the site due to health reasons whilst about 11.84% of the hikers visit the site for socialization. Lastly, a few (1.14%) of the hikers visits the site for other reasons. One major reason that accounts for this variation is that many people are conscious about their health since health walks play a pivotal role towards improving their health status and eventually, increasing their life expectancy which confirm results of studies by [12; 22].

On the means of transportation to the site, quite a number (30.10%) of the hikers use public transportation to visit the site whilst quite a handful (29.67%) visit the site with their own vehicles. An appreciable number (26.82%) of the hikers visit the site with carpooling whereas 12.84% visit the mountain by walking. Apart from the major reasons stated, about 0.57% visits the mountain by other means.

With respect to the educational levels of the hikers, more than half (52%) of the hikers have attained tertiary education whilst 31.90% of the hikers have attained secondary education whilst 12.97% of the hikers have acquired primary education with 3.13% having no education. This study follows the hypothesis that people that are educated strongly appreciate exercise and the environment than those that are uneducated. On a whole, hikers on the average spend about 15 years in school.

With regards to their employment status, quite a number (28.67%) of the hikers works in the public sector whilst an appreciable number (26.25%) of the hikers works in the private formal. Moreover, a handful (4.14%) of the hikers work in the private informal whereas 12.13% are self-employed registered. Also, 9.42% of the hikers are self-employed unregistered whilst 18.26% are students with 1.13% unemployed.

The results also indicate that about 39% of the hikers know about other existing sites whilst majority (61%) of the hikers does not know about other existing centres.

Table 2. Summary Descriptive Statistics of the Hikers

Variables	Description	Mean	Std. dev.
Number of visit	Number of visits hikers make to the site monthly	2.443	1.193
Age	Average age of hikers in years	34.191	9.734
Years spent in school	Number of years spent in school	15	4.075
Travel Cost	Total Travel Cost from residence to site and from site to residence	7.60	6.01
BMI	Body mass index of the hikers	26.01	3.425

Variables	Description	Frequency	Percentage	Cumulative
Nationality	The country in which you are born whether by birth or naturalisation. Ghana =1,			
1. Ghanaian (1/0)	non-Ghanaian =0	645	92.01	92.01
Gender	Sex of the hikers whether male or female			
0. Female		312	44.64	44.64
1. Male		387	55.36	100
Marital status	The marital status of the hikers. Married=1, otherwise=0			
Married(1/0)		354	50.50	95.71
Purpose of visit	The main purpose why hikers visit the site			
1. Health reasons		610	87.02	87.02
2. Socialisation		83	11.84	98.86
3. Other reasons		8	1.14	100.00
Mode of transportation	Mode of transportation into the site			
1. Own vehicle		208	29.67	29.67
2. Public transport		211	30.10	59.77
3. Carpooling		188	26.82	86.59
4. Walking		90	12.84	99.43
5. Other means of getting to site		4	0.57	100.00
Substitute	Substitute to other sites apart from Accra-Aburi Mountains			
1. No		427	60.91	60.91
2. Yes		274	39.09	100
Preference to other sites	Preference of Accra-Aburi to other sites			
1. No		537	76.70	76.70
2. Yes		87	12.44	89.13
3. Indifferent		76	10.85	100
Blood Pressure	The Blood pressure of hikers on the site			
Normal		489	69.75	69.75
Abnormal		212	30.24	100.00

Source: Author's Survey, 2018

Moreover, the results show that majority (76%) of hikers who knows about other existing sites prefers Accra-Aburi Mountains to the other sites. This could be explained by the ambience of the centre, the difficulty of climbing the hill, socialisation and aerobics which take place during the walk.

The BMI from the data analysis has a minimum of 13.84 kg/m^2 and a maximum of 41.52 kg/m^2 with the mean BMI 26 kg/m^2. From the data, 69% of the hikers have normal BP and the remaining as abnormal BP. Out of the abnormal BP, 39% are females and 60% are males. This result supports a study by [46] that conclude that men are at more risk of hypertension than women. This assertion is evident as a study by [46] show that women are often protected from most cardiovascular cases as compared with men. However, women tend to experience cardiovascular cases after menopause whilst men are also at risk of cardiovascular disease at their early stages of life. See Table 2 for details.

B. Results of the Generalised Poison Regression

The result of the standard Poisson analysis shows there is an under-dispersion problem in the data. Specifically, the mean is less than the variance as indicated in the data, suggesting the existence of under-dispersion problem. Thus the standard Poisson results may not be appropriate to use as the standard errors may be misleading and bias. In this case, the negative binomial analysis can be used in place of the standard Poisson to solve the over-dispersion issue. However, this is not applicable to a case of under-dispersion. Therefore the generalised Poisson is used for the estimation of the results. See Table 3 for details.

Table 3: Results of the Generalised Poison Regression

Variable Number of visits	Incidence-Rate Ratio(IRR)	Standard errors	P>|z|
Total cost of transportation	0.098***	0.003	0.00
Ghanaian (1/0)	1.16**	0.087	0.05
Age	1.00	0.003	0.11

Years spent in school	1.00	0.005	0.27
Male(1/0)	1.08**	0.04	0.03
Public sector(1/0)	1.01	0.012	0.54
Average income	1.00*	0.00	0.06
Preference to other sites	1.05	0.05	0.29
Cardiovascular disease	0.85**	0.05	0.02
Family history	0.89***	0.04	0.00
BMI	0.89	0.06	0.10
Blood pressure	1.33***	0.06	0.00
Marital status	1.14***	0.06	0.00
_cons	1.60***	0.25	0.00

***, **, and * indicates the coefficient is statistically significant at the 1%, 5% and 10% level respectively. N=701

C. Welfare Calculations

We use the coefficients of the total cost of transportation to compute welfare measures in terms of the CS hikers get from visiting the mountain by multiplying the z by the standard error of the total cost of transportation. The economic value of the Aburi Mountain is computed by multiplying per visit CS of the demand function by the total number of hikers to the site in a particular year. The CS per visit can be computed as = -1/βTC [20] where βTC is the coefficient of the total travel cost parameter.

Specifically, the CS per visit = -1/βTC = - (1/-0.0098)

= GH₵102.04($22.68) Using an exchange rate of $1= GH₵4.5.

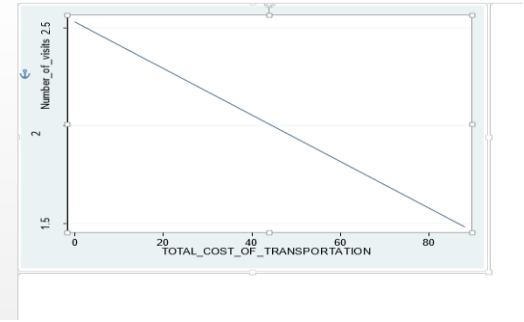
One bias associated with travel cost is the issues of visitors not incurring the travel cost to visit only that site but take the opportunity to undertake other activities not associated with the on-site experience. In such a situation, the determined CS becomes overestimated. To resolve this problem, hikers were asked to indicate the percentage of the travel cost that can be assigned with only the on-site experience [68]. The results indicate that on average about 92.08% of the travel cost of the hikers can be attributed to only on-site experience. This shows that the yearly on-site experience per hiker is GH₵93.95 ($20.88) which is computed by multiplying the percentage of the travel cost attributed to the on-site experience (92.08% x GH₵102.04). The total value that hikers place on the Accra-Aburi Mountain walkway was valued as GH₵13,654,693($3,034,376.22) in 2018 based on a yearly visitation rate of 145,340 hikers. These values indicate the value hikers place on the mountain.

Where yearly visitation rate = number of weeks per year x number of visits per week =52 x 2795 = 145,340 visits.

Total yearly value of the Accra-Aburi Mountain= yearly visitation rate of hikers x the yearly per hiker value for the on-site experience

= 145,340 x 93.95 = GH₵13,654,693($3,034,376.22).

Figure 1: Demand Curve of Visitation Rate and Travel Cost



Source: Author's Construct, 2018

The demand curve exhibits a negative relationship between travel cost and number of visit to the site variable. This indicates that hikers with lower travel costs visit more frequently than those with higher travel cost which is consistent with economic theory.

D. Discussions of Results

The results show that there is a negative association between the rate of visit and the travel cost for Poisson and the negative binomial. The Poisson and the negative binomial seem to have the same coefficients, signs, P-values and standard errors for all variables. The generalised Poisson results have improved the significance level in general and are very simple to the Poisson results.

The generalised Poisson results show a negative association between the rate of visit and the travel cost. The negative coefficient of the travel cost variable shows that people with lower travel costs visit the site often and this is consistent with economic theory that states that as travel cost increases visitation reduces [14; 15] and other empirical studies [40; 43; 64]. This means that most Ghanaians will visit the Accra-Aburi Mountains walkway for health walk if the site is closer to their home of residence where travel costs is cheaper. Contrarily, if the site is far from their home of residence, Ghanaians may not visit the mountains for health walk. The coefficient of total travel cost has the expected negative sign,

which yields a negatively sloped demand curve for an individual. This means that the further away an individual lives the fewer the visits to the mountain for improvement in health walk in the past 1 year. The variable Ghanaian is seen as positive, thus Ghanaians who visit the site are 1.14 more than non-Ghanaians.

The results show that females exercise less than males, thus males' visit the site 1.08 times more than females which confirms the theory that boys engage in exercise to be lighter, whereas girls desire to be heavier so most girls do not mostly value exercise [3; 30; 53].

The effect of income presents significant level. In most instances, income is found to be non-significant in travel cost studies [64]. However, this study confirms that income has a positive sign which suggests that higher income hikers have the tendency to visit the Accra-Aburi Mountains walkway twice more than that of low income hikers. It's quite surprising that those with cardiovascular diseases visit the site less than those without the disease and therefore individuals need to be educated on the need for health walks as a remedy to reduce the risk of NCDs which confirms a study by [5]. Also, those with family history of cardiovascular disease visit the site less.

Married respondents visit the site 1.14 times more than the non-married. Also, those with hypertension visit the site 1.33 times more than those without hypertension. It is argued that after exercise, BP increases so to control that, individuals were allowed to rest for some time before their BP was checked. This confirms studies by [45, 52, 56] which indicate that there is a strong positive association between walking and BP, thus small improvements in the amount of daily walking is better than no walking, and greater increases health benefits against BP.

V. CONCLUSION

Health walk is regarded as a critical investment in health capital. The WHO has noted that the major diseases contributing to the high mortality rate in Ghana include obesity, overweight, diabetes, high cholesterol, hypertension, hypotension, stroke and arthritis among others. These diseases mostly occur due to lack of physical activities such as health walk. This study seeks to address the problem by employing the Individual Travel Cost Method (ITCM) to estimate the economic value and the factors that influence visits to the Accra-Aburi Mountains walkway in Ghana. The basic principle of the TCM is that the travel costs incurred by a hiker to get to a recreational centre rely on several factors like the costs of driving and the opportunity costs of the time spent travelling to the site. The findings from the ITCM indicates that a hiker spends GH₵30.12 ($6.70) yearly with a yearly visitation rate of 2400 hikers. The total amount of money that hikers spend on health walk on the mountain is valued as GH₵72,288 ($16,064) in 2018. The results from the generalized poison regression method indicate that travel cost, gender, average income, cardiovascular diseases, family history and blood pressure are the factors that influence visitation to the mountain for health walks. The study recommends that government should embark on health walk promotion that aims at encouraging females to visit recreational centres to keep fit. This suggestion came from the findings that females exercise less than males, thus males' visit the site 1.08 times more than females.

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REFERENCES

[1] Adamowicz, W., Louviere, J. and Williams, M. (1994). Combining revealed and stated preference methods for valuing environmental amenities. *Journal of Environmental Economics and Management*, *26*(3), 271-292.

[2] Akpalu, W., Robinson, E. (2011_. Political Petrol Pricing: The Distributional Impact of Ghana's Fuel Subsidies, unpublished.

[3] Al Kubaisy, W., Mohamad, M., Ismail, Z. and Abdullah, N. N. (2015). Gender Differences: motivations for performing physical exercise among adults in Shah Alam. *Procedia-Social and Behavioral Sciences*, *202*, 522-530.

[4] Amoah, P. and Moffat, G. P. (2017). Estimating Demand for Reliable Piped-Water Services in Urban Ghana: An application of competing valuation approaches. *School of Economics working paper*, 2017-01.

[5] Aral, S. and Nicolaides, C. (2017). Exercise contagion in a global social network. *National Communication, 8*, 14753 doi: 10.1038/ncomms14753.

[6] Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J., Martin, B. W. and Lancet Physical Activity Series Working Group. (2012). Correlates of physical activity: why are some people physically active and others not? *The lancet*, *380*(9838), 258-271.

[7] Bartlett, S. and It Going, K. (2008). *Role of exercise in the Management of Arthritis*. The Johns Hopkins Arthritis Center.

[8] Bertram, C. and Larondelle, N. (2017). Going to the Woods Is Going Home: Recreational Benefits of a Larger Urban Forest Site - A Travel Cost Analysis for Berlin, Germany. *Ecological Economics*, *132*, 255-263.

[9] Brown, R. W. and Jewell, R. T. (1996). The impact of provider availability on abortion demand.*Contemporary Education Policy*, *14*(2), 95-106.

[10] Cameron, A. C. and Trivedi, P. K. (1986). Regression-based tests for over dispersion in the Poisson model. *Journal of Econometrics*, *46*(3), 347-364.

[11] Casey, F. J., Vukina, T. and Danielson, L. E. (1995). The Economic Value of Hiking: Further Considerations of Opportunity Cost of Time in Recreational Demand Models. *Journal of Agricultural and Applied Economics*, 27(2), 658-668.

[12] Chae, D. R., Wattage, P. and Pascoe, S. (2012). Recreational benefits from a marine protected area: A travel cost analysis of Lundy. *Tourism Management*, *33*(4), 971-977.

[13] Christie, M. and Matthews, J. (2003). The Economic and Social Value of Walking in Rural England: A Report for the Ramblers Association.

[14] Clarke, P. M. (1998). Cost - benefit analysis and mammographic screening: a travel cost approach. *Journal of Health Economics 17*(6), 767-787.

[15] Clawson, M. and Knetsch, J. L. (1966). *Economics of outdoor recreation*. Baltimore, ML, USA: Johns Hopkins Press.

[16] Coady, D., El-Said, M., Gillingham, R., Kpodar, K., Medas, P. and Newhouse, D. (2006). *The Magnitude and Distribution of Fuel Subsidies: Evidence from Bolivia, Ghana, Jordan, Mali, and Sri Lanka*. IMF Working Paper: International Monetary Fund

[17] Consul, P. C. (1989). *Generalized poisson distributions: properties and applications*. New York: Dekker.

[18] Consul, P. C. and Famoye, F. 1992. Generalized Poisson regression model. *Communications in Statistics Theory and Methods*, *21*: 89-109.

[19] Cortright, J. (2009). Walking the walk: How workability raises home values in U.S. Cities. Retrieved from: http://www.citeulike.org/group/11305/article/5541951 (Accessed 20/05/2017).

[20] Creel, M. D. and Loomis, J. B. (1990). Theoretical and empirical advantages of truncated count data estimators for analysis of deer hunting in California. *American Journal of Agricultural Economics*, *Agricultural and Applied Economics Association*, *72*(2), 434-441.

[21] Curtis, J. B. (2002). Estimating the demand for Salmon Angling in Ireland. Econ. *Soc. Rev.*, *33*(3), 319-332.

[22] Dang, A., Likhar, N. and Alok, U. (2016). Importance of economic evaluation in health care: An Indian perspective. *Value in Health Regional Issues*, *9*, 78-83.

[23] Devaux, M., Sassi, F., Church, J. Cecchini, M. and Borgonovi, F. (2011). Exploring the Relationship Between Education and Obesity, *OECD Journal: Economic Studies*, *2011*(1), 121-159.

[24] Englin, J. E., Holmes, T. P. and Sills, E. O. (2003). *Estimating forest recreation demand using count data models*. In: Sills, E.O. (Ed.), Forests in a Market Economy. Kluwer, Dordrecht, The Netherlands: 341–359 (Chapter 19).

[25] Englin, J. and Shonkwiler, J. S. (1995). Modeling Recreation Demand in the Presence of Unobservable Travel Costs: Toward a Travel Price Model. *Journal of Environmental Economics and Management*, *29*(3), 368-377.

[26] Ergbenta, I. (2017). Application of travel cost method to valuation of historic building: old residence in Calabar, Nigeria. Middle-East Journal of Scientific Research, 25(10), 1925-1933.

[27] Fan, M., Su, M., Tan, Y., Liu, Q., Ren, Y., Li, L. and Lv, J. (2015). Gender, age, and education level modify the association between body mass index and physical activity: a cross-sectional study in Hangzhou, China. *PloS one*, *10*(5), e0125534.

[28] Feather, P. and Shaw, W. D. (1998). Estimating the cost of leisure time for recreation demand

[29] Models. *Summer AAEA Meetings*, Salt Lake City, UT.

[30] Freeman, A.M. (1993). *The measurement of environmental and resource values: theory and methods.* Resources for the Future, Washington.

[31] Furnham, A., Badmin, N. and Sneade, I. (2002). Body image dissatisfaction: Gender differences in eating attitudes, self-esteem, and reasons for exercise. *The Journal of psychology*, *136*(6), 581-596.

[32] Grogger, J. and Carson, R. (1991). Models for truncated counts. *Journal of Applied Econometrics*, 6(3), 225-238.

[33] Greene, G., (1992). Conversations with Graham Greene. Uni. Press of Mississippi.

[34] Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., Ekelund, U. and Lancet Physical Activity Series Working Group. (2012). Global physical activity levels: surveillance progress, pitfalls, and prospects. *The lancet*, *380*(9838), 247-257.

[35] Harris, T., Yang, Z. and Hardin, J. W. (2012). Modeling under dispersed count data with generalized Poisson regression. *Stata J*, *12*(4), 736-747.

[36] Haase, D., Larondelle, N., Andersson, E., Artmann, M., Borgström, S., Breuste, J.,... and Kabisch, N. (2014). A quantitative review of urban ecosystem service assessments: concepts, models, and implementation. *Ambio*, *43*(4), 413-433.

[37] Hatziandreu, E. I., Koplan, J. P., Weinstein, M. C., Caspersen, C. J., Warner, K. E. (1989). A cost-effectiveness analysis of exercise as a health promotion activity. Am J Public Health, 79(3), 273-278

[38] Hellerstein, D. M. and Mendelsohn, R. (1993). A theoretical foundation for count data models. *American Journal of Agricultural Economics 75*(3), 604–611.

[39] Herriges, J. A. and Kling, C. L. (1999). *Valuing Recreation and the Environment: Revealed Preference Methods in Theory and Practice*. Edward Elgar, Aldershot, UK.

[40] Hesseln, H., Loomis, J. B., Gonza´ lez-Caba´ n, A. and Alexander, S. (2003). Wildfire effects on hiking and biking demand in New Mexico: a travel cost study. *Journal of Environmental Management 69*(4), 359–368.

[41] Hotelling, H. (1949). Letter, In: an economic study of the monetary evaluation of recreation in the national parks. National Park Service, Washington, DC.

[42] Jeuland, M., Lucas, M., Clemens, J. and Whittington, D. (2010). Estimating the private benefits of vaccination against cholera in Beira, Mozambique: A travel cost approach. *Journal of Development Economics*, *91*(2), 310-322.

[43] Jones, T. F. and Eaton, C. B. (1994). Cost-benefit analysis of walking to prevent coronary heart disease in archives of family medicine. 3, 703.

[44] Kassavou, A., Turner, A. and French, D. P. (2013). Do interventions to promote walking in groups increase physical activity? A meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *10*(1), 18.

[45] Kavianpour, K. and Esmaeli, A. (2002). Recreational Economic evaluation of Si Sangan Forest Park.

[46] Longo, A., Hutchinson, W. G., Hunter, R. F., Tully, M. A. and Kee, F. (2015). Demand response to improved walking infrastructure: A study into the economics of walking and health behavior change. *Social Science and Medicine*, *143*, 107-116.

[47] Lowensteyn, I., Coupal, L., Zowall, H. and Grover, S. A. (2000). The cost-effectiveness of exercise training for the primary and secondary prevention of cardiovascular disease. *J Cardiopulm Rehabil*, *20*(3), 147-55.

[48] Maranon, R. and Reckelhoff, J. F. (2013). Sex and gender differences in control of blood pressure. *Clinical science*, *125*(7), 311-318.

[49] Martinez-Espineira, R. and Amoako-Tuffour, J. (2008). Recreation Demand Analysis Under Truncation, Overdispersion, And Endogenous Stratification: An Application To Gros Morne National Park. *J. Environ. Manage*, 88(4), 1320-1332.

[50] McConnell, K. E. and Strand, I. (1981). Measuring the cost of time in recreation demand analysis: an application to sportfishing. *Am. J. Agric. Econ. 63*(1), 153-156.

[51] McPhearson, T., Andersson, E., Elmqvist, T. and Frantzeskaki, N. (2014). The influence of urban green environments on stress relief measures: A field experiment. *Journal of Environmental Psychology*, *38*(2014), 1-9.

[52] Morris, J. N. and Hardman, A. E. (1997). Walking to health. *Sports Med. 23*, 306-332.

[53] Murtagh, E. M., Murphy, M. H. and Boone-Heinonen, J. (2010). Walking–the first steps in cardiovascular disease prevention. *Current opinion in cardiology*, *25*(5), 490.

[54] Ocansey, R., Aryeetey, R., Sofo, S., Nazzar, A., Delali, M., Pambo, P. and Sarkwa, R. (2016). Results from Ghana's 2016

Report Card on Physical Activity for Children and Youth. *Journal of physical activity and health*, *13*(11 Suppl 2), S165-S168.

[55] Ogilvie, D., Foster, C. E., Rothnie, H., Cavill, N., Hamilton, V., Fitzsimons, C. F. and Mutrie, N. (2007). Interventions to promote walking: systematic review. *Bmj*, *334*(7605), 1204.

[56] Owen, N., Humpel, N., Leslie, E., Bauman, A. and Sallis, J. F. (2004). Understanding environmental influences on walking: review and research agenda. *American journal of preventive medicine*, *27*(1), 67-76.

[57] Pandey, A., LaMonte, M., Klein, L., Ayers, C., Psaty, B. M., Eaton, C. B. and Berry, J. D. (2017). Relationship between physical activity, body mass index, and risk of heart failure. *Journal of the American College of Cardiology*, *69*(9), 1129-1142.

[58] Robertson, M. C., Devlin, N., Gardner, M. M. and Campbell, A. J. (2001). Effectiveness and economic evaluation of a nurse delivered home exercise programme to prevent falls. 1: Randomised controlled trial. *BMJ.* *322*(7288), 697-701.

[59] Sælensminde, K. (2004). Cost-benefit analyses of walking and cycling track networks taking into account insecurity, health effects and external costs of motorized traffic. *Transportation Research Part A: Policy and Practice*, *38*(8), 593-606.

[60] Shaw, D. (1988). On-site sample regression: problems of non-negative integers, truncation, and endogenous stratification. *Journal of Econometrics 37*, 211–223.

[61] Siegel, P. Z., Brackbill, R. M. and Heath, G. W. (1995). The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. *American Journal of Public Health*, *85*(5), 706-710.

[62] Sohn, D. W., Moudon, A. V. and Lee, J. (2012). The economic value of walkable neighborhoods. *Urban Des. Int. 17*(2), 115-128.

[63] Taylor, E. S., Klein, L. C., Lewis, B. P., Gruenewald, T. L., Gurung, R. A. R. and Updegraff, A. J. (2000). Biobehavioral responses to stress in Females: tend and befriend, not fight or flight. *Psychological Review*, *107*(3), 411-429.

[64] Twerefou, D. K. and Ababio, D. K. A. (2012). An economic valuation of the Kakum National Park: An individual travel cost approach. *African Journal of Environmental Science and Technology*, *6*(4), 199-207.

[65] Wang, G., Macera, C. A., Scudder-Soucie, B., Schmid, T., Pratt, M. and Buchner, D. (2005). A cost-benefit analysis of physical activity using bike/pedestrian trails. *Health promotion practice*, *6*(2), 174-179.

[66] Wang, W. and Famoye, F. (1997). Modeling household fertility decisions with generalized Poisson regression. *Journal of Population Economics*, *10*(3), 273-283.

[67] Wang'ombe, J. K. (1984). Economic evaluation in primary health care: The case of Western Kenya community based health care project. *Social Science and Medicine, Elsevier*, *18*(5), 375-385.

[68] Willis, K. G. and Garrod, G. (1991). An Individual TCM of Evaluating Forest Recreation. *J. Agric. Econ.*, *42*(1): 33-42.

[69] Zandersen, M., Bartczak, A., Czajkowski, M., Giergiczny, M. and Termansen, M. (2012). *Guide on Economic Instruments and Non-market Valuation Methods*. Warsaw Ecological Economic Center.