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How Much Are Tourists Willing to Pay for Malaria Control? Evidence from a Contingent Valuation Study in Zanzibar

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Abstract

Malaria disease remains one of the greatest challenges in Tanzania; costing lives, households' income and huge amount of public resources. This calls for a continued effort to sustainably control the problem, requiring significant amount of financial resources. The main sources of finance for previous efforts have been foreign dominated. In this study we test a potential domestic source of income to finance the efforts: tourist tax. We assess whether tourists visiting the country would be willing to contribute some amounts of money to be set aside for malaria control in the country; and estimate the exact marginal amount they are actually willing to contribute. The rationale for this rests on the fact that tourists spend reasonably huge amounts of money to protect themselves against mosquito bites (hence malaria) once in Tanzania (direct benefit); and that this could also be considered as an altruistic giving (indirect benefit). Results suggest that 76 percent of our sampled tourists are willing to contribute for malaria control programs; with an average fee ranging from US$17-29 depending on the elicitation format.

Key words: *malaria, contingent valuation method, willingness to pay*

JEL Classification: *G13, I1, H20, H51, Q51*

1. Introduction

Malaria remains as one of the main killer diseases and source of various disabilities in tropical Africa, including Tanzania. Over 93 percent of the Tanzania's population lives within malaria endemic areas, with reported malaria cases ranging between 10-12 million each year, associated with up to 80,000 annual deaths (USAID, 2017). On the other hand, Tanzania -- and Zanzibar in particular -- has a number of natural attractions, making tourism one of its major sources of foreign income and employment. However, it is reasonable to argue that high prevalence of mosquitos and malaria in the country may constraint the sector from achieving its highest possible potential. Therefore, efforts to control the problem are expected to have other positive externalities (e.g., tourism increase) beyond the disease burden itself.

Over the past years Zanzibar has been implementing a malaria control program that has succeeded in meeting and even surpassing the set targets to cut down malaria prevalence and its associated morbidity and mortality rate in the island. The program has succeeded in reducing the malaria prevalence rate from 70% in the past years, to less than 1% today (MoH-RGoZ, 2011). Strategies are designed

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to ensure both the sustainability of this success and envisage the possibility of a complete elimination of the malaria endemic in the islands, and hence a malaria-free Zanzibar. A feasibility study conducted in Zanzibar suggests that the total elimination of malaria in the island is possible (ZMCP, 2009).

However, it is important to note that most of these programs have been donor-funded (e.g., by the Global Fund and the (USA) President's Malaria Initiative), something that raises concerns on the sustainability of such progress should there be no continued funding from foreign sources. A clear consequence will be the resurgence of malaria prevalence back to high levels, hence eroding all the benefits accrued by the programs so far. This is what calls for the need to seek for alternative sources of sustainable financing for malaria control programs in Tanzania.

In this study we test whether an introduction of tourism tax could be one of the possible avenues of raising such a fund. Specifically, we design a contingent valuation study that allows us to measure how much tourists would be willing to pay to enjoy a malaria free environment during their visits. Given an increasingly growing popularity of Zanzibar in the global tourism industry as reflected by an ever-growing tourist inflow in the island,[1] this financing mechanism is anticipated, if carefully designed, to generate sustainable revenue to finance the program.

However, the introduction of such a tax/fee would imply an increase in the total cost incurred by tourists visiting Zanzibar, other factors remaining constant. The net effect of this increase on the international tourists flow and the entire industry in the islands will be matter of big concern. Theoretically, it is expected that an increase in tourism costs will reduce the flow of tourists, driven by both the substitution and income effects experienced by the rational tourists. The magnitude of such decrease depends largely on the average sensitivity of international tourists to the cost changes (i.e., price elasticity coefficient), and the constancy of other parameters, although in this case increased costs are also associated with some benefits to tourists, i.e., *malaria free* destinations.

While the cost increase (due to tax) is likely to be a disincentive and hence reduce the flow of tourists in the area, some studies have proven that malaria reduction/elimination in the area attracts more international tourists (see, for example, Modrek et al, 2012; Tourism KwaZulu-Natal, 2004). Therefore, the net effect of the introduction of such taxes to finance a malaria reduction/elimination program on the total tourists flow in Zanzibar remains to be an empirical issue.

This study, therefore, intends to assess the feasibility of the introduction of tourist airport tax to finance a malaria control program in Zanzibar without causing

[1]Registered tourist arrivals in Zanzibar grew by 50% in the period 2006-2009 as compared to the 2001-2005 periods (Steck et al., 2010).

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adverse effect on the industry. Whether tourists will change their travel behaviour to Zanzibar as a result of this depends on the value they place on a malaria-free environment when compared to that of increased costs. Thus, the study sheds some light on tax ceiling above which tourists may consider visiting alternative destinations. If, on average, tourists value more a malaria free environment than the proposed tax rate then its introduction is feasible and even attractive as it acts as an incentive to even more tourists in Zanzibar than at the current level. Generally speaking, therefore, how much to be taxed depends on the value tourists attach on the associated improvements with malaria control.

We use the contingent valuation method (CVM) to elicit the mean value that tourists place on malaria control and use it to recommend the plausible tax rate to be levied for the purpose. We conducted the CVM survey with 507 randomly selected international tourists from all over the world departing from Zanzibar either at the airport or at the seaport. A carefully crafted scenario was presented to the respondents clearly explaining the good to be valued, how the payment shall be done, the condition necessary for the provision of the good and who is responsible for the provision of the good. Both closed-ended (single bounded) and open-ended elicitation formats were used partly to mimic the nature of market transactions in Zanzibar, and also for robustness check reason. We also collected other variables—such as social economic characteristics, trip information, malaria awareness, and other important information—that enabled us to estimate the determinants of the willingness to pay (WTP). We then used proper econometric models (binary logit/probit for the closed-ended elicitation format and censored/tobit model for the open-ended format) to estimate the mean WTP and its determinants.

Results suggest that more than76 percent of tourists are willing to pay some money to finance a malaria control program, with the average WTP ranging between US$17.7 and US$29.4, depending on the elicitation format used. These values suggest that imposing a tourist tax rate not exceeding the values within this range is potentially a feasible means of financing the program. We find that the amount of tax to be charged (i.e., bid level) and the total costs incurred by an individual respondent in protecting oneself against malaria to have a significant influence on the probability of contributing a positive amount to the program. These results are very similar regardless of the elicitation format, suggesting that the design and implementation of the survey was carefully done to ensure that respondents state their true WTP (i.e., minimum bias).

The remainder of this report is organized as follows. Section two presents the theoretical and empirical justification for the CV method; while section three gives a general overview of the project design and sampling methods. Section four elaborates the estimation methods used in the study (econometric strategies), followed by section five that presents the descriptive statistics. Section six presents the estimation results for the mean WTP, and finally section seven concludes the study.

2. Theoretical and Empirical Justification for the CV Method

The CV method (CVM) is a nonmarket valuation method that is used to value specific changes from the status quo. The method is widely used in areas of environmental economics (Köhlin & Amacher, 2005; Hanemann, 1994), health economics (Corso et al, 2001), transportation safety (Jones-Lee et al, 1995) and cultural economics (Thompson et al, 2002). In this method, the value of the nonmarket good is elicited directly, as answer to a question about willingness to pay (WTP) to have more of the good (services), or willingness to accept (WTA) to have less of it. The main reason for doing this is the fact that there are no markets for such goods (services) where we can observe transactions, and hence their price/value like other ordinary marketable goods; yet we need to know the value of these goods or services for some reasons such as cost-benefit analysis or a feasibility study.

In our case, for example, we cannot get the value that tourists attach to a malaria-free zone from the market simply because there never exists such a market. Still, we need to understand that value to make an informed decision on the level of tourist tax that we should set to finance a malaria control program without jeopardizing the tourism industry in Zanzibar.

The fundamental framework underpinning the WTP concept is the 'value theory' (Asante & Okyere, 2003). This theory assumes that consumers value their own consumption, (in this case, benefits of a malaria-free Zanzibar/ good health), and that they rationally seek to maximise the value of their consumption as best they can, subject to various constraints such as their income and prices (Caron & Hanemann, 2005). It is expected that rational people will be willing to pay a price that reflects the value they place on their health and life. The valuation questions can also ask for the WTP an individual may have for the benefits accruing to others apart from oneself (i.e., altruism or non-use value). This is important in this case given that a malaria-free Zanzibar is a public good, benefiting both those who contribute and those who do not. In addition to the private value, contingent valuation appears to be the only method capable of measuring altruistic benefits.

The crucial step of a CVM study rests on the construction of a scenario (a story) that sets the reason for payment. The main idea for this is to place respondents in a market-like situation to be able to purchase the targeted products. Crafting a good CV scenario amounts to writing a short story about the problem or situation that is the focus of the survey, and then posing an interesting choice (or decision) for the respondent (Whittington, 2002). Thus, the story is designed to be meaningful, plausible, understandable and relevant (i.e., it should make sense to the respondents). It provides respondents with answers to fundamental questions like: What is the good/service to be paid for? What are the benefits of the proposed good/service to the respondent? When will the good/service be available? How will the respondents pay? How much will others be expected to pay? Who will pay? What are the conditions for the provision of the good/ service? What institutions will be responsible for the delivery of the good/service? If one looks closely, these are the key questions going around ones' head before purchasing any product in

the ordinary market. Similarly, the scenario should be carefully designed to put respondents as close as possible to a real-life market situation so that they reveal their true valuation for the good/service. If respondents understand the commodity to be valued and answer valuation questions truthfully, then one can confidently rely on the WTP estimates obtained.

Despite its importance in measuring the use and non-use value respondents attach to nonmarket goods, the CV method is prone to a number of biases that may affect its estimates if not carefully designed and implemented. One major source of CV biases is mainly attributed to the hypothetical nature of the good in place. These include: strategic bias where, for some reasons, a respondent has an incentive to misreport his/her true value over the hypothesized good; compliance bias, especially when a respondent believes that the good will for sure be offered by a donor (or not be offered at all); and an interviewer bias where a respondent just states the values to please the interviewer (Mitchel & Carson, 1989). Another source of bias rests on the poor design of a CV scenario (Whittington, 2002). This may result into a failure of a respondent to understand the commodity or the valuation task the way the researchers intend, and eventually state a value for a totally different good from the one intended.

In this study we tried to minimize the biases attributed to these sources by doing the following. First, we carefully designed a CV scenario to ensure that all important ingredients that will enable respondent to state the value for the intended good are addressed. For example, we chose a payment vehicle that is relatively cohesive so that a respondent clearly knows that the amount stated will certainly be paid. We also introduced some cheap talks together with the willingness to pay questions to help eliciting most honest answers from the respondents. Second, we interviewed tourists during their departure from Zanzibar, with a strong belief that they will have had a chance to know malaria and the good in question (a malaria-free Zanzibar) so as to avoid answers for an unfamiliar good. Third, we conducted a thorough training to enumerators specifically addressing key issues as advised in Whittington (2002), appreciating the fact that even the best CV scenario may make little sense to a respondent if the enumerator is not well-trained to deliver it smoothly and sensitively. Fourth, but very important, we translated the survey instruments into different languages (mainly English, Italian and French), recruited enumerators covering all these linguistic skills and ensured that each respondent was interviewed in the most convenient language to minimize any bias that could arise due to miscommunication caused by a language barrier. In addition, the fact that Zanzibar had already minimized the malaria problem by 99 percent at the time of the study exposed tourists very close to an ideal world we were marketing for, hence reducing the hypothetical bias nature of 'our good'.

The choice of the elicitation method is also very important when designing a CVM study. Different elicitation formats have been discussed in detail in the CVM literature, including a bidding game approach, open-ended questions, payment

cards, closed-ended single-bounded, and closed-ended double-bounded. In a bidding game approach (Davis, 1963), respondents are asked a series of questions along the lines of: Would you be willing to contribute $X for a malaria control program? If the respondent said 'Yes', the question was then repeated with a larger value for X. If the response is 'No', the question was repeated with a lower value for X. This continued until the response switched from 'Yes' to 'No'; or from 'No' to 'Yes'; thereby isolating a specific amount that was the most that a respondent was willing to pay. It is this final amount that was recorded as a respondent's WTP.

However, this approach has been challenged due to what is known as *starting bid bias*. The first value stated to the respondent has a strong influence in the answer given, which may not reflect the true WTP of a respondent (Carson & Hanemann, 2005). This weakness led into the development of *open-ended questions* format in which a respondent would be free to state the maximum amount s/he feels to contribute for the good. However, despite its advantage of getting more information, the method is also challenged for resulting into large number of zero responses (or values), respondents' difficulty to provide correct answers (i.e. cognitive challenge), and for not being incentive-compatible (i.e. not mimicking the real market scenario). Consequently, closed-ended methods were proposed to address these challenges and to date they are the mostly used in CVM studies. In a single-bounded closed-ended format, only one question is asked of each respondent, but the valuation amount is varied across respondents, using random assignment with a set number of alternative values. This method is easy to answer, resembles market transaction and incentive-compatible. However, it has a disadvantage of providing less information, which means a relatively larger sample size is required, and more complicated econometrics.[2]

In this study, we used both the single-bounded closed-ended and open-ended formats to exploit the advantages of these two approaches, and to check the robustness of our estimates. We first asked the respondents a closed-ended question, stating a specified bid amount selected randomly from an objectively designed set.[3] Regardless of a given 'Yes' or 'No' answer, we then asked the respondent to state freely the maximum amount s/he was willing to contribute for the program. This arrangement resembles the market structure in developing countries, including Zanzibar, where a buyer first faces a pre-set price for a good, and then gets a room to bargain by proposing his/her actual valuation of the good in question. In addition, Green et al. (1995) argue that a binary question with open-ended follow-up questions provides far more information on WTP and information on plausibility of responses than alternatives such as the double-referendum method. Generally, the introduction of follow-up questions to the dichotomous-choice payment question helps to improve the precision of the WTP estimates (FAO, 2000).

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[2] See Carson and Hanemann (2005) for a more detailed discussion of different elicitation formats for CVM studies.

[3] Responses obtained during the pilot survey on the open-ended questions provided a basis for the values in the bid vector.

3. Project Design and Sampling Procedure

We use a two-stage stratified sampling design with unequal selection probabilities for the first-stage units, and with constant selection probabilities for the second-stage units, as applied in Cantis and Ferrante (2012). The first-stage units are constructed through a purposeful combination of places, days and hours. Whereas places are selected to ensure representation of tourists arriving through both harbours and airports, days and hours are selected considering the schedules of different airlines. Both allow sufficient representation of tourists from different destinations to be captured in our sample. This is motivated by the fact that flights from different destinations arrive at different schedules: ignoring this is likely to bias the variation of our sample in terms of countries of origin. The second-stage units constitute of tourists, selected within the first stage units through a systematic selection procedure. In this stage the first respondent is randomly selected among passengers waiting-to-board, then enumerators systematically approach every 5th foreign passenger seated on the waiting-to-board room, hence assigning equal probability of selection to each of the passengers to a given destination. In the case of the fifth person being of the age below 18 or refuses to participate in the survey, the next (i.e., sixth) person was chosen, thus maintaining the same 5th person rule.

As a result, a sample of 507 tourists departing from Zanzibar was interviewed: 91 (18 percent of the total sample) at the Zanzibar ferry harbour, and 416 (92 percent at the airport. This represents approximately 3.4 percent of tourists who entered the island during the month of September, 2012. As mentioned earlier, the choice of interviewing departing tourists was made purposely to ensure that our respondents had a better understanding of malaria by having lived in Zanzibar for some days. The main survey was administered within 16 days at the airport, and 7 days at the sea port (ferry); all within the month of September, 2012.

Before the survey, enumerators were well trained on the fundamentals of CVM, the basic principles of conducting a survey and their relevance on the quality of data to be obtained.[4] During the training, enumerators were paired to practice conducting the interview using the study questionnaire to experience potential challenges and problems. Also, some teams were asked to perform the interview in front of other trainees so that the rest could identify potential weaknesses and strengths behind different interviews and practically learn from them. Finally, we conducted a pilot survey, both at the airport and at the sea port, with the same enumerators who were divided into teams both to test our survey instruments and also to practically expose them to the real surveys so as to sharpen their skills before going to the main survey. From the pilot survey we learnt that there was a significant fraction of tourists that did not speak or understand English. This group of respondents mainly constituted tourists from Italy and France. Following this, we hired and trained extra enumerators eloquent in French and Italian languages,

[4]Appendix A of the report presents a detailed discussion on the survey implementation process, including challenges encountered and solutions opted for.

and consequently had our final questionnaire translated into three major international languages: English, French and Italian. The pilot survey was also useful in strengthening our questionnaire, obtaining the bid vector for the closed-ended elicitation format for the WTP section, and improving other administrative practicalities for the implementation of a better survey.

4. **Estimation Strategies**

Econometric analysis used in estimating mean or median WTP depends largely on the elicitation format used in obtaining the bid variable. With the open-ended format it is relatively easy to obtain mean or median WTP since one has specific amounts stated by each of the respondents from which we can calculate these values, and with regression analysis we can estimate the determinants of the WTP. However, with closed-ended single-bounded format the raw data only informs us whether a respondent's WTP is higher or lower than the bid variable. This means that we cannot rely on simple mean or median obtained from such bid information to estimate the WTP; neither can an ordinary least square regression give us the efficient estimates of its determinants.

With an open-ended question, mean WTP would be given by the following formula:

$$Mean\ WTP_{open} = \frac{\sum_{i=1}^{n} Bid_i}{N} \qquad (1)$$

However, there are two potential problems associated with such measurement of WTP from open-ended responses. One is the possibility of the presence of a few extreme responses that have a large impact on the mean WTP. Another problem is the possibility of the presence of large fraction of zero responses in the bid variable. This is usually not a problem if these zeros are in fact true zeros, and not a result of any form of bias (e.g., protest response). The standard solutions to the first problem are usually either to remove the extreme values using some rule (e.g., share of income, large impact on mean, etc.), or reporting both the mean and median since the median is much more insensitive to outliers. But all these solutions are usually ex-post, applied after one has collected one's data set.

In this study, we designed the questionnaire objectively to minimize these problems during the data collection stage (i.e., ex-ante solutions). We did this by asking both the closed-ended (single-bounded) and open-ended questions in a consecutive order. We believe this arrangement forces a respondent to give a well thought bid amount to the open-ended question, following the response s/he has just given on the closed ended question; as opposed to that of asking outright the open-ended question or both but in a reversed order. We found that this strategy worked at minimizing the problems. This is evidenced by similar values of mean WTP we obtained from the two bid vectors, the absence of outlier values in the open-ended bid vector, and a strong correlation of no response and zero bids in the closed-ended and open-ended formats, respectively. Thus, we can confidently rely on the value estimate obtained from this formula.

To estimate the determinants of WTP in the open-ended framework, the following econometric model is specified and estimated:

$$WTP_i = X_i'\beta + \varepsilon_i \qquad (2)$$

where WTP_i, the dependent variable, is the amount of bid stated on an open-ended question, X_i' is the vector of independent variables already stated, β presents the vector of coefficients to be estimated, and ε_i is the random error term.

A starting point of estimating such a model is the use of the standard ordinary least squares (OLS) method. This method, among other things, requires that the dependent variable in the data set be a continuous one. However, in our case the dependent variable -- the bid amount -- is censored at zero since we observe either a zero or positive value for each of the tourists. Estimating the WTP function using OLS in such case will bias our parameter estimates. Thus, we used Tobit type 1 model that allows for the censored dependent variable. This latent variable model considers that the true WTP function is:

$$WTP_i^* = X_i'\beta + \varepsilon_i \qquad (3)$$

But what we observe is:

$$WTP_i = \max(0, WTP_i^*)\,;\ \varepsilon_i \sim N(0, \sigma_i^2)$$

where WTP_i^* presents the true but unobserved willingness to pay by a given tourist, while WTP_i is the observed one. X_i' is a vector of independent variables similar to those in equation (1).

However, with closed-ended data, we only observe if a person says 'Yes' or 'No' to a certain bid. This is a very limited information. The question is how we can obtain estimates of mean WTP, and if we can estimate the determinants of WTP. In this case we used a random utility framework to motivate the estimation strategy of a binary logit model. Consider an indirect utility function by a consumer associated with a nonmarket good to be given as:

$$V(p, q_i, M, \varepsilon)$$

where p is the price, q is the quantity or quality, M is income, and ε is the random element in the utility function.

Suppose that an individual is confronted with a CV scenario in which a discrete change in the good from q_0 to q_1 is proposed but at a price equivalent to the proposed bid amount. The probability that the respondent will respond with a 'Yes' given the bid t_k can then be expressed as:

$$P(Yes) = P[V(q_1, M - t_k, \varepsilon_1) > V(q_0, M, \varepsilon_0)] \qquad (4)$$

Which simply means that a respondent will say 'Yes' if and only if s/he anticipates a relatively higher utility out of the proposed change, compared to that of the status quo. If we assume that the indirect utility function is linear with an additive error component and only one explanatory variable we can express the utility function as:

$$V_{0k} = \alpha_0 + \beta M + \varepsilon_{0k} \text{ and}$$
$$V_{1k} = \alpha_1 + \beta(M - t_k) + \varepsilon_{1k} \qquad (5)$$

This, upon some simple algebraic manipulation implies that:

$$P(Yes) = P[(\alpha - \beta t_k) > \mu]$$

where $\alpha = \alpha_1 - \alpha_0$ and $\mu = \varepsilon_{1k} - \varepsilon_{0k}$

If we further assume that the error term follows a logistic distribution, after some few calculations one can show that the mean WTP for a utility maximizing consumers of the good in question can be given by:

$$WTP^* = E\left(\frac{\alpha + \mu_k}{\beta}\right) = \frac{\alpha}{\beta} \qquad (6)$$

where α is the estimate for the constant parameter from the logit regression results, and β is the estimate for the coefficient of bid from the same results.

However, since the sign of the bid coefficient is usually negative, we always need to pre-multiply the results by a negative number to obtain the positive value of mean WTP. It is important to note that the above calculations apply only when we do not control for other explanatory variables in the regression function (i.e., when we assume that variation across individuals is only due to preference uncertainty attributed to the unobserved hetereogeneity (μ_k). However, the utility function is often a function of socio-economic characteristics. These are included to capture observable individual heterogeneity, which results into:

$$V_{ik} = \gamma Z_k + \beta M + \varepsilon_{ik} \qquad (7)$$

where Z_k is a vector of other observable explanatory variables such as age, education, sex, etc.

If similar derivations are used as in the above case they result into a mean WTP being given by:

$$WTP^* = \frac{\gamma Z_k}{\beta} \qquad (8)$$

Notice that in this case γ constitutes the coefficient estimates of all other explanatory variables and the constant term from the logit regression results (i.e., vector of all coefficients except β. Now the major question at this point would be what value of each explanatory variable to use in calculating the products. The most common approach is to calculate mean WTP at sample mean of each variable or to calculate mean WTP for each individual, and then take the that mean. Since both give the same results, any can be used.

5. Descriptive Statistics

Table 1 presents social-economic characteristics of the interviewed tourists. We find that the average age of our respondents was 37 years, but ranged between 18 and 85

years; and 46% of the respondents were married. There is a reasonable balance of the respondents by gender, with 42% being female tourists. We also find that although 79% of the respondents reported to be travelling with other accompanying members, only 9% had children (of age below 18 years). The annual monthly income of our respondents was approximately US$71,000; but varied from below US$25,000 to above US$300,000 per year.[5]

Table 1: Social Economic Characteristics

Variable	Mean	Std. Dev.
Age of respondent (years)	37	12.68389
Female (%)	42,4%	.4946852
Married	46,9%	.4995574
If travelled with any child (% of yes)	9,3%	.2903011
If travelled with other friends or family members (% of yes)	78,7%	.4098445
Family annual income	70,962	68010.18

Table 2 provides descriptive statistics of our sample by WTP status. We want to initially investigate whether there exist any systematic differences between those willing to pay something and those who are not, to already signal some potential drivers of the WTP.

Table 2: Descriptive Statistics by the Willingness to Pay Status

	WTP = YES		WTP = NO	
Variable	**Mean**	**Std. Dev**	**Mean**	**Std. Dev.**
Age of respondent (years)	38	13,29662	35	10,07647
Female (%)	44%	0,496579	38%	0,488151
University	71%	0,454074	64%	0,481521
If travelled with any child (% of yes)	9%	0,290841	9%	0,289765
If travelled with other friends or family members (% of yes)	78%	0,414538	81%	0,395263
Income (categorical labelled 1 to 7)	74402	69692.73	58750	60419.96
Malaria_sick	32%	0,468227	31%	0,463741
Whether booked the flight via travel agent (% share of respondents)	80,6%	0,395785	87%	0,34136
Italian	14,7%	0,35485	22%	0,413701
Whether this is the first time visit to Zanzibar (% of respondents)	82,9%	0,376596	83%	0,374241
Whether plan to come back to ZNZ in the future (% of yes)	85,0%	0,357407	73%	0,448387
Whether satisfied with the stay in ZNZ (% of respondents)	99,0%	0,10127	97%	0,180258
Planned spending while in ZNZ (US$)	1273	1416,593	1049,675	1110,954
Actual spending while in ZNZ (US$)	2927	28927,85	1061,372	1267,401
Cost to protect against malaria (US$)	74	92.48742	68.41002	85.92977
Malaria_know	97%	0,158863	98%	0,15678

[5]The income question was asked on the categorical form and each respondent chose the income group applicable to him/her. We then consider mean value of each category as one's family income during this calculation.

We find that there are some differences in terms of the share of females, mean age, the share of university graduates, income, cost to protect against malaria, proportion of those planning to re-visit Zanzibar, and the actual expenditure while in Zanzibar between the two groups. The 'Yes' group has more females, more university graduates, are relatively older, are much richer, have a larger share of those planning to re-visit the island, incurred higher costs to protect against malaria and spent much more while in Zanzibar compared to their counterparts in the 'No' group. We test the statistical significance of these differences in explaining the probability of the 'Yes' response and the number of bids stated in the next section.

6. Estimation results of the Mean WTP and its determinants

In this section we present the estimation results of the mean WTP from both the open-ended and closed-ended elicitation format, and estimate factors explaining the probability of a 'Yes' WTP response. For the open-ended format, the calculations of the mean WTP is straight forward: we just use the standard arithmetic mean formula presented by equation (1) above. We find that the mean value of the tourists' WTP in financing malaria control program is US$18. This can be interpreted as the extra amount of money that tourists would be willing to pay on their flight ticket (or as extra airport charges) to finance a malaria control program without affecting their travel decisions to Zanzibar.

For robustness checks, we estimate the mean WTP using the bids and WTP responses obtained through the closed-ended elicitation format. In this case the calculation is not as straightforward as in the open-ended case. Instead, as already discussed in section 4 above, we estimate a binary probit model for the WTP function and estimate the mean WTP using the formula presented in equation (6), if we do not control for other observable characteristics; but we use equation (8) if we control for other explanatory variables.

Table 3 presents the probit regression results without controlling for other explanatory variables. We find that the coefficient of bid is negative and statistically significant at 1 percent, implying that the probability of a 'Yes' response decreases with an increased bid level, other factors being equal.

Table 3: Probit Regression Results Without Other Controls

Variables	(1) WTP_Closed
bid_closed	-0.038***
	(0.005)
Constant	0.768***
	(0.104)
Observations	507
Pseudo R2	0.0918
Log pseudolikelihood	-317.9

Note: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Using the formula (6), we obtain the mean WTP to be US$20.5, calculated as: $wtp = -(\alpha/\beta) = -(0.76762/-0.03753) = 20.5$. Where α is a constant term; and β is the coefficient of the bid closed from the regression results. This value is slightly comparable to that obtained from the open-ended elicitation format, since in that case we did not, as well, control for any observable differences across respondents. We notice that the two values are very close, suggesting that respondents indeed gave their true valuation regardless of the elicitation format.

However, estimating the determinants of WTP requires controlling for the potential explanatory variables in our regression model, allowing us to control for observable differences across respondents. In this case, we need to use a different formula to calculate the mean WTP, as presented by equation (8). Table 4 presents the probit estimation results with other controls. Again, we find that the coefficient of bid is negative and statistically significant, implying that the probability of a 'Yes' response decreases with the bid amount.

Table 4: Probit Regression Results with Other Controls

		(1) WTP_Closed	(2)
Variables	**Variable Definition**	**Coef**	**SE**
bid_closed	Bid amount for the closed ended	-0.0387***	(0.0051)
age	Age of respondent	0.0008	(0.0053)
female	Female dummy (1=Yes)	0.0370	(0.1239)
university	University education dummy (1=Yes)	0.1127	(0.1393)
othercompany	If travelled with other friends or family members (1=Yes)	0.1346	(0.1459)
income	Monthly income	0.0000	(0.0000)
cost_protect	Cost to protect against malaria (US$)	-0.0021***	(0.0008)
airport	Whether interviewed at the airport as opposed to the ship port (1=Yes)	0.1908	(0.1644)
italian	Italian dummy (1=Yes)	-0.4985***	(0.1749)
firsttime_znz	Whether this is the first time visit to Zanzibar (1=Yes)	-0.0551	(0.1603)
comeback	Whether plan to come back to ZNZ in the future(1=Yes)	0.5479***	(0.1611)
costinznb_actual	Actual spending while in ZNZ (US$)	0.0000**	(0.0000)
cost_ticket	Cost of travel ticket (US$)	0.0001**	(0.0001)
Constant		-0.0049	(0.3799)
Observations		507	
Pseudo R2		0.1561	
Log pseudolikelihood		-295.4	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

In addition, we find that the coefficient of the cost incurred to protect against malaria (i.e., cost_protect) is also negative and statistically significant. This principally suggests that those who incurred higher malaria protection costs were less likely to contribute to the program compared to their counterparts. Intuitively, those indicating the need to come back to Zanzibar for a next visit (i.e., comeback) are

relatively more willing to pay than their counterparts. Other significant variables include the total visits costs and Italian dummies positively and negatively influencing the WTP, respectively. However, we find that other explanatory variables are not statistically significant at explaining the differences in the probability of a 'Yes' response. We conducted robustness checks on the determinants of WTP using the Tobit estimation of the open-ended bids, and we found almost similar results.

We then use formula 8 to calculate the mean WTP of the sample mean of each variable. For tractability, we present the coefficient estimates, sample mean of each variable and the corresponding product (i.e., γZ_k) in Table 5. After controlling for other observable characteristics, we find that the mean WTP to be US$17.3, which is larger than the one in the previous cases.

Table 5: Calculating Mean WTP When we Control for Other Variables

Variable	Coefficient (γ)	Sample Mean (Z)	γZ
bid_closed=β	-0.0387		
age	0.0008	37.3136	0.0299
female	0.0370	0.4181	0.0155
university	0.1127	0.6943	0.0782
othercompany	0.1346	0.7870	0.1059
income	0.0000	70961.9200	0.0000
cost_protect	-0.0021	72.5482	-0.1524
airport	0.1908	0.8205	0.1566
italian	-0.4985	0.1637	-0.0816
firsttime_znz	-0.0551	0.8304	-0.0458
comeback	0.5479	0.8205	0.4496
costinznb_actual	0.0000	2509.5250	0.0000
cost_ticket	0.0001	1198.0010	0.1198
Constant	-0.0049		-0.0049
Total γZ			**0.6708**
Mean WTP = $-$Total γZ/ β			**17.3332**

Therefore, we obtained different values of the mean WTP depending on the elicitation format used and whether we control for other observable differences across respondents or not. Importantly, the mean WTP ranges between US$17.3 and US$20.5. Fig. 1summarizes the mean WTP obtained from different estimates used.

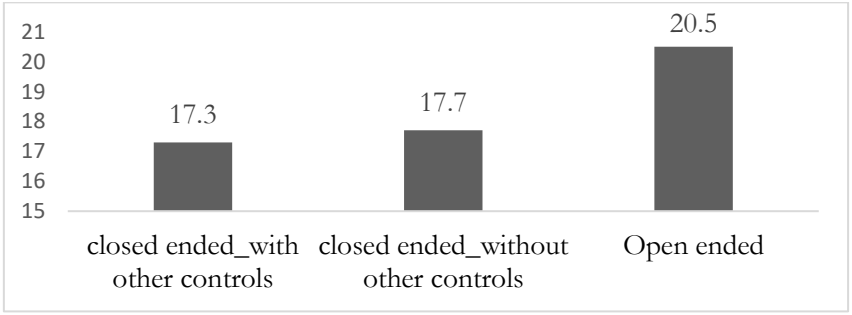

Figure 1: ***Mean WTP from Different Estimates (values in US$)***

7. Conclusion

In this study we used the CV method to assess the feasibility of introducing tourist tax to finance a malaria control program in Zanzibar. The main objective was to check whether tourists would be willing to contribute for such a program, and hence estimate tourists' mean willingness to pay. The value from this would provide the threshold tax level below which the tourism industry will not be put at risk of diverging potential tourists to other competing destinations. Recognizing the fact that different elicitation formats have different advantages and disadvantages, which eventually may lead to different numerical estimates, we employed both open-ended and closed-ended questions to elicit and hence estimate tourists' willingness to pay.

We find that, on average, tourists are willing to contribute between US$17.3 and US$20.5 for the financing a malaria control program. With a very pessimistic view of higher values of the interval, this suggests that any tax level below US$17.3 is ideal for raising funds to finance a malaria control program without imposing some distortionary risk to the sector. This study, therefore, recommends that, if it is to be introduced, the tourist tax should be within this band for it to be effective in meeting its target without compromising other benefits in the tourism industry.

Considering the number of tourists entering the islands in 2011 this extra fee would raise a total of US$3,028,659 per year. This could be collected as a marginal increment through the already existing other tourists charges (e.g., airport fees), hence introducing no extra costs associated to its administration. A feasibility study conducted by the ZMCP (2009) shows that an average annual cost of US$2.9m is required to sustained the control of the malaria problem, suggesting that the raised funds from this tourist levy could basically cover the entire costs. The money would finance various malaria control related activities such as the introduction of highly effective treatment, distribution of long-lasting insecticide-treated bed-nets for prevention, and indoor residual treatment (IRS).

References

Asante, A.F. & A.K. Okyere. 2003. Economic Burden of Malaria in Ghana, A technical report submitted to the World Health Organization, African regional Office (AFRO).

Carson, R.T. & W.M. Hanemann. 2005. Contingent Valuation. In K.-G. Mäler and J.R. Vincent (eds.). *Handbook of Environmental Economics, Volume 2*. Elsevier.

Corso, P.S., J.K. Hammitt & J.D. Graham. 2001.Valuing Mortality Risk-reduction: Using Visual Aid to Improve the Validity of Contingent Valuation. *Journal of Risk and Uncertainty,* 23: 165–84.

De Cantis, S. & M. Ferrante. 2012. Border Surveys and Time Location Sampling (TLS): An Application on Incoming Tourism in Sicily. Accessed at http://meetings.sis-statistica.org/index.php/sm/sm2012/paper/viewFile/2180/149 on 17th August, 2012.

Diamond, A.P. & J.A. Hausman, 1994. Contingent Valuation: Is Some Number Better Than No Number? *Journal of Economic Perspectives*, 8(4): 45–64.

Food and Agricultural Organisation (FAO). 2000. Applications of the Contingent Valuation Method in Developing Countries: A Survey. FAO, Rome. Economic and Social Development Paper no. 146. [http://www. fao. org/DOCREP/003/X8955E/ X8955 E00.HTM].

Donald, G., K. E. Jacowitz, D. Kahneman & D. Mcfadden. 2012. Referendum Contingent Valuation, Anchoring and Willingness to Pay for Public Goods. A paper presented at the August 1995 World Congress of Econometric Society, Tokyo.

Hanemann, M.W. 1994.Valuing the Environment Through Contingent Valuation. *Journal of Economic Perspectives,* 8(4): 19–43.

Jones-Lee, M.W., M.G. Loomes & P. Philip. 1995. Valuing the Prevention of Non-fatal Road Injuries: Contingent Valuation versus Standard Gamble. *Oxford Economic Papers*, 47: 676–95.

Köhlin, G. & G.S. Amacher. 2005. Welfare Implications of Community Forest Plantations in Developing Countries: The Orissa Social Forestry Project. *American Journal of Agricultural Economics*, 87(4)): 855–869.

Modrek, S., J. Liu, R. Gosling & R.G.A. Feachem. 2012. The Economic Benefits of Malaria Elimination: Do they Include increases in Tourism? *Malaria Journal*, 11–244.

Revolutionary Government of Zanzibar (RGoZ), Ministry of Health. 2011. Financial Sustainability Plan for the Zanzibar Malaria Control Programme. Report Document.

Steck, B., K. Wood & J. Bishop. 2010. Tourism: More Value for Zanzibar. Value Chain Analysis Summary Report.

Thompson, E., M. Berger, G. Blomquist & S. Allen. 2002. Valuing the Arts: A Contingent Valuation Approach. *Journal of Cultural Economics*, 26: 87–113.

Tourism Kwa-Zulu Natal. 2004. Occasional Paper No. 21: Effects of Malaria on Tourism.

Whittington, D. 2002. Improving the Performance of Contingent Valuation Studies in Developing Countries. *Environmental and Resource Economics,* 22: 323–367.

Zanzibar Malaria Control Program. 2009. Malaria Elimination in Zanzibar: A Feasibility Assessment: A Technical Report.

APPENDICES

Appendix 1: Scenario and WTP Question Extracts of the Questionnaire

Appendix1A: The English version Scenario and the Follow-up WTP questions

ENUMERATOR: Read the paragraphs below carefully and systematically to ensure that the respondent understands clearly what is written. Avoid introduction of your own words or giving any other different interpretation of the content of the below paragraphs.

I would like you to know that,

Malaria is a common disease in tropical areas, like Zanzibar. It is caused by a parasite, which is transmitted via the bites of infected mosquitoes. Symptoms of malaria are fever, headache, and vomiting. If not treated, malaria can quickly become life-threatening. The Government of Zanzibar has been implementing malaria control measures with an aim of eliminating the disease from the islands of Zanzibar. The Government pays for important malaria control programs like treatment with effective drugs, treated bednets, and spraying insecticide on the inside walls of houses.

So far, great success has been achieved and the number of cases of malaria in Zanzibar has fallen significantly. In 2011 the incidence of malaria in Zanzibar fell from 300 per 1,000 population, to only 3 cases per 1,000 population. In order to maintain the low levels of malaria and to hopefully eliminate malaria completely from Zanzibar, these control measures and others will need to continue to be in place for many years.

There are several benefits of keeping malaria low, and eventually eliminating:

- Reduction in deaths and sickness from malaria among Zanzibari citizens, including among children and pregnant women
- Visitors to Zanzibar can enjoy a malaria free holiday, without worrying about getting sick and buying prophylaxis
- Freeing up resources to invest in other items such as education

Citizens of Zanzibar are already contributing to health care in Zanzibar, but financing this programme is very costly and so far the government cannot guarantee its sustainability. Zanzibar relies heavily on donor support for malaria; but in the past, when donor funding was withdrawn in Zanzibar, there was a resurgence of malaria. Therefore, other sources of funds to finance the program have to be found to keep controlling malaria effectively.

One possible option is to introduce a small malaria control levy on all arrivals in Zanzibar to be directly set aside for the malaria control program. This fixed levy would be attached to the plane ticket or collected at the port of entry.

We are therefore conducting research to ask visitors coming to Zanzibar how much they would be willing to contribute to keeping malaria low in Zanzibar, and eventually eliminating malaria from Zanzibar.

Now:

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
3.7	Would you be willing to pay some money to contribute towards financing the malaria control program?	YES.....1 NO.....2 REFUSED .....99 DON'T KNOW.....0	NEXT SKIP TO 3.9 SKIP TO 3.10
3.8	(FOR THOSE WHO SAID YES IN 3.7) Would you be willing to pay US$[……] extra on your flight ticket, **per visit, per person,** to contribute to the malaria control and elimination program? ***(Enumerator: emphasize, pay per individual and not per group)***	YES.....1 NO.....2 REFUSED .....99 DON'T KNOW.....0	
3.9	(FOR THOSE WHO SAID NO IN 3.7) What are the reasons why you would not be willing to pay?	[RECORD RESPONSE, PROBE]	
3.10	What is the maximum amount that you would be willing to pay to contribute to this cause?	[STATE AMOUNT AND CURRENCY]	
3.11	The final amount to be set for the tax will depend on the responses from all those we interview. If the final levy amount is larger than your maximum willingness to pay, what would you do? ***(ENUMERATOR: Do not suggest answers, but look for answers like :)***	[RECORD RESPONSE. ONLY PROBE IF NONE GIVEN] 1. I WOULD GO ELSEWHERE 2. I WOULD NOT TRAVEL TO ZNZ 3. I WOULD STILL PAY [RECORD OTHER RESPONSE] REFUSED .....99 DON'T KNOW.....0	

Appendix 1B: French Version of Scenario 1A Above

AGENT RECENSEUR : Veuillez lire les paragraphes suivants soigneusement et systématiquement, de façon à s'assurer que le(la) sondé(e) comprend bien ce qui est écrit. Veuillez éviter l'utilisation de Votre propre terminologie ou de fournir une interprétation différente de la teneur des paragraphes suivants.

Nous considérons qu'il est important que vous sachiez que,
Le paludisme est une maladie répandue dans les régions tropicales, y compris Zanzibar. Le gouvernement de Zanzibar met en œuvre des mesures de contrôle qui visent à éliminer la maladie des îles de Zanzibar. Les principales interventions mises en œuvre pour le control du paludisme comprennent diagnostic rapide et traitement avec médicaments efficaces; usage de moustiquaires traitées ; usage de vaporisateurs insecticide sur les murs internes des bâtiments pour éliminer les moustiques.

Jusqu'à présent, les mesures ont eu un grand succès et le nombre de cas de paludisme a Zanzibar a sensiblement diminué. En 2011 l'incidence de paludisme à Zanzibar était d'environs 3 cas pas 1000 personnes. Afin de maintenir un faible niveau de paludisme et, si possible, d'éliminer complètement cette maladie de Zanzibar, il est nécessaire que les mesures de contrôle ci-dessus et d'autres encore continuent d'être mises en œuvre pour nombreuses années.

Le succès des mesures mises en place pour lutter contre le paludisme s'accompagne d'une série d'avantages pour les citoyens résidents et les étrangers. Un des bénéfices apportés par ce programme est une diminution du nombre de décès dus au paludisme à Zanzibar, en particulier chez les enfants et les femmes enceintes. Maintenir la transmission du paludisme à un niveau faible a aussi amélioré la santé et la fréquence scolaire des enfants à Zanzibar. En outre, si la transmission de la maladie reste faible, le coût que les visiteurs comme vous et les résidents de Zanzibar devront payer pour la prévention et traitement du paludisme diminuera sensiblement.

Cependant, financer ce programme est très couteux et jusqu'ici le gouvernement ne peut pas garantir sa durabilité (et donc les bénéfices) dans le cadre des ressources financières actuelles. Outres sources de fonds pour financer le programme doivent être obtenues à cet effet. Les citoyens de Zanzibar contribuent déjà à travers divers formes d'impôts et autres mécanismes indirects. Une autre option possible serait l'introduction d'une petite taxe à faveur du contrôle du paludisme à toutes les arrivées à Zanzibar, cette taxe serait directement mise de côté pour le programme de contrôle. Si cet impôt était appliqué, un montant forfaitaire serait payé en espèces par chaque touriste à l'arrivée à l'aéroport ou le port de Zanzibar.

Pour venir à établir le montant de la redevance pour le paludisme, nous sommes en train de mener une recherche afin de demander aux touristes qui viennent à Zanzibar combien d'argent ils seraient prêts à contribuer à ce programme.

Avant de répondre aux questions ci-dessous, n'oubliez pas que même si vous n'avez pas l'intention de retourner dans un proche avenir, d'autres provenant de votre pays visiteront Zanzibar; eux recevront les bénéfices de la mise en œuvre du programme et ils devront payer le montant requis.

Nous tenons également à vous faire réfléchir sur le fait que la quantité que vous seriez prêt à payer aura seulement un léger impact sur le budget que vous avez prévu pour le voyage, tout en réduisant vos risques de contracter le paludisme.

Maintenant:

Appendix 1C: Italian Version of Scenario 1A Above

INTERVISTATORE: Si prega di leggere i paragrafi seguenti attentamente e accuratamente, in modo da essere certi che l'intervistato capisca chiaramente cosa è scritto. Si prega sia di evitare l'uso di una terminologia propria, sia di non fornire alcuna interpretazione che sia diversa dal contenuto dei paragrafi seguenti.

Riteniamo importante che Lei sappia che,
La malaria è una malattia comune nelle regioni tropicali come Zanzibar. Il Governo di Zanzibar implementa delle misure di controllo che hanno come obiettivo l'eliminazione della malattia dalle isole di Zanzibar. Interventi chiave implementati per il controllo della malaria includono: diagnosi rapida e trattamento con medicine efficaci; utilizzo di zanzariere da letto trattate; uso di insetticida spray sui muri interni dei palazzi per eliminare le zanzare.

Fino ad ora le misure effettuate hanno riportato un grande successo e il numero di casi di malaria a Zanzibar è diminuito considerevolmente. Nel 2011 l'incidenza della malaria sull'isola è stata approssimativamente di 3 casi su 1000. Allo scopo di mantenere basso il livello di malaria e, possibilmente, eliminare completamente questa malattia da Zanzibar, bisogna che le misure di controllo suddette e altre ancora continuino ad essere implementate ancora per molti anni.

Il successo dei provvedimenti messi in atto per la lotta alla malaria produce una serie di benefici a favore sia dei cittadini residenti che degli stranieri. Uno dei benefici apportati dal programma a Zanzibar è la diminuzione dei decessi causati dalla malaria, in particolare tra bambini e donne incinte. Mantenere bassa la trasmissione della malaria ha anche migliorato lo stato di salute e la frequenza scolastica dei bambini di Zanzibar. Inoltre, se la trasmissione della malattia si mantiene a un livello basso, non solo la popolazione residente di Zanzibar ma anche i turisti come Lei vedrebbero una riduzione significativa dei costi per la prevenzione e per il trattamento della malattia.

Tuttavia, l'attuazione di questo programma comporta un costo elevato e, per adesso, il Governo locale, con le risorse finanziarie attualmente a sua disposizione, non può garantire la sua sostenibilità (e quindi i benefici). Per questo motivo, si rende necessario reperire i fondi per il finanziamento del programma sollecitando altre fonti. I cittadini di Zanzibar contribuiscono già attraverso varie forme di tassazione e altri contributi indiretti. Un'altra opzione possibile sarebbe l'introduzione di una piccola tassa a favore del controllo della malaria all'arrivo a Zanzibar: l'introito sarebbe direttamente veicolato al programma di controllo. Se questa tassa sarà implementata, ogni visitatore che giunge sull'isola pagherà una somma fissa all'arrivo al porto o all'aeroporto di Zanzibar.

Per giungere a stabilire l'ammontare della tassa per la malaria, stiamo conducendo un sondaggio per stabilire quale somma i turisti che arrivano a Zanzibar ritengono giusto versare a favore di questo programma.

Prima di rispondere alle domande successive, vorremmo farLe presente che, anche se Lei personalmente non prevede di ritornare prossimamente, altre persone, provenienti dal Suo paese o altrove, visiteranno Zanzibar; costoro riceveranno dei benefici dall'attuazione del programma e saranno loro a dover pagare la somma richiesta.

Vogliamo inoltre farLa riflettere sul fatto che la somma che, per ipotesi, Lei sarebbe disposto/a a pagare, influenzerebbe solo di poco il budget da Lei previsto per il viaggio, ma e allo stesso tempo Le ridurrebbe il rischio di contrarre la malaria.

Ora:

Table A1: Distribution of Tourists by Country of Origin in 2011

Country of Origin	Frequency	Percent
Italy	83	16.4
England (Uk)	50	9.9
German	43	8.5
South Africa	43	8.5
Usa	36	7.1
France	34	6.7
Australia	29	5.7
Spain	14	2.8
Belgium	13	2.6
Switzerland	11	2.2
Denmark	10	2.0
Canada	9	1.8
Kenya	9	1.8
Muscat - Oman	9	1.8
Polland	9	1.8
Portugal	9	1.8
Unspecified Origin	9	1.8
Japan	8	1.6
Netherlands	7	1.4
China	6	1.2
New Zealand	6	1.2
Holland	5	1.0
Sweden	5	1.0
Brazil	4	0.8
Dubai	4	0.8
Norway	4	0.8
Austria	3	0.6
Israel	3	0.6
Russia	3	0.6
Zimbabwe	3	0.6
Namibia	2	0.4
Pakistan	2	0.4
Burundi	1	0.2
Croatia	1	0.2
Dominican Republic	1	0.2
India	1	0.2
Indonesia	1	0.2
Korea	1	0.2
Mexico	1	0.2
Mozambique	1	0.2
Nicaragua	1	0.2
Sri Lanka	1	0.2
Sudan	1	0.2
Tanzania Mainland	1	0.2
Uganda	1	0.2
Zambia	1	0.2
Britain	1	0.2
Czech Republic	1	0.2
Cyprus	1	0.2
Ethopia	1	0.2
Argentina	1	0.2
Turkey	1	0.2
Phillipines	1	0.2
Romania	1	0.2
Total	**507**	**100**