

## Supplemental

### Appendix A: Standard Operating Procedure for DCE Administration [11]

#### Purpose

This SOP describes how to deliver the Discrete Choice Experiment (DCE) questionnaire in Nakaseke, Uganda on the Android tablet. This DCE aims to understand the factors that respondents take into consideration when obtaining medicines for hypertension and/or diabetes. This is a quantitative research methodology to measure the relative importance and trade-offs respondents will tolerate for particular health facility characteristics.

#### Scope

This SOP is applicable for all research assistants and data supervisors involved in DCE data collection.

#### Responsibilities

- I. All research assistants involved in data collection are responsible for understanding and following the protocols outlined in this SOP.
- II. The study coordinator is responsible for ensuring that all research assistants have access to this SOP, have been trained in accordance to this SOP and is available to answer any questions for clarification.

#### Procedures

Discrete Choice Experiments present respondents with two hypothetical health care facilities described in terms of 6 attributes. For each pair of facilities, respondents are asked to choose which one they would prefer. This DCE aims to understand how respondents decide where to obtain their medicines for hypertension and/or diabetes. The DCE will be administered to a sample of 300 to 500 respondents at three clinics: Nakaseke Hospital, Semuto Health Centre IV and Life Care Clinic. The number of respondents recruited from each clinic will be approximately proportional to the clinic size. There are 3 different versions of the DCE: A, B, and C. You will cycle through the different versions according to facility while leading respondents through DCE. Research assistants will be given a paper to mark down the number of each version he or she has facilitated at each health facility to ensure that each version is completed with approximately equal frequency at each site.

The eligibility criteria for participation in the DCE are:

- Over the age of 18
- Diagnosed with hypertension and/or diabetes

The DCE tool is programmed in both English and Luganda. Both languages will be presented in the DCE.

The data manager has the responsibility of initiating the DCE surveys on Kobocollect and stopping data collection once 500 respondents have participated. The data manager will delete the DCE surveys from Kobocollect once 500 respondents have participated.

For the first question:

To begin, you will describe the choice task that is being asked of them and define each attribute and their meaning to the respondents before proceeding to the first choice set. This description is provided in the introduction to the tool that precedes the choice tasks.

Read the tool introduction in its entirety. Make sure the respondent understands that there will be 8 choice sets followed by demographic questions. Let the respondent ask any question about the DCE module and ensure that they understand what they are being asked to do.

Ensure the tablet is visible to the respondent at all times; they must be able to see what you are reading. If necessary, leave the tablet in the hand of the respondent as he or she contemplates the question and his or her answer. Then, take back the tablet and select the choice he or she has indicated.

The first column tells us the characteristics. Facility A is the left column. Facility B is the column on the right.

For each of the questions, make sure you read out both Facility A and B in the following way:

Example: "In Facility A, I receive more than a month's worth of your prescribed medicines from the facility pharmacy. The staff at the health facility sometimes change and I feel there is a basic level of friendliness in our relationship. I travel 10 km and can choose to walk or pay an average cost of 10 000 UGX. I pay an average monthly cost of 10 000 UGX for medicines and facility visits. There are no patient support groups to join at the facility. In these groups, respondents with the same conditions share about their experiences and those who choose to pay 10 000 UGX per year can receive some medicines and/or sugar testing strips in case of stockouts. I receive some education about diabetes at the facility"

As you read, make sure you point at every image so that the respondent understands how you are reading the graph.

Then ask: "Do you prefer going to Facility A or Facility B given the circumstances?"

Tap the selected answer and proceed to the next question.

Repeat the same process for each question. Be consistent with each choice set.

What you are allowed to do:

- Clarify the differences between the two facilities to the respondent. Example, if the respondent complains that the two facilities look the same, you are allowed to point out how they are different.
- You are allowed to repeat what each attribute means

What you are **not allowed** to do:

- Stop reading out the models. Every question needs to be read out as previously described in its entirety.
- Asking or framing questions in a different way than previously described.
- Suggesting what respondents should answer, highlighting or judging certain characteristics.

**Appendix B.** Additional Mixed Logit Regression Results

Attribute	$\beta$			St. Dev.		
	Mean	LB	UB	p-Value	Mean	p-Value
Peer Groups: Groups vs None	0.27	0.07	0.46	0.01	0.03	0.82
Healthcare Provider: somewhat friendly vs. change/unfriendly	0.66	0.50	0.83	<0.01	0.03	0.85
Healthcare Provider: constant/friendly vs change/unfriendly	1.03	0.79	1.27	<0.01	0.12	0.35
Amount of Medicines Available: <month vs none	-0.11	-0.36	0.14	0.39	0.98	<0.01
Amount of Medicines Available: 1 month vs none	1.32	1.09	1.54	<0.01	0.86	<0.01
Amount of Medicines Available: >month vs none	1.13	0.88	1.39	<0.01	0.24	0.12
Distance: 5km vs 2km	0.66	0.35	0.97	<0.01	2.57	<0.01
Distance: 10km vs 2km	0.53	0.34	0.72	<0.01	0.17	0.17
Distance: 20 km vs 2km	0.24	-0.03	0.50	0.08	1.42	<0.01
Education: Some vs None	-0.35	-0.50	-0.19	<0.01	0.05	0.62
Education: A lot vs None	0.09	-0.11	0.29	0.38	0.58	<0.01
Costs of Treatment per month: 5000 vs 0 UGX	-0.83	-1.09	-0.56	<0.01	0.14	0.19
Costs of Treatment per month: 10,000 vs 0 UGX	-2.51	-2.83	-2.19	<0.01	0.06	0.62
Costs of Treatment per month: 20,000 vs 0 UGX	-1.13	-1.39	-0.87	<0.01	0.12	0.33

**Table B1:** Mixed logit regression with all respondents were used to estimate the relative utility of each attribute level compared to a reference attribute level. All variables are coded as dichotomous categorical variables.

Attributes	$\beta$				St. Dev.	
	Mean	LB	UB	p-Value	Mean	p-Value
Peer Groups: Groups vs None	0.32	0.04	0.60	0.02	0.02	0.87
Healthcare Provider: somewhat friendly vs. change/unfriendly	0.74	0.49	0.99	0.00	0.05	0.70
Healthcare Provider: constant/friendly vs change/unfriendly	1.00	0.69	1.31	0.00	0.11	0.39
Amount of Medicines Available: <month vs none	-0.03	-0.38	0.33	0.88	0.99	0.00
Amount of Medicines Available: 1 month vs none	1.14	0.82	1.46	0.00	0.85	0.00
Amount of Medicines Available: >month vs none	1.02	0.67	1.37	0.00	0.23	0.15
Distance: 5km vs 2km	0.31	-0.15	0.77	0.19	2.61	0.00
Distance: 10km vs 2km	0.42	0.16	0.68	0.00	0.16	0.21
Distance: 20 km vs 2km	0.24	-0.13	0.62	0.21	1.45	0.00
Education: Some vs None	-0.21	-0.45	0.03	0.08	0.06	0.52
Education: A lot vs None	0.12	-0.17	0.42	0.41	0.59	0.00
Costs of Treatment: 5000 vs 0 UGX	-0.82	-1.19	-0.45	0.00	0.16	0.15
Costs of Treatment: 10,000 vs 0 UGX	-2.35	-2.77	-1.93	0.00	0.05	0.68
Costs of Treatment 20,000 vs 0 UGX	-1.06	-1.43	-0.70	0.00	0.07	0.63
<b>Interaction with DM only</b>						
(Peer Groups: Groups vs None) x DM only	-0.23	-0.60	0.14	0.22		
(Healthcare Provider: somewhat friendly vs. change/unfriendly) x DM only	-0.12	-0.46	0.23	0.52		
(Healthcare Provider: constant/friendly vs change/unfriendly) x DM only	0.04	-0.34	0.43	0.83		

(Amount Available: <month vs none) x DM only	-0.17	-0.67	0.33	0.51
(Amount Available: 1 month vs none) x DM only	0.10	-0.33	0.54	0.65
(Amount Available: >month vs none) x DM only	0.11	-0.34	0.57	0.63
(Distance: 5km vs 2km) x DM only	0.53	-0.15	1.20	0.13
(Distance: 10km vs 2km) x DM only	0.31	-0.06	0.68	0.10
(Distance: 20 km vs 2km) x DM only	0.13	-0.38	0.65	0.61
(Education: Some vs None) x DM only	-0.24	-0.57	0.10	0.16
(Education: A lot vs None) x DM only	-0.16	-0.58	0.26	0.45
(Costs of Treatment: 5000 vs 0 UGX) x DM only	0.02	-0.48	0.53	0.94
(Costs of Treatment: 10,000 vs 0 UGX) x DM only	-0.10	-0.65	0.44	0.71
(Costs of Treatment 20,000 vs 0 UGX) x DM only	0.00	-0.50	0.51	0.99
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Interaction with DM and HTN				
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(Peer Groups: Groups vs None) x DM and HTN	0.25	-0.21	0.70	0.29
(Healthcare Provider: somewhat friendly vs. change/unfriendly) x DM and HTN	-0.09	-0.52	0.34	0.69
(Healthcare Provider: constant/friendly vs change/unfriendly) x DM and HTN	0.16	-0.30	0.63	0.49
(Amount Available: <month vs none) x DM and HTN	-0.15	-0.77	0.48	0.65
(Amount Available: 1 month vs none) x DM and HTN	0.81	0.26	1.36	0.00*
(Amount Available: >month vs none) x DM and HTN	0.40	-0.17	0.96	0.17

(Distance: 5km vs 2km) x DM and HTN	0.70	-0.10	1.50	0.09
(Distance: 10km vs 2km) x DM and HTN	0.00	-0.45	0.46	1.00
(Distance: 20 km vs 2km) x DM and HTN	-0.24	-0.86	0.39	0.46
(Education: Some vs None) x DM and HTN	-0.23	-0.64	0.19	0.28
(Education: A lot vs None) x DM and HTN	0.18	-0.37	0.73	0.53
(Costs of Treatment: 5000 vs 0 UGX) x DM and HTN	-0.10	-0.73	0.53	0.75
(Costs of Treatment: 10,000 vs 0 UGX) x DM and HTN	-0.75	-1.44	-0.07	0.03*
(Costs of Treatment 20,000 vs 0 UGX) x DM and HTN	-0.43	-1.09	0.23	0.20

**Table B2.** Mixed Logit Model Including Interactions for Health Condition. Relative utility was estimated for respondents with both DM and HTN and DM only compared to respondents with HTN only. \* Indicates significant value.

Attributes	$\beta$				St. Dev.	
	Mean	LB	UB	p-Value	Mean	p-Value
Peer Groups: Groups vs None	0.13	-0.10	0.36	0.26	0.04	0.79
Healthcare Provider: somewhat friendly vs. change/unfriendly	0.54	0.35	0.74	0.00	0.03	0.82
Healthcare Provider: constant/friendly vs change/unfriendly	0.88	0.61	1.14	0.00	0.10	0.41
Amount of Medicines Available: <month vs none	-0.06	-0.35	0.23	0.69	1.02	0.00
Amount of Medicines Available: 1 month vs none	1.31	1.05	1.58	0.00	0.85	0.00
Amount of Medicines Available: >month vs none	1.18	0.89	1.48	0.00	0.22	0.14

Distance: 5km vs 2km	0.75	0.36	1.13	0.00	2.90	0.00
Distance: 10km vs 2km	0.65	0.43	0.88	0.00	0.19	0.13
Distance: 20 km vs 2km	0.28	-0.02	0.58	0.07	1.46	0.00
Education: Some vs None	-0.28	-0.47	-0.09	0.00	0.05	0.63
Education: A lot vs None	0.17	-0.06	0.41	0.15	0.44	0.00
Costs of Treatment: 5000 vs 0 UGX	-0.78	-1.09	-0.48	0.00	0.13	0.27
Costs of Treatment: 10,000 vs 0 UGX	-2.59	-2.95	-2.22	0.00	0.05	0.65
Costs of Treatment 20,000 vs 0 UGX	-1.06	-1.36	-0.76	0.00	0.12	0.35
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Interaction with Life Care Centre (LCC)						
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(Peer Groups: Groups vs None) x LCC	0.10	-0.49	0.69	0.73		
(Healthcare Provider: somewhat friendly vs. change/unfriendly) x LCC	0.78	0.25	1.30	0.00*		
(Healthcare Provider: constant/friendly vs change/unfriendly) x LCC	1.29	0.72	1.86	0.00*		
(Amount Available: <month vs none) x LCC	0.93	0.16	1.70	0.02*		
(Amount Available: 1 month vs none) x LCC	0.60	-0.06	1.27	0.08		
(Amount Available: >month vs none) x LCC	0.85	0.21	1.50	0.01*		
(Distance: 5km vs 2km) x LCC	-0.48	-1.57	0.62	0.39		
(Distance: 10km vs 2km) x LCC	-0.21	-0.71	0.29	0.41		
(Distance: 20 km vs 2km) x LCC	-0.04	-0.77	0.70	0.92		
(Education: Some vs None) x LCC	-0.25	-0.76	0.26	0.34		
(Education: A lot vs None) x LCC	0.34	-0.24	0.92	0.25		
(Costs of Treatment: 5000 vs 0 UGX) x LCC	1.12	0.39	1.86	0.00*		
(Costs of Treatment: 10,000 vs 0 UGX) x LCC	0.04	-0.53	0.61	0.89		
(Costs of Treatment 20,000 vs 0 UGX) x LCC	0.32	-0.32	0.96	0.32		
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Interaction with Semuto Health Centre IV (SHC)						
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(Peer Groups: Groups vs None) x SHC	0.29	-0.16	0.74	0.21
(Healthcare Provider: somewhat friendly vs. change/unfriendly) x SHC	0.22	-0.21	0.65	0.32
(Healthcare Provider: constant/friendly vs change/unfriendly) x SHC	0.00	-0.48	0.49	0.99
(Amount Available: <month vs none) x SHC	-0.77	-1.43	-0.11	0.02*
(Amount Available: 1 month vs none) x SHC	-0.03	-0.56	0.50	0.91
(Amount Available: >month vs none) x SHC	-0.70	-1.28	-0.12	0.02*
(Distance: 5km vs 2km) x SHC	-0.04	-0.90	0.82	0.93
(Distance: 10km vs 2km) x SHC	-0.06	-0.52	0.39	0.78
(Distance: 20 km vs 2km) x SHC	0.09	-0.57	0.75	0.80
(Education: Some vs None) x SHC	-0.44	-0.85	-0.04	0.03*
(Education: A lot vs None) x SHC	-0.75	-1.31	-0.18	0.01*
(Costs of Treatment: 5000 vs 0 UGX) x SHC	-0.14	-0.82	0.53	0.68
(Costs of Treatment: 10,000 vs 0 UGX) x SHC	0.01	-0.48	0.50	0.96
(Costs of Treatment 20,000 vs 0 UGX) x SHC	0.09	-0.44	0.62	0.75

**Table B3.** Mixed Logit Model including facility interactions. Relative utility was estimated for respondents sampled from Life Care Clinic (LCC) and Semuto Health Centre IV (SHC) compared to Nakaseke Hospital. \* Indicates significant result.



### Appendix C. Results of Predictive Validity Test

In the main analysis for this paper, we estimate two mixed logit model specifications using data collected from responses to 24 choice tasks that were included in the DCE design of this study. Specifically, we estimated one model where all variables were coded as dummy variables except distance and cost, which were coded as linear continuous variables. This is the model specification was used as the basis for the main results discussed in our paper. In addition, we also estimated a model where all variables were coded as dummy variables including distance and cost. This specification was included as a robustness check.

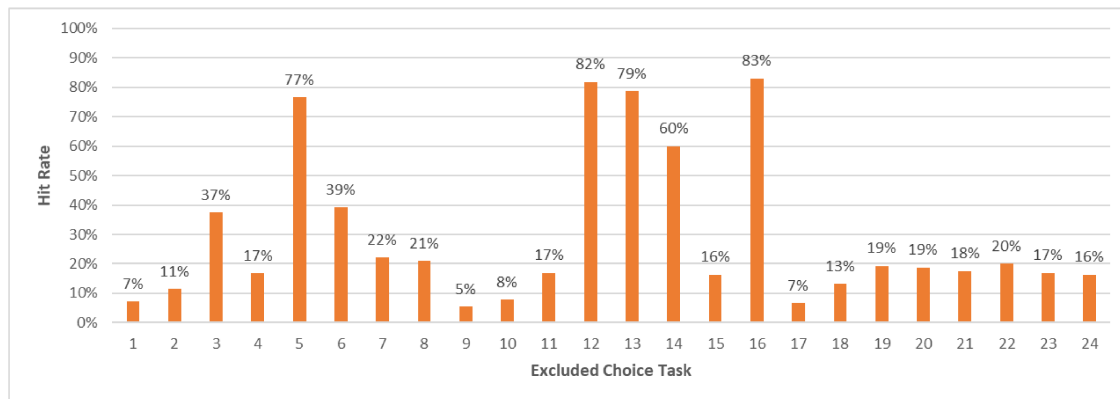
To test the predictive validity of these mixed logit models, we conducted the following analysis. First, we excluded one choice task, then re-estimated each model specification using data collected from responses to the remaining 23 choice tasks. We did this for all 24 choice tasks, results in 48 separate mixed logit models (one for each model specification). Next, we used the estimated models to predict respondent answers to the excluded choice task. We then compared the predicted answers to the observed answers to see if our predictions were correct or not. If the prediction was correct, we considered this a “hit”. If the prediction was incorrect, we considered this a “miss”. Lastly, we calculated the percentage of responses the model correctly predicted (i.e., the “hit rate”). This hit rate can range from 0% (i.e., no responses were correctly predicted) to 100% (i.e., all responses were correctly predicted).

Figure B1 provides a summary of hit rates for the model specification where distance and cost were coded as linear continuous variables (i.e., the main results of this paper). The hit rate for this model ranges from 5% to 83%. The average hit rate for this specification is 30%.

Figure B2 provides a similar summary of hit rates for the model specification where all variables were coded as dummy variables. The hit rate for this model ranges from 5% to 92%. The average hit rate for the model specification where all variables were coded as dummy variables is 39%.

This analysis is informative because it shows that the models being estimated can potentially have significant predictive power, depending on the choice task being excluded. However, we do believe there are limitations. First, we believe our study is the first to conduct this type of analysis, so it is difficult to say whether our average hit rate is lower than one would expect compared to the literature. Second, by excluding choice tasks, we are actually reducing the predictive power of the random utility models we estimate because we are estimating the model on a smaller subsample than we intended when planning this study. Ideally, the predictive power of the mixed logit models we estimated would be tested using a hold task that all respondents saw that would not need to be used in model estimation. Third, just because a mixed logit model has low predictive power does not necessarily mean it does not provide reliable information on the tradeoffs respondents are willing to make between attributes (the main focus of this study).

**Figure B1. Prediction accuracy of model where distance and cost are coded as linear continuous variables**



**Figure B2. Prediction accuracy of model where all variables are coded as dummy variables**

