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Pick a Treatment, Any Treatment!

Using Discrete Choice Experiments to Analyze Treatment Preferences.

Cynthia Alvarez

ICON plc

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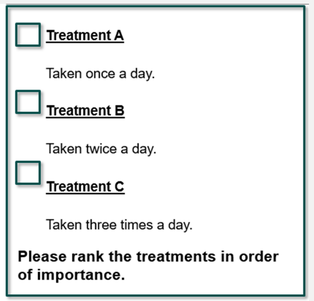
ABSTRACT

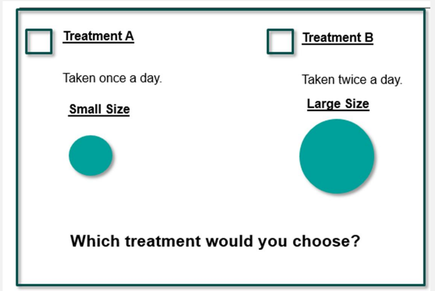
A discrete choice experiment (DCE) prompts individual preferences by giving individuals choices between hypothetical alternatives, such as Treatment A vs. Treatment B. The choices can vary by different attributes, such as color or size. Within those attributes, levels such as the color red or blue can be compared. In evaluating the preferences, one can determine the significance each attribute and evaluate the trade-off of one attribute for another.

This poster will give an overview of the background, design and analysis of a DCE. An example will be used to illustrate how to structure the data. PROC PHREG will be used in SAS® 9.4 to analyze preferences within attribute levels, as well as preferences of different treatment profiles.

BACKGROUND and DESIGN

- A DCE allows for a combination of attributes to be evaluated over another combination of attributes.
- While ranking allows one to measure attributes individually, a DCE allows to measure them combined.





- A DCE Design encompasses choosing attributes, levels for the attributes, and designing the choice sets.
- Attributes are combined to create choice sets (Treatment A vs. Treatment B).
- If we want to have all combinations of the attribute levels, we will have a full factorial design.
- If we want to have some of the combinations, we can use a fractional factorial design.
- Ideally, the attributes are independent of each other (orthogonal) and the attribute levels are presented equally (balanced).

The following attributes and levels were used to create the Choice Sets:

Attribute	Level 1	Level 2	Level 3	Level 4
Color	Red	Green	Yellow	Blue
With Food	Take with food	Take with or without		
Side Effects	Those of Drug A	Those of Drug B		
Size	A (smallest 7mm)	B (medium 9mm)	C (largest 11mm)	
Drug Release	Fast release	Regular release	Delayed release	
Frequency	Once a day	Twice a day	Twice a week	Once a week
Coating	Sugar coated	Not sugar coated		
Capsule or Tablet	Capsule	Tablet		

Choice Set 1:

Choice A	Choice B
Blue Color	Red Color
Take with or without food	Take with Food
Side effects of Treatment A	Side effects of Treatment B
Medium Size (9mm)	Large Size (11mm)
Delayed Release	Fast Release
Taken once a day	Taken twice a day
Not sugar coated	Sugar coated
Capsule	Tablet

ANALYSIS

- The analysis can be done using a generalized, conditional, or mixed logit model. This analysis is illustrated using a conditional logit model in PROC PHREG.
- There are 32 Choice Sets. Half of the Choice Sets are randomized to be shown to 50 participants, and the other half are given to another 50 participants. We first want to restructure the dataset.

DCE Analysis

Obs	patno	quest	ch30	ch6	ch28	ch23	ch13	ch14	ch1	ch3	ch11	ch31	ch24	ch9	ch15	ch32	ch12	ch27	ch20	ch16	ch18	ch26	ch21	ch25	ch5	ch22	ch8	ch2	ch17	ch4	ch29	ch10	ch7	ch19
1	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	1	2	1	2	2	1	1	1	1	2	2	1	1
2	2	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	2	2	1	1	2	1	2	2	2	1	1	2	1	1
3	3	1	2	1	2	1	1	2	1	1	2	1	1	2	1	2	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4	4	1	1	1	2	2	2	1	1	1	2	1	2	1	2	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	5	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2	2	2	2	2	2	2	2	1	2	1	1	2	1	1

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ANALYSIS (CONTINUED)

1. Restructure the data to one record per participant per choice set (32 rows per participant). SAS Code
2. Restructure the data to one record per participant per choice set per selection (64 rows per participant). SAS Code
3. Bring in the study design data.
4. Sort both the participant and study design data and merge them together to create the DCE Dataset.

To create Table 1 (Results of Conditional Logit Model, including odds ratios for preference of attribute levels),

```
**We will bring in our DCE Dataset and create a choice12 variable that we will use in PROC PHREG;
data temp01;
  set saslib.&indat1.;
  if choice=1 then choice12=1;
  else if choice=0 then choice12=2;
run;

**We use PROC PHREG for analysis and output the parameter estimates;
ods output ParameterEstimates = pe01;
proc phreg data=temp01 nosummary;
  class attr1(ref='2') attr2(ref='2') attr3(ref='1') attr4(ref='3')
        attr5(ref='1') attr6(ref='4') attr7(ref='1') attr8(ref='1');
   model choice12*choice12(2) =  attr1 attr2 attr3 attr4 attr5 attr6 attr7 attr8/rl;
   strata patno setc;
run;
ods output close;
```

After some formatting (SAS Code) and a proc print (SAS Code), Table 1 is created.

Rich Text Format

To create Table 2 (Odds ratios for preference of different profiles),

```
**Here in temp02, we will output our linear predictors and standard errors, which we will use to
calculate OR's and p-values;
proc phreg data=temp01 nosummary;
  class attr1(ref='2') attr2(ref='2') attr3(ref='1') attr4(ref='3')
        attr5(ref='1') attr6(ref='4') attr7(ref='1') attr8(ref='1');
  model choice12*choice12(2) =  attr1 attr2 attr3 attr4 attr5 attr6 attr7 attr8/rl;
  strata patno setc;
  output out=temp02 StdXBeta=stdBeta XBeta=estBeta;
run;
```

After some odds ratio calculations, formatting (SAS Code), and a proc print (SAS Code), Table 2 is created.

Rich Text Format

DCE Analysis
All Participants (N=100)

Table 1. Results of Conditional Logit Model, including odds ratios for preference of attribute levels - All Participants

Parameter	Level	Estimate	SE	Chi-Sq	P-value	OR	Lower 95%	Upper 95%
Color								
	Red	-0.015	0.089	0.029	.87	0.985	0.828	1.173
	Green (reference)	--	--	--	--	--	--	--
	Yellow	0.432	0.089	23.720	<.001	1.541	1.295	1.833
	Blue	0.353	0.103	11.848	<.001	1.423	1.164	1.740
Take with Food								
	Take with Food	-0.039	0.051	0.579	.45	0.962	0.870	1.063
	Take with or without Food (reference)	--	--	--	--	--	--	--
Side effects								
	Side effects from Drug A (reference)	--	--	--	--	--	--	--
	Side effects from Drug B	-0.018	0.051	0.125	.72	0.982	0.888	1.086
Size								
	A (smallest 7mm)	0.438	0.080	29.954	<.001	1.549	1.324	1.812
	B (medium 9 mm)	0.162	0.079	4.202	.040	1.176	1.007	1.374
	C (largest 11 mm) (reference)	--	--	--	--	--	--	--
Drug Release								
	Fast release (reference)	--	--	--	--	--	--	--
	Regular release	-0.012	0.065	0.033	.86	0.988	0.870	1.123
	Delayed release	-0.112	0.080	1.976	.16	0.894	0.765	1.045
Frequency								
	Once a day	-0.047	0.089	0.278	.60	0.954	0.802	1.136
	Twice a day	0.060	0.103	0.341	.56	1.062	0.868	1.298
	Twice a week	-0.062	0.089	0.498	.48	0.939	0.790	1.117
	Once a week (reference)	--	--	--	--	--	--	--
Coating								

DCE Analysis
All Participants (N=100)

Table 2. Odds ratios for preference of different profiles, All participants

Color	Food required	Side Effects	Size	Drug Release	Frequency	Coating	Capsule or Tablet	OR*	P-value
Green	With or Without Food	Treatment A Side Effects	C. Largest (11mm)	Fast Release	Once a Week	Sugar Coated	Capsule	1.000	--
Red	With or Without Food	Treatment A Side Effects	C. Largest (11mm)	Delayed Release	Twice a Week	Sugar Coated	Tablet	0.746	.062
Red	With Food	Treatment B Side Effects	C. Largest (11mm)	Fast Release	Once a Day	Not Sugar Coated	Tablet	0.746	.073
Green	With Food	Treatment B Side Effects	B. Medium Sized (9mm)	Delayed Release	Twice a Week	Not Sugar Coated	Tablet	0.784	.17
Green	With Food	Treatment A Side Effects	C. Largest (11mm)	Delayed Release	Twice a Week	Sugar Coated	Capsule	0.808	.10
Red	With or Without Food	Treatment A Side Effects	C. Largest (11mm)	Regular Release	Once a Week	Not Sugar Coated	Tablet	0.818	.13
Green	With Food	Treatment A Side Effects	C. Largest (11mm)	Delayed Release	Once a Week	Sugar Coated	Capsule	0.860	.11
Green	With or Without Food	Treatment B Side Effects	C. Largest (11mm)	Regular Release	Once a Day	Not Sugar Coated	Capsule	0.864	.26
Red	With Food	Treatment B Side Effects	C. Largest (11mm)	Fast Release	Twice a Day	Sugar Coated	Tablet	0.890	.47
Red	With Food	Treatment B Side Effects	B. Medium Sized (9mm)	Delayed Release	Once a Day	Sugar Coated	Capsule	0.934	.71
Green	With or Without Food	Treatment B Side Effects	C. Largest (11mm)	Fast Release	Twice a Day	Not Sugar Coated	Capsule	0.972	.82
Green	With Food	Treatment B Side Effects	B. Medium Sized (9mm)	Regular Release	Once a Day	Not Sugar Coated	Capsule	0.977	.88
Green	With or Without Food	Treatment A Side Effects	B. Medium Sized (9mm)	Regular Release	Once a Day	Sugar Coated	Tablet	0.999	>.99
Red	With or Without Food	Treatment A Side Effects	B. Medium Sized (9mm)	Regular Release	Twice a Week	Not Sugar Coated	Capsule	1.003	.99
Red	With or Without Food	Treatment B Side Effects	B. Medium Sized (9mm)	Regular Release	Twice a Day	Not Sugar Coated	Tablet	1.003	.99
Red	With Food	Treatment A Side Effects	B. Medium Sized (9mm)	Fast Release	Once a Week	Sugar Coated	Tablet	1.004	.98
Green	With or Without Food	Treatment B Side Effects	B. Medium Sized (9mm)	Regular Release	Twice a Day	Not Sugar Coated	Tablet	1.018	.91

MONDAY TIPS

- Discrete choice experiments allow one to evaluate individual preferences by giving individuals choices between hypothetical alternatives.
- A discrete choice experiment can be analyzed using the following models: generalized logit model, conditional logit model, and mixed logit model.
- The conditional logit model and mixed logit model can be analyzed using the procedure PHREG.

REFERENCES and FURTHER READING

- Kuhfeld W.F. (2010). Marketing Research Methods in SAS. Cary, NC: SAS Institute Inc. URL http://support.sas.com/techsup/technote/mr2010.pdf
- Na B., Elkin E. (2013). "Are You Discrete? Patients' Treatment Preferences and the Discrete Choice Experiment" in Proceedings of the SAS Global Forum 2013 Conference. URL http://support.sas.com/resources/papers/proceedings13/429-2013.pdf
- Mangham L.J., Hanson K., McPake B. (2009). How to do (or not to do)…Designing a discrete choice experiment for application in a low-income country. *Health Policy and Planning*, 24(2), 151–158. https://doi.org/10.1093/heapol/czn047

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Your comments and questions are valued and encouraged. Below is my contact information:

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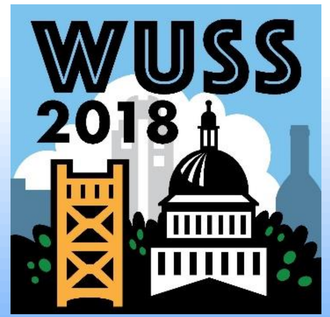

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1.

```
**Restructure to one record per participant per choice set (32 rows per participant);
**With a flag for which choice was selected (A or B) and the number of choice sets;

data pat02 (keep=patno setc quest);
  set pat01;
  array section {1:32}  ch1 ch2 ch3 ch4 ch5 ch6 ch7 ch8 ch9 ch10 ch11 ch12
                        ch13 ch14 ch15 ch16 ch17 ch18 ch19 ch20 ch21 ch22
                        ch23 ch24 ch25 ch26 ch27 ch28 ch29 ch30 ch31 ch32;
do setc=1 to 32;
    quest=section {setc};
    output;
end;

run;
```

2.

```
**Restructure to one record per participant per choice set per selection (64 rows per participant);
**With a flag for whether or not the participant chose the selection A or B in the choice set;
data pat03;
  set pat02;

  setchoice = "A";
  if quest eq 1 then choice=1;
  else choice=0;
  output;

  setchoice = "B";
  if quest eq 2 then choice=1;
  else choice=0;
  output;

run;
```

1.

DCE Analysis

Obs	patno	quest	setc
1	1	.	1
2	1	1	2
3	1	.	3
4	1	1	4
5	1	2	5
6	1	.	6
7	1	1	7
8	1	1	8
9	1	.	9
10	1	2	10
11	1	.	11
12	1	.	12
13	1	.	13
14	1	.	14
15	1	.	15
16	1	1	16
17	1	1	17
18	1	1	18
19	1	1	19
20	1	1	20
21	1	2	21
22	1	2	22
23	1	.	23
24	1		24

2.

DCE Analysis

Obs	patno	quest	setc	setchoice	choice
1	1	.	1	A	0
2	1	.	1	B	0
3	1	1	2	A	1
4	1	1	2	B	0
5	1	.	3	A	0
6	1	.	3	B	0
7	1	1	4	A	1
8	1	1	4	B	0
9	1	2	5	A	0
10	1	2	5	B	1
11	1	.	6	A	0
12	1	.	6	B	0
13	1	1	7	A	1
14	1	1	7	B	0
15	1	1	8	A	1
16	1	1	8	B	0
17	1	.	9	A	0
18	1	.	9	B	0
19	1	2	10	A	0
20	1	2	10	B	1
21	1	.	11	A	0
22	1	.	11	B	0
23	1	.	12	A	0
24	1	.	12	B	0
25	1	.	13	A	0

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3.

	SETC	Setchoice	attr1	attr2	attr3	attr4	attr5	attr6	attr7	attr8
1	1	A	4	2	1	2	3	1	2	1
2	2	A	4	2	2	1	3	1	1	2
3	3	A	2	2	1	2	1	3	1	1
4	4	A	1	2	1	1	2	2	1	1
5	5	A	3	1	1	2	3	2	2	2
6	6	A	4	1	2	1	1	2	1	2
7	7	A	1	1	1	2	1	4	1	2
8	8	A	3	1	2	1	3	2	1	1
9	9	A	4	2	1	1	2	4	2	2
10	10	A	2	2	2	3	1	2	2	1
11	11	A	3	2	1	1	1	4	2	1
12	12	A	2	1	1	3	3	4	1	1
13	13	A	2	1	2	1	3	4	2	2
14	14	A	4	1	1	1	1	3	2	2
15	15	A	3	1	2	3	2	3	1	2
16	16	A	4	1	1	3	1	2	2	1
17	17	A	1	1	2	3	1	1	2	2
18	18	A	3	2	2	2	1	4	1	2
19	19	A	1	1	2	1	1	4	2	1
20	20	A	3	2	1	3	1	1	2	2
21	21	A	3	1	1	1	2	3	2	1
22	22	A	1	1	1	1	1	1	1	1
23	23	A	2	1	1	1	2	1	1	2
24	24	A	1	2	2	1	3	3	2	1
25	25	A	1	2	1	3	3	3	1	2
26	26	A	4	1	2	2	1	3	1	1
27	27	A	1	2	2	2	2	2	2	2
28	28	A	2	1	2	2	2	1	2	1
29	29	A	3	2	2	1	1	1	1	1
30	30	A	2	2	2	1	1	3	2	2
31	31	A	4	2	2	3	2	4	1	1
32	32	A	2	2	1	1	1	2	1	2
33	1	B	1	1	2	3	1	2	1	2
34	2	B	1	1	1	2	1	2	2	1
35	3	B	3	1	2	3	2	4	2	2
36	4	B	2	1	2	2	3	3	2	2
37	5	B	4	2	2	3	1	3	1	1
38	6	B	1	2	1	2	2	3	2	1
39	7	B	2	2	2	3	2	1	2	1
40	8	B	4	2	1	2	1	3	2	2
41	9	B	1	1	2	2	3	1	1	1
42	10	B	3	1	1	1	2	3	1	2
43	11	B	4	1	2	2	2	1	1	2
44	12	B	3	2	2	1	1	1	2	2

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4.

```
**Sort data for merge;
proc sort data=pat03 out=pat03s;
  by setc setchoice;
run;

proc sort data=matrix out=matrixs;
  by setc setchoice;
run;

data merge01 (drop=quest);
  merge pat03s (in=a)
        matrixs (in=b);
  by setc setchoice;
  if a;
  label attr1     = "Color"
        attr2     = "Food required"
        attr3     = "Side Effects"
        attr4     = "Size"
        attr5     = "Drug Release"
        attr6     = "Frequency"
        attr7     = "Coating"
        attr8     = "Capsule or Tablet"
        setc      = "Choice Set Number"
        choice    = "Choice 1=Chose 0=Did not Choose"
        setchoice = "Set Choice (A or B)";
run;
```

DCE Analysis

Obs	patno	setc	setchoice	choice	attr1	attr2	attr3	attr4	attr5	attr6	attr7	attr8
1	1	1	A	0	4	2	1	2	3	1	2	1
2	2	1	A	0	4	2	1	2	3	1	2	1
3	3	1	A	1	4	2	1	2	3	1	2	1
4	4	1	A	1	4	2	1	2	3	1	2	1
5	5	1	A	0	4	2	1	2	3	1	2	1
6	6	1	A	1	4	2	1	2	3	1	2	1
7	7	1	A	0	4	2	1	2	3	1	2	1
8	8	1	A	1	4	2	1	2	3	1	2	1
9	9	1	A	0	4	2	1	2	3	1	2	1
10	10	1	A	1	4	2	1	2	3	1	2	1
11	11	1	A	1	4	2	1	2	3	1	2	1
12	12	1	A	0	4	2	1	2	3	1	2	1
13	13	1	A	0	4	2	1	2	3	1	2	1
14	14	1	A	1	4	2	1	2	3	1	2	1
15	15	1	A	1	4	2	1	2	3	1	2	1
16	16	1	A	0	4	2	1	2	3	1	2	1
17	17	1	A	0	4	2	1	2	3	1	2	1
18	18	1	A	0	4	2	1	2	3	1	2	1
19	19	1	A	1	4	2	1	2	3	1	2	1
20	20	1	A	0	4	2	1	2	3	1	2	1
21	21	1	A	0	4	2	1	2	3	1	2	1
22	22	1	A	0	4	2	1	2	3	1	2	1
23	23	1	A	0	4	2	1	2	3	1	2	1
24	24	1	A	0	4	2	1	2	3	1	2	1
25	25	1	A	0	4	2	1	2	3	1	2	1
26	26	1	A	0	4	2	1	2	3	1	2	1

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```
**Format and label parameter estimates;
data pe02;
  set pe01;

  estimate_c = strip(put(estimate,8.3));
  stdErr_c   = strip(put(stdErr,8.3));
  chiSq_c    = strip(put(chiSq,8.3));
  OR         = strip(put(Hazardratio,8.3));
  ORLower    = strip(put(HRLowerCL,8.3));
  ORUpper    = strip(put(HRUpperCL,8.3));

**p-value format;
  pval  = strip(put(ProbChisq,pval2fmt.));

  label estimate_c = "Estimate"
        stdErr_c   = "SE"
        chiSq_c    = "Chi-Sq"
        OR         = "OR"
        ORLower    = "Lower 95%"
        ORUpper    = "Upper 95%"
        pval       = "P-value";
run;
```

```
**Create a dataset with the labels we want to use;
data empty01;
   infile datalines delimiter=',';
   length parameter $5 ClassVal0 $1 Param $50 paramLabel $80;
   input parameter $ ClassVal0 $ Param $ paramLabel $;
   datalines;
attr1,0,Color,
attr1,1, ,Red
attr1,2, ,Green (reference)
attr1,3, ,Yellow
attr1,4, ,Blue
attr2,0,Take with Food,
attr2,1, ,Take with Food
attr2,2, ,Take with or without Food (reference)
attr3,0,Side effects,
attr3,1, ,Side effects from Drug A (reference)
attr3,2, ,Side effects from Drug B
attr4,0,Size,
attr4,1, ,A (smallest 7mm)
attr4,2, ,B (medium 9 mm)
attr4,3, ,C (largest 11 mm) (reference)
attr5,0,Drug Release,
attr5,1, ,Fast release (reference)
attr5,2, ,Regular release
attr5,3, ,Delayed release
attr6,0,Frequency,
attr6,1, ,Once a day
attr6,2, ,Twice a day
attr6,3, ,Twice a week
attr6,4, ,Once a week (reference)
attr7,0,Coating,
attr7,1, ,Sugar Coated (reference)
attr7,2, ,Not Sugar Coated
attr8,0,Capsule or Tablet,
attr8,1, ,Capsule (reference)
attr8,2, ,Tablet
;

run;
```

```
**Sort the label data and estimates data and merge them. Then
create dashes for reference categories.;
proc sort data=empty01 out=empty01s;
  by parameter classval0;
run;

proc sort data = pe02 out = pe02s;
  by parameter classval0;
run;

data merge02;
  merge pe02s(in=b)
        empty01s(in=a);
  by parameter classval0;

  **These should match up with the references used in PHREG;
  if (parameter eq "attr1" and ClassVal0 eq "2") or
        (parameter eq "attr2" and ClassVal0 eq "2") or
        (parameter eq "attr3" and ClassVal0 eq "1") or
        (parameter eq "attr4" and ClassVal0 eq "3") or
        (parameter eq "attr5" and ClassVal0 eq "1") or
        (parameter eq "attr6" and ClassVal0 eq "4") or
        (parameter eq "attr7" and ClassVal0 eq "1") or
        (parameter eq "attr8" and ClassVal0 eq "1")
     then do;  *reference categories;
        Estimate_C = "--";
        StdErr_C   = "--";
        ChiSq_C    = "--";
        pval       = "--";
        OR         = "--";
        ORLower    = "--";
        ORUpper    = "--";
      end;

    label param = "Parameter"
          paramLabel = "Level";
 run;
```

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Using Discrete Choice Experiments to Analyze Treatment Preferences.

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```
title;
footnote;
title1  &fmt.  "DCE Analysis";
title2  &fmt.  "All Participants (N=100)";
footnote1 &fmt.  "Prepared by X. Do Not Distribute. ";
options nodate nocenter nonumber orientation=landscape;

ods rtf file = "&tbldir.\&program..rtf"  startpage = no notoc_data;

ods rtf startpage=now;
ods rtf text = "^S={outputwidth=100% just=l}{&fmt_title. Table 1. Results of Conditional Logit Model, including odds ratios for preference of attribute levels - All Participants}";

proc print data = merge02 label noobs;
  var param paramLabel / style(data)=table{font=("&TextFont.",&TextFS.) just=l asis=on cellwidth=1.7 in }
                         style(header)=table{font=("&TextFont.",&TextFS.) just=l asis=on cellwidth=1.7 in};
  var Estimate_c StdErr_C ChiSq_C pval OR ORLower ORUpper/ style(data)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=0.9 in }
                         style(header)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=0.9 in};
run;
ods rtf close;
```

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```
**We keep the variables we want, sort the data by attributes, and add formats;
proc sort data=temp02 out=temp02s (keep=attr1 - attr8 estBeta stdBeta) nodupkey;
  by attr1-attr8;
  format attr1 attr1f. attr2 attr2f. attr3 attr3f. attr4 attr4f.
         attr5 attr5f. attr6 attr6f. attr7 attr7f. attr8 attr8f.;
run;

**Then we calculate odds ratios and p-values from the estimates and apply labels and formats;
data temp03;
  set temp02s;

  OR = exp(estBeta);
  format OR 8.3;
  chiStat = (estBeta/stdBeta)**2;

  **P-value using Chi SQ Test;
  pval_ChiSq = 1 - probchi(chiStat,1);

  **Apply p-value format;
  pval = put(pval_ChiSq,pval2fmt.);

  label OR="OR*"
        pval = "P-value";
run;
```

```
**We will need to create a reference row;
data refrow;
   length pval $7;
   input OR  pval attr1 attr2 attr3 attr4 attr5 attr6 attr7 attr8;
   datalines;
   1 -- 2 2 1 3 1 4 1 1
   ;
run;

proc sort data=temp03 out=temp03s;
  by OR;
run;

data combine01;
  set refrow
      temp03s;
run;
```

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```
title;
footnote;
title1  &fmt.  "DCE Analysis";
title2  &fmt.  "All Participants (N=100)";
footnote1 &fmt.  "Prepared by X. Do Not Distribute. ";
options nodate nocenter nonumber orientation=landscape;
ods rtf file = "&tbldir.\&program..rtf"  startpage = no notoc_data;

ods rtf startpage=now;
ods rtf text = "^S={outputwidth=100% just=l}{&fmt_title.Table 2. Odds ratios for preference of different profiles, All participants}";
proc print data=combine01 noobs label  split="~" ;
  var attr1 / style(data)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=1.0 in }
              style(header)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=1.0 in};
  var attr2/ style(data)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=1.0 in }
             style(header)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=1.0 in};
  var attr3 attr4 attr5 attr6 attr7 attr8/ style(data)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=1.1 in }
                    style(header)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=1.1 in};
  var OR pval/ style(data)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=0.6 in }
                          style(header)=table{font=("&TextFont.",&TextFS.) just=c asis=on cellwidth=0.6 in};
run;
ods rtf text = "^S={outputwidth=100% just=l font=('Arial',8pt)}*Odds ratio of choosing this profile compared to reference
 profile of the treatment with green color, taken with or without food, with side effects of Treatment A, largest size (11mm),
 fast release, sugar coated, capsule taken once a week.";

ods rtf close;
```

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DCE Analysis
All Participants (N=100)

Table 1. Results of Conditional Logit Model, including odds ratios for preference of attribute levels - All Participants

Parameter	Level	Estimate	SE	Chi-Sq	P-value	OR	Lower 95%	Upper 95%
Color								
	Red	-0.015	0.089	0.029	.87	0.985	0.828	1.173
	Green (reference)	--	--	--	--	--	--	--
	Yellow	0.432	0.089	23.720	<.001	1.541	1.295	1.833
	Blue	0.353	0.103	11.848	<.001	1.423	1.164	1.740
Take with Food								
	Take with Food	-0.039	0.051	0.579	.45	0.962	0.870	1.063
	Take with or without Food (reference)	--	--	--	--	--	--	--
Side effects								
	Side effects from Drug A (reference)	--	--	--	--	--	--	--
	Side effects from Drug B	-0.018	0.051	0.125	.72	0.982	0.888	1.086
Size								
	A (smallest 7mm)	0.438	0.080	29.954	<.001	1.549	1.324	1.812
	B (medium 9 mm)	0.162	0.079	4.202	.040	1.176	1.007	1.374
	C (largest 11 mm) (reference)	--	--	--	--	--	--	--
Drug Release								
	Fast release (reference)	--	--	--	--	--	--	--
	Regular release	-0.012	0.065	0.033	.86	0.988	0.870	1.123
	Delayed release	-0.112	0.080	1.976	.16	0.894	0.765	1.045
Frequency								
	Once a day	-0.047	0.089	0.278	.60	0.954	0.802	1.136
	Twice a day	0.060	0.103	0.341	.56	1.062	0.868	1.298
	Twice a week	-0.062	0.089	0.498	.48	0.939	0.790	1.117
	Once a week (reference)	--	--	--	--	--	--	--
Coating								

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DCE Analysis
All Participants (N=100)

Table 2. Odds ratios for preference of different profiles, All participants

Color	Food required	Side Effects	Size	Drug Release	Frequency	Coating	Capsule or Tablet	OR*	P-value
Green	With or Without Food	Treatment A Side Effects	C. Largest (11mm)	Fast Release	Once a Week	Sugar Coated	Capsule	1.000	--
Red	With or Without Food	Treatment A Side Effects	C. Largest (11mm)	Delayed Release	Twice a Week	Sugar Coated	Tablet	0.746	.062
Red	With Food	Treatment B Side Effects	C. Largest (11mm)	Fast Release	Once a Day	Not Sugar Coated	Tablet	0.746	.073
Green	With Food	Treatment B Side Effects	B. Medium Sized (9mm)	Delayed Release	Twice a Week	Not Sugar Coated	Tablet	0.784	.17
Green	With Food	Treatment A Side Effects	C. Largest (11mm)	Delayed Release	Twice a Week	Sugar Coated	Capsule	0.808	.10
Red	With or Without Food	Treatment A Side Effects	C. Largest (11mm)	Regular Release	Once a Week	Not Sugar Coated	Tablet	0.818	.13
Green	With Food	Treatment A Side Effects	C. Largest (11mm)	Delayed Release	Once a Week	Sugar Coated	Capsule	0.860	.11
Green	With or Without Food	Treatment B Side Effects	C. Largest (11mm)	Regular Release	Once a Day	Not Sugar Coated	Capsule	0.864	.26
Red	With Food	Treatment B Side Effects	C. Largest (11mm)	Fast Release	Twice a Day	Sugar Coated	Tablet	0.890	.47
Red	With Food	Treatment B Side Effects	B. Medium Sized (9mm)	Delayed Release	Once a Day	Sugar Coated	Capsule	0.934	.71
Green	With or Without Food	Treatment B Side Effects	C. Largest (11mm)	Fast Release	Twice a Day	Not Sugar Coated	Capsule	0.972	.82
Green	With Food	Treatment B Side Effects	B. Medium Sized (9mm)	Regular Release	Once a Day	Not Sugar Coated	Capsule	0.977	.88
Green	With or Without Food	Treatment A Side Effects	B. Medium Sized (9mm)	Regular Release	Once a Day	Sugar Coated	Tablet	0.999	>.99
Red	With or Without Food	Treatment A Side Effects	B. Medium Sized (9mm)	Regular Release	Twice a Week	Not Sugar Coated	Capsule	1.003	.99
Red	With or Without Food	Treatment B Side Effects	B. Medium Sized (9mm)	Regular Release	Twice a Day	Not Sugar Coated	Tablet	1.003	.99
Red	With Food	Treatment A Side Effects	B. Medium Sized (9mm)	Fast Release	Once a Week	Sugar Coated	Tablet	1.004	.98
Green	With or Without Food	Treatment B Side Effects	B. Medium Sized (9mm)	Regular Release	Twice a Day	Not Sugar Coated	Tablet	1.018	.91

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