What are...
Discrete Choice Experiments?

Matthew Quaife
Faculty of Public Health and Policy
London School of Hygiene and Tropical Medicine

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Improving health worldwide
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ECONOMICS AND CHOICE
Economics and choice

Resources are scarce and choices must be made

These choices give us information about individual preferences
HOW DO WE OBSERVE CHOICES?
HOW DO WE OBSERVE CHOICES?

**Revealed** Preferences:
“What did you do?”

**Stated** Preferences:
“What would you do?”
HOW DO WE OBSERVE CHOICES?

**Pros:**
- Face validity – people actually make the choice
- Simple to analyse

**Cons:**
- Choices must exist in reality (new products?)
- Hard to get data on alternatives not chosen

**Revealed Preferences:**
“What did you do?”
HOW DO WE OBSERVE CHOICES?

**Revealed** Preferences:
“What did you do?”

**Stated** Preferences:
“What would you do?”
HOW DO WE OBSERVE CHOICES?

Pros:
Flexible – can focus on important tradeoffs
Not limited to existing alternatives

Cons:
Lower external validity – Hypothetical bias?

Stated Preferences:
“What would you do?”
Lancaster’s theory of demand

“The whole is greater than the sum of its parts”

Aristotle, ~300 BC
Lancaster’s theory of demand

exactly

“The whole is greater than the sum of its parts”

Kelvin Lancaster, 1966

Aristotle, ~300 BC
Lancaster’s theory of demand

exactly

“The whole is greater than the sum of its parts”

Kelvin Lancaster, 1966

“The total utility gained from a product or service is the sum of the individual utilities provided by the attributes of that good”

Aristotle, ~300 BC
Discrete Choice Experiments
Discrete Choice Experiments: Brexit

Choice

IN

Vote Leave
## Discrete Choice Experiments: Brexit

<table>
<thead>
<tr>
<th>Choice</th>
<th>Economic impact</th>
<th>GDP increases by 1% per year</th>
<th>GDP increases by 0.5% per year</th>
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</thead>
<tbody>
<tr>
<td>IN</td>
<td></td>
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<td></td>
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<tr>
<td>Vote Leave</td>
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## Discrete Choice Experiments: Brexit

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<th>Choice</th>
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<th>Net Migration</th>
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<tbody>
<tr>
<td><strong>IN</strong></td>
<td>GDP increases by 1% per year</td>
<td>200,000 per year</td>
</tr>
<tr>
<td><strong>Vote Leave</strong></td>
<td>GDP increases by 0.5% per year</td>
<td>150,000 per year</td>
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## Discrete Choice Experiments: Brexit

<table>
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<th>Choice</th>
<th>Economic impact</th>
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<th>Prime Minister</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IN</strong></td>
<td>GDP increases by 1% per year</td>
<td>200,000 per year</td>
<td>David Cameron</td>
</tr>
<tr>
<td><strong>Vote Leave</strong></td>
<td>GDP increases by 0.5% per year</td>
<td>150,000 per year</td>
<td>Michael Gove</td>
</tr>
</tbody>
</table>
# Discrete Choice Experiments: Brexit

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<th>Choice</th>
<th>IN</th>
<th>Vote Leave</th>
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<tbody>
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<td>Economic impact</td>
<td>GDP increases by 1% per year</td>
<td>GDP increases by 1% per year</td>
</tr>
<tr>
<td>Net Migration</td>
<td>300,000 per year</td>
<td>150,000 per year</td>
</tr>
<tr>
<td>Prime Minister</td>
<td>![David Cameron]</td>
<td>![Theresa May]</td>
</tr>
</tbody>
</table>
Discrete Choice Experiments: New HIV Prevention Products

Here are the products and this is what they do. Please select the product you would most prefer.

<table>
<thead>
<tr>
<th>Product</th>
<th>HIV Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Injection</td>
<td>95% risk reduction (19 of 20 people remain HIV negative)</td>
</tr>
<tr>
<td>B Oral PrEP</td>
<td>75% risk reduction (15 of 20 people remain HIV negative)</td>
</tr>
<tr>
<td>C Diaphragm and Microbicide Gel</td>
<td>95% risk reduction (19 of 20 people remain HIV negative)</td>
</tr>
</tbody>
</table>

- Prevents pregnancy
- Does not prevent pregnancy

<table>
<thead>
<tr>
<th>Product</th>
<th>HIV Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condom</td>
<td>95% risk reduction (19 of 20 people remain HIV negative)</td>
</tr>
</tbody>
</table>

- Prevents pregnancy
Discrete Choice Experiments: Essay Cheating

<table>
<thead>
<tr>
<th></th>
<th>Buy Essay 1</th>
<th>Buy Essay 2</th>
<th>Buy Essay 3</th>
<th>Buy None of Them</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price of Essay</td>
<td>£100</td>
<td>£75</td>
<td>£100</td>
<td></td>
</tr>
<tr>
<td>Risk of Being Caught</td>
<td>1 in 100</td>
<td>1 in 100</td>
<td>1 in 1000</td>
<td></td>
</tr>
<tr>
<td>Penalty if Caught</td>
<td>Repeat the Year</td>
<td>0% for the Unit</td>
<td>Repeat the Year</td>
<td></td>
</tr>
<tr>
<td>Quality of the Essay</td>
<td>1st Class</td>
<td>2(i)</td>
<td>3rd Class</td>
<td></td>
</tr>
</tbody>
</table>

What would you do? Tick one option (✓)

- 
- 
- 
- 
-
Results

• Attribute preferences
  – “What is the most important attribute of the Brexit choice?”
Results

• Attribute preferences
  – “What is the most important attribute of the Brexit choice?”
Results

• Attribute preferences
  – “What is the most important attribute of the Brexit choice?”

• Demand forecasts (market share)
  – “How many people will vote to leave?”
Demand forecasts (market share)
Results

• Attribute preferences
  – “What is the most important attribute of the Brexit choice?”

• Demand forecasts
  – “How many people will vote to leave?”

• Willingness to pay
  – “How much would GDP need to increase by for you to accept a migration increase of 100,000?”
Summary: Advantages of DCEs

• Provide policy relevant information
  – What is important to people?
  – How might people trade-off between attributes?
  – Simulation of possible scenarios
Summary: Advantages of DCEs

• Provide policy relevant information
  – What is important to people?
  – How might people trade-off between attributes?
  – Simulation of possible scenarios

• Basic results easy to interpret
  – Well received by policy makers

• Easy for participants to understand
  – Mimic real choice behaviour
Summary: Disadvantages of DCEs

• Hypothetical choices
  – Limited external validity?
• Simplified (simplistic?) approach to choices
Summary: Disadvantages of DCEs

• Hypothetical choices
  – Limited external validity?
• Simplified (simplistic?) approach to choices
• Complex to design and analyse
• Cognitively demanding surveys
  – Heuristics, fatigue, etc.
Questions?

@matthew_quaife
matthew.quaife@lshtm.ac.uk
References


Image Credits:
- Theresa May: http://cdn.quotationof.com/images/theresa-may-3.jpg
- Michael Gove: https://i.guim.co.uk/img/static/sys-images/Guardian/Pix/pictures/2014/7/15/1405423652338/Michael-Gove-011.jpg?w=620&q=55&auto=format&usm=12&fit=max&s=2bf0f97f3114cf706aa46721755da88d
# Methods for Eliciting Preferences

## QUANTITATIVE TECHNIQUES

<table>
<thead>
<tr>
<th>Ranking Techniques</th>
<th>Rating Techniques</th>
<th>Choice-Based Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Simple ranking</td>
<td>• Likert scale</td>
<td>• Simple choice exercises</td>
</tr>
<tr>
<td>• Qualitative discriminant process</td>
<td>• Visual analogue scale</td>
<td>• Discrete Choice Experiments</td>
</tr>
<tr>
<td>• Conjoint analysis</td>
<td>• Guttman scales</td>
<td>• Analytic hierarchy process</td>
</tr>
<tr>
<td></td>
<td>• Conjoint analysis</td>
<td>• Standard gamble</td>
</tr>
<tr>
<td></td>
<td>• Semantic differential technique</td>
<td>• Time trade-off</td>
</tr>
<tr>
<td></td>
<td>• Satisfaction surveys</td>
<td>• Willingness to pay</td>
</tr>
<tr>
<td></td>
<td>• SERVQUAL</td>
<td>• Allocation of points</td>
</tr>
</tbody>
</table>

## QUALITATIVE TECHNIQUES

<table>
<thead>
<tr>
<th>Individual Approaches</th>
<th>Group Approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>• One-to-one interviews</td>
<td>• Focus groups</td>
</tr>
<tr>
<td>• Dyadic interview</td>
<td>• Concept mapping</td>
</tr>
<tr>
<td>• Case study analysis</td>
<td>• Citizen juries</td>
</tr>
<tr>
<td>• Delphi technique</td>
<td>• Consensus panels</td>
</tr>
<tr>
<td>• Complaints procedures</td>
<td>• Public meetings</td>
</tr>
<tr>
<td></td>
<td>• Nominal group techniques</td>
</tr>
</tbody>
</table>
RANK the Importance of the following FIVE factors in your choice of a laptop from 1 (Most Important) to 4 (Least Important):

<table>
<thead>
<tr>
<th>Rank</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Power</td>
</tr>
<tr>
<td>2.</td>
<td>Weight</td>
</tr>
<tr>
<td>3.</td>
<td>Battery life</td>
</tr>
<tr>
<td>4.</td>
<td>Price</td>
</tr>
</tbody>
</table>
Ranking of factors

Price: 2.38
Power: 2.50
Weight: 2.56
Battery life: 2.56

Average Rank (95%CI)
Limitations of ranking

• No relative strength of preferences
• Unclear implementation of decision rule from results
Information obtained in a DCE

\[ V = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_k X_k \]

Where

- \( \alpha \): alternative-specific constant
- \( X_j \): attributes
- \( \beta_j \): parameters (relative importance of attributes)
Discrete Choice Model Estimation

Individuals maximise $U_{ij}$ which is composed of and explainable systematic component $V_{ij}$ and a random component $\varepsilon_{ij}$:

$$U_{ij} = V_{ij} + \varepsilon_{ij}$$

Where:

$$V_{ij} = \beta_1 X_{1j} + \beta_2 X_{2j} + \beta_3 Z_{3j} + \ldots + \beta_k X_{kj} + \beta_k Z_{kj}$$

Where each $\beta$ term represents the weight that individual $n$ places on the corresponding design attributes $X_{kj}$. $Z_{kj}$ represents individual socio-demographic characteristics.

According to random utility theory (RUT) we assume that individuals choose alternative such that they maximise utility.
Estimation – Multinomial logit

\[ p_{ij} = \frac{\exp(X'_j \beta)}{\sum_{q=1}^{J} \exp(X'_q \beta)} \]

• Assumptions:
  – All errors independent and follow type-1 extreme distribution
  – Error terms and choice probabilities subject to iia restriction
  – Does not account for heterogeneity in preferences across individuals

• Computationally quick and easy to run, good to scope out model structure

• MNL (or nested logit) unlikely to be acceptable final model
Estimation – Random parameter logit (mixed logit)

The mixed logit model explicitly accounts for respondent heterogeneity in value judgements, allowing parameters to vary by respondent, $i$, such that:

$$\beta_{ki} = \bar{\beta}_k + \eta_{ki}$$

Where $\bar{\beta}_k$ is the population mean and $\eta_{ki}$ the individual deviation representing heterogeneity in value judgements.

- Introduces random parameters
  - Accounts for heterogeneity
  - Allows for correlation across error terms, negates requirement for iia assumption
Historical Development of DCEs

• Origins
  – Psychometrics (conjoint analysis)
  – Econometrics (choice modelling)

• Application
  – Market research
  – Transport economics
  – Environmental economics
  – Health economics (Late 1990s)
Applications of DCE in health

• Valuing patients’ preferences
  – Patients’ experience factors vs. health outcomes
  – WTP for QALY

• Patients’ service preferences

• Pharmaceutical industry

• Service providers’ treatment preferences

• Labour supply decisions
Steps in DCE studies

1. DCE design

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>LEVELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Whether the practice is open at lunchtime (12-2pm)</td>
<td>* Never * Sometimes</td>
</tr>
<tr>
<td>2. Whether the practice has extended opening hours</td>
<td>* Yes * No</td>
</tr>
<tr>
<td>3. How quickly you can normally be seen by a GP in this practice</td>
<td>* Same day * Next day * A few days later * A week or more</td>
</tr>
</tbody>
</table>

2. Experimental design

<table>
<thead>
<tr>
<th>set</th>
<th>r0</th>
<th>r1</th>
<th>r2</th>
<th>u0</th>
<th>u1</th>
<th>u2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
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<td>2</td>
<td>4</td>
<td>2</td>
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<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
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<td>2</td>
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</tr>
<tr>
<td>8</td>
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<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
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</table>

3. Survey

4. Data

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
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<tr>
<td>0</td>
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5. Analysis