Probabilistic attribute presentation in discrete choice experiments: a review of current practice

Gabriela S. Fernandez[1], Saudamini Oke[2], Matt Quaife[2,3]

[1]Thermo Fisher Scientific, Waltham, MA, USA
[2]London School of Hygiene and Tropical Medicine, London, UK
[3]Thermo Fisher Scientific, London, UK

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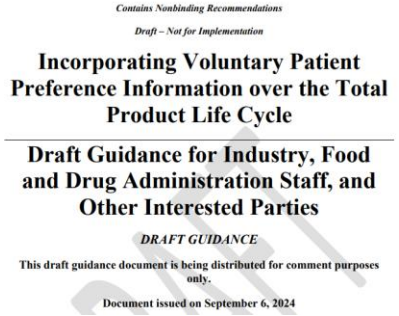
Background

- Discrete choice experiments (DCE) quantitatively assess trade-offs people are willing to make between distinct attributes of a treatment/healthcare-related intervention

- Risk communication has been a topic of research dating back to the 1970s, with participant understanding shown to be variable:[1-6]
  - Individuals are found to struggle with understanding risk (‘collective statistical illiteracy’)
  - Individuals’ perception of risk is found to be highly context and framing dependent
  - Individuals’ sensitivity and perception of risk depend on its magnitude (scope bias)
  - There is little understanding of the difference between absolute and relative risk



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DRAFT GUIDANCE

This draft guidance document is being distributed for comment purposes only.

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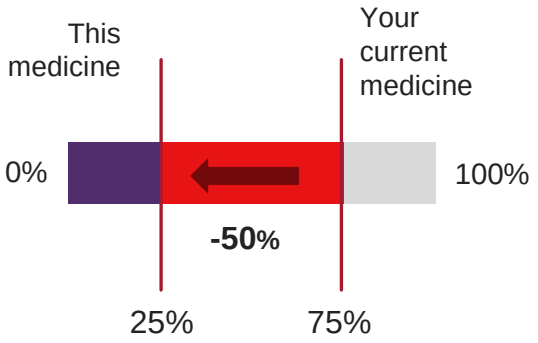
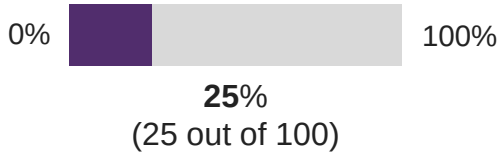
While there is not a universally recommended format for probabilistic attribute presentation, the FDA suggests some practices including:[7]

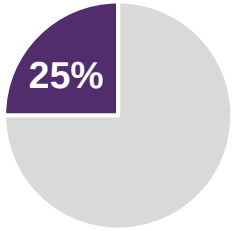
- Avoiding verbal-only descriptions of uncertainty
- Avoiding the use of fractions, decimals, or differing denominators in risk presentation
- Using an absolute scale for benefits and risks presentation rather than relative terms
- Using multiple sources of framing, including text descriptions and a pictograph/icon array
- Describing uncertainty using both positive and negative framing when possible

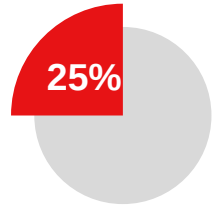
Examples of Graphic Representations

- DCEs often require probabilistic information to be represented visually to represent these attributes
- There are many possible ways to visually represent probabilities. For example, 25% can be represented as:



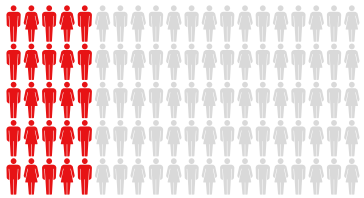






25%

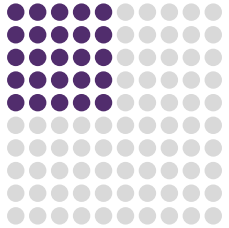
1 in **4** patients (25%)



25 out of **100** (**25**%)

25 out of **100** (**25**%)

25 out of **100** (**25**%)



25 out of **100** (**25**%)

25%
Female patients

25%
Male patients

Examples of Probabilistic Attribute Framing

There are many ways to frame a probabilistic attribute:

Framing	Example
Percentage	25%
Proportion	25 out of 100 people
Proportion with percentage	25 out of 100 people (25%)
Percentage with description	25% experience side effects
Proportion with description	25 out of 100 people experience side effects
Proportion with percentage and description	25 out of 100 people (25%) experience side effects 75 out of 100 people (75%) do not experience side effects
Fraction with description	25/100 experience side effects
Fraction with percentage	25/100 (25%)

Objectives

- Two previous reviews[8,9] found that:
  - Generally, DCEs with risk attributes often use the appropriate basic risk information (absolute risks) and visual aids (icon/dot arrays)
  - The use of icon arrays in DCEs with risk attributes is increasing over time
    - Studies have shown use of icon arrays improved comprehension when compared with numbers only, including overall comprehension and comprehension of absolute and relative risk/risk reduction
  - Visual risk communication strategies additionally help participants with low health literacy interpret risk information and promote risk knowledge
    - For example, understanding of risk reduction is improved when visuals include the entire population at risk

- **This study aimed to synthesize current practices in presenting probabilities in DCEs and report how attributes were framed and presented.**

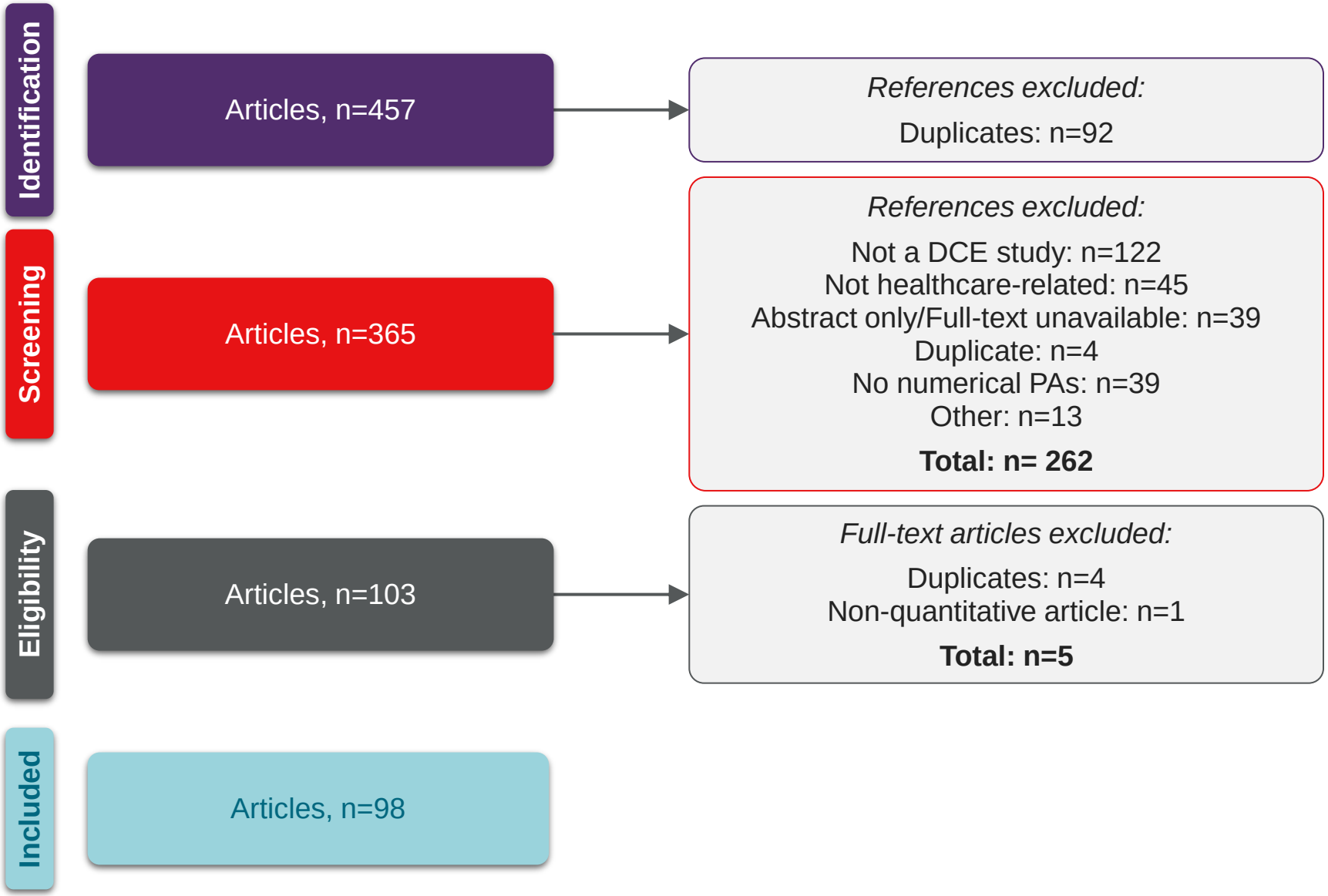
Abbreviations: DCE = discrete choice experiment

Methods

- We identified all DCEs of health-related interventions published between October 2022 through August 2024 that included probabilistic attributes
- Articles were identified from Medline, Embase, Web of Science, EconLit, and PsychINFO, with titles/abstracts and full texts subsequently screened. Ten percent of titles and abstracts and all full texts were double-screened by two researchers, with conflicts resolved by a third
- Relevant studies were double-extracted by two researchers using a prespecified framework

Abbreviations: DCE = discrete choice experiment

PRISMA

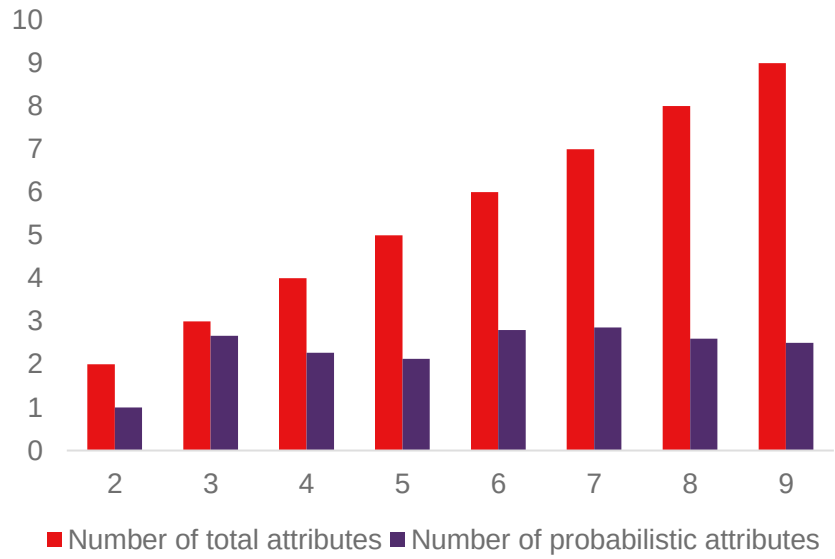


Abbreviations: DCE = discrete choice experiment; PA = probabilistic attribute

Results (1 of 2)

Data from **98** studies were extracted

- DCEs spanned a range of therapeutic areas, most commonly:
  - **30%** Oncology
  - **11%** Endocrinology
  - **7%** Dermatology
- Most studies included patients (**83**%) and were focused on assessing treatment preferences (**81**%).
  - **83%** Four-fifths reported some sort of pretesting
- The majority of DCEs included 5–7 attributes (**70%**) and 1–3 probabilistic attributes (**77%**)



Abbreviations: DCE = discrete choice experiment

Results (2 of 2)

More DCEs included probabilistic risk attributes (**85%**) than probabilistic benefit attributes (**64%**)

- Risks were most frequently presented as proportions alongside percentages (37%), and benefits most frequently as percentages only (30%)
  - **25** out of **100** (**25%**) vs 25%
- All risk attributes used absolute framing, whereas 16% of benefit attributes used relative framing
  - **25%** vs 25% reduction

Graphics were used more often to present risks than benefits;

59% vs 46%

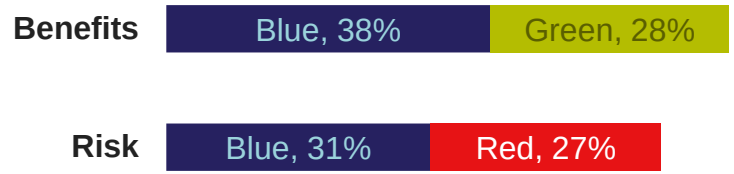
within these, arrays of person-like figures were used

72% vs 71%

Risks Benefits

80% of benefits and **87%** of risks use exclusively male figures to represent results

Colors most frequently used for risks and benefits



Abbreviations: DCE = discrete choice experiment

Summary of Findings

- There has been improvement in probabilistic attribute presentation over time
  - For example, 64% of reviewed DCEs included icon arrays compared with 21% in the Richter et al. literature review
- Generally, healthcare-related DCEs follow best practice designs but there is still room for improvement
  - Inclusivity within icon array use for DCEs appeared more limited, with 61% of icon arrays using exclusively male figures
  - Eighty-three percent of studies mentioned the use of pretesting and/or pilot testing, despite FDA recommendations for the critical nature of testing

Abbreviations: DCE = discrete choice experiment

Implications

- Use of icon arrays alongside verbal presentations can be considered the current “gold standard” for presenting probabilistic attribute presentations
- Pre-testing is essential for validating DCE design prior to instrument fielding

- Optimization of verbal framing, format and color use for icon arrays, and communication of benefits attributes are all areas identified where further research would be valuable to support critical DCE design decisions

Abbreviations: DCE = discrete choice experiment

Disclosures

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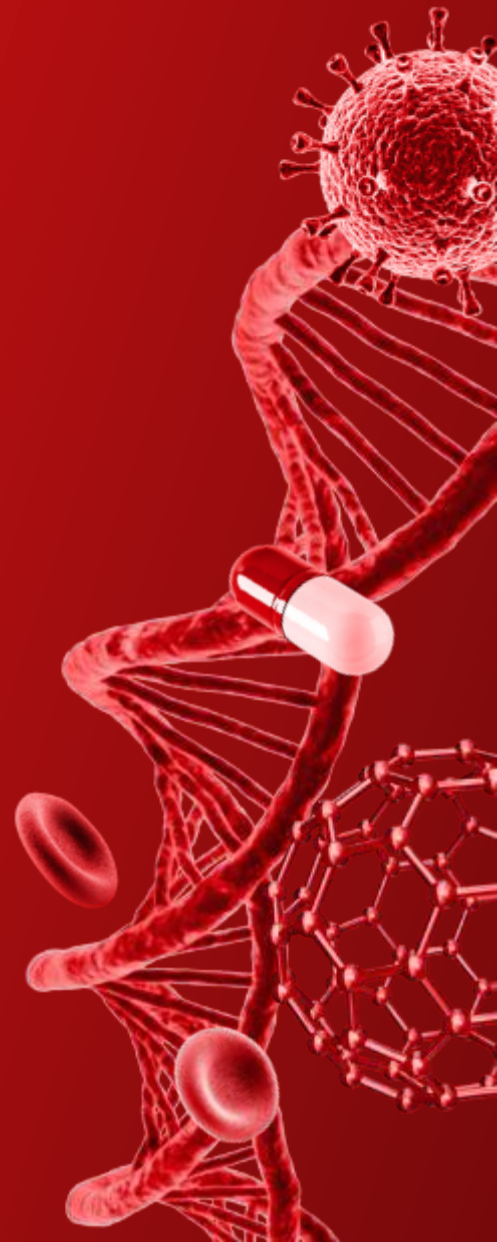
Thank you



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