

A Discrete Choice Analysis Comparing Sugar Labels and Warnings of Selecting Sugar-Sweetened Beverage Among Hong Kong Adults

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Background

Excess consumption of sugar-sweetened beverages contributes to obesity and non-communicable diseases. Although front-of-package labels may facilitate healthier choices, evidence comparing warning formats, icon formats, and price within the same choice environment remains limited in affluent Asian settings.

Objective

To quantify Hong Kong adults’ relative preferences for sugar-warning labels, icon labels, and price in beverage choice, and to examine predicted choice probabilities and preference heterogeneity.

Methods

Cross-sectional, web-based discrete choice experiment among **536** adults in Hong Kong who had consumed sugar-sweetened beverages in the preceding month.

1 Participants

- Qualtrics online panel
- Age/sex quota sampling by HK census 2025
- Hong Kong residents aged ≥18 years
- English or traditional Chinese literacy

2 Experimental design

- D-efficient fractional factorial design by Ngene
- 48 choice sets divided into 4 blocks
- Participants randomly assigned to 1 of 4 blocks
- 12 tasks completed per respondent

3 Choice task

- 5 beverage alternatives plus opt-out
- 4 Attributes: price, sugar contents, icon label, warning label

4 Statistical analysis

- Combination-variable conditional logit model with an opt-out alternative.
- Because sugar warning label was applied only to high-sugar beverages, sugar content and warning-label status were jointly coded as five feasible profiles: low sugar, medium sugar, high sugar without warning, high sugar with text warning, and high sugar with graphic warning.

$$V_{njt} = \beta_1 Price_{njt} + \beta_2 Icon_{njt} + \beta_3 Low_{njt} + \beta_4 Medium_{njt} + \beta_5 HighText_{njt} + \beta_6 HighGraphic_{njt} + \beta_7 OptOut_{njt}$$

Outputs: ORs and 95% CIs

- Relative importance
- Predicted probabilities
- Preference heterogeneity

What respondents saw

Please select the one product you are most likely to purchase from the following, or choose 'Not purchasing'.



☐ Lime Soda Water
HKD 5.0



☐ Kyoho Grape Juice
HKD 5.5



☐ Vita Lemon Tea
HKD 5.5



☐ UCC Low Sugar Coffee
HKD 6.0



☐ Electrolyte Drink
HKD 11.0

☐ Not Purchasing

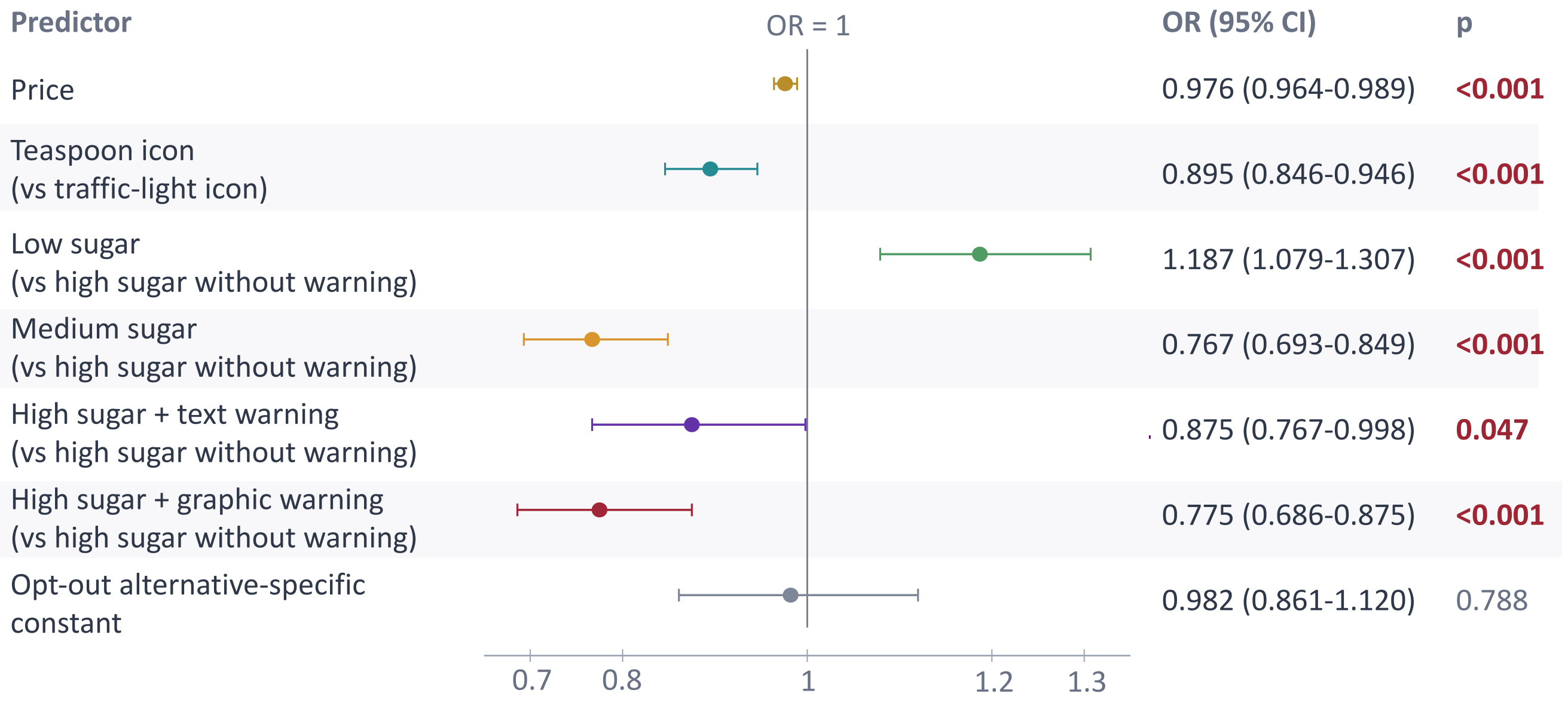
Main Results

Participant Characteristics

536 respondents | Mean age 39.7 years | 49.6% female | 86.2% college-educated or above

Attribute Preferences

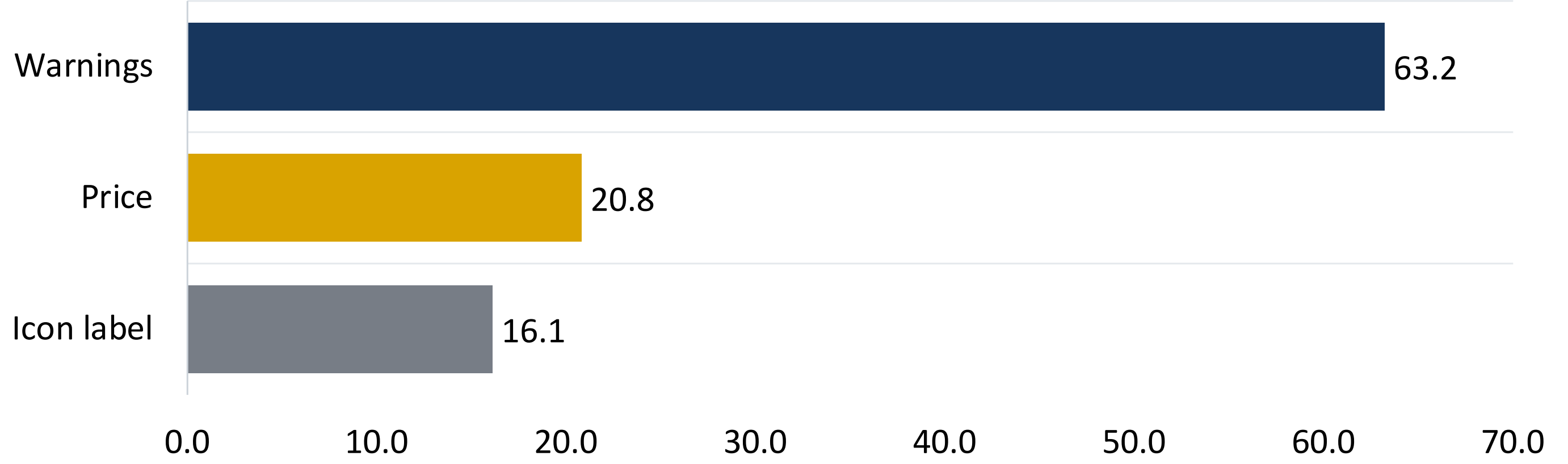
- Sugar–warning label and price were the most important attributes shaping beverage choice, whereas icon label contributed less.
- Relative to high-sugar beverages without warning, both text and graphic warning labels were associated with lower relative preference for high-sugar beverage profiles.
- The graphic-warning estimate was numerically stronger than the text-warning estimate, although their direct difference was not statistically significant (OR = 0.866, p=0.066).



References: high sugar without warning; traffic-light icon. Two-sided P values. OR=odds ratio.

Relative importance

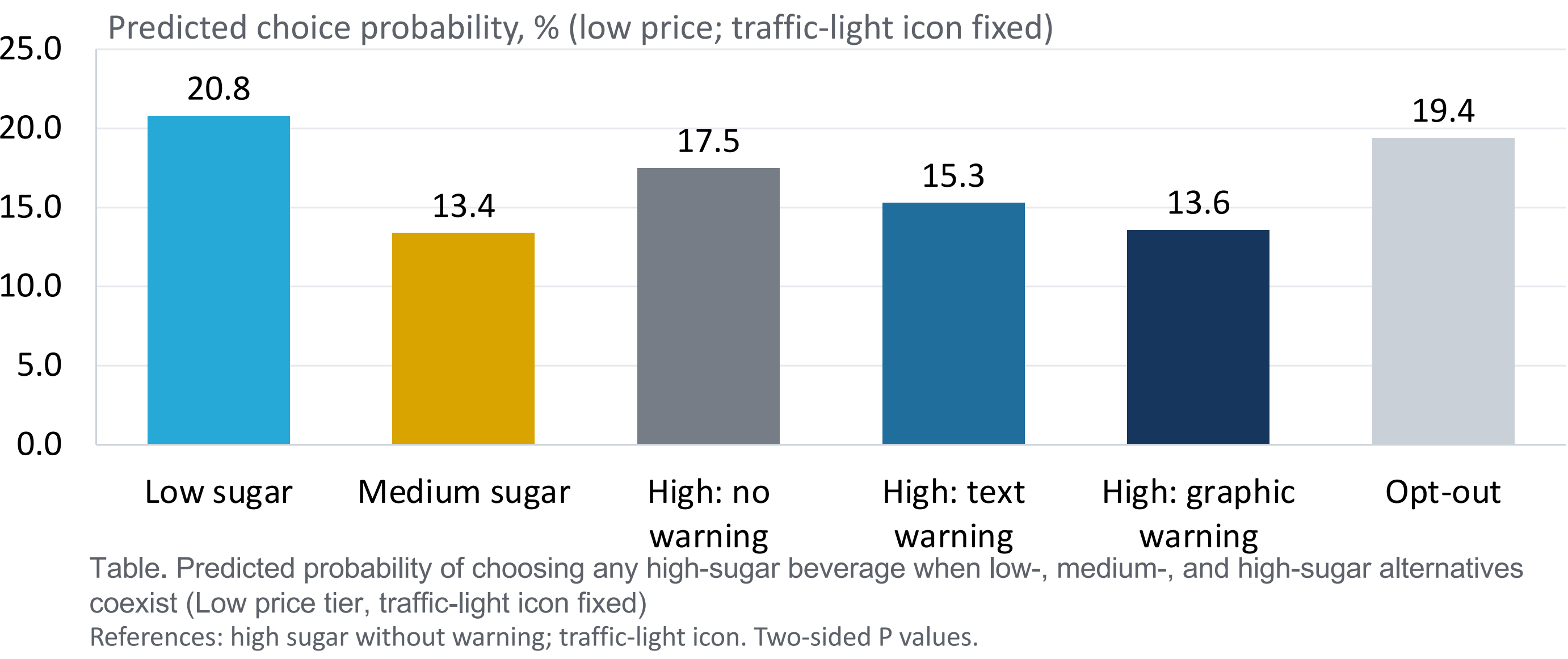
Respondents placed greatest weight on the combined sugar-warning profile when making beverage choices (63.2%), while icon format contributed comparatively less (16.1%).



Note: Relative importance calculated from utility ranges in the main model. Price utility range used observed within-choice-set price variation across beverage categories.

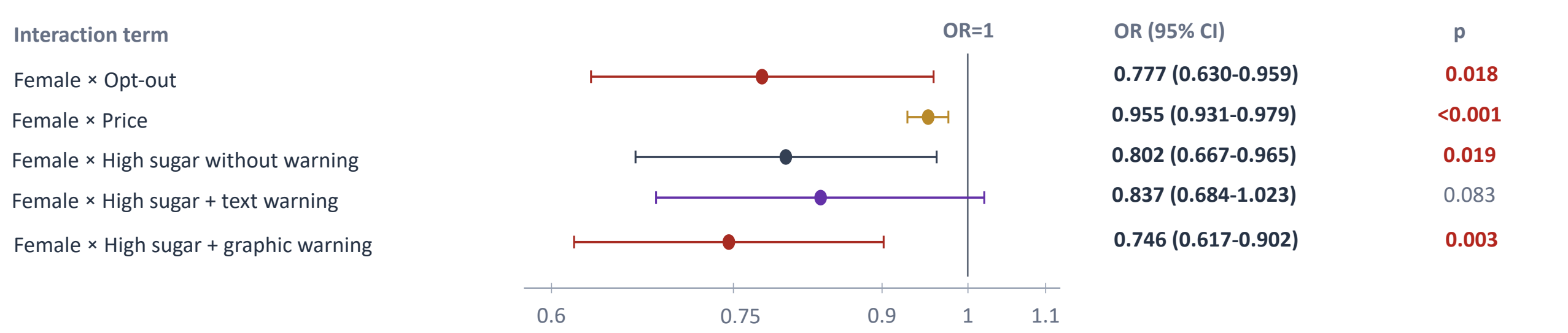
Modelled Coexistence Scenario

Low-sugar beverages showed the highest purchasing probability overall; Predicted probability of high-sugar beverages, no warning > text warning > graphic warning.



Preference Heterogeneity

- Preference heterogeneity was more evident for opt-out behaviour and price sensitivity than for warning-label preferences.
- Female and higher-income respondents were more price-sensitive, while respondents aged ≥40 years were more likely to opt out.
- Example: Women were less likely to opt out, price-sensitive, showed lower relative preference for selected high-sugar beverages and high-sugar beverages with graphic warning.



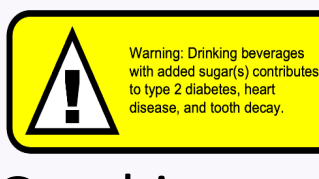
Note. This subgroup model simultaneously included the interaction terms shown above, in addition to the main combination-variable model terms. Female respondents were compared with male respondents.

Conclusion & Policy Implication

- Sugar–warning label** and **price** are the most important attributes shaping beverage choice
- Both text and graphic warning labels are associated with lower relative preference for high-sugar beverage profiles compared with no warning.
- When lower-sugar alternatives coexist in the same choice set, high-sugar beverages occupy a weaker competitive position in the presence of warning labels, and this position is further weakened by higher prices and, to a lesser extent, by the teaspoon icon.
- The policy relevance of warning labels in this setting therefore lies in their association with lower relative preference for high-sugar beverages and their potential to shift choices toward more favourable alternatives within realistic competitive environments.

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DCE Attributes and Levels

Attribute	Levels	Operational Definition / Description
Sugar Content	1. Low sugar 2. Medium sugar 3. High sugar	≤ 5g/100mL > 5g to 8 g/100mL > 8g/100mL (Threshold for warning labels)
Price (per unit)	1. HKD 5.0 2. HKD 5.5 3. HKD 6.0	Baseline price (market average) 10% price increase (simulated tax) 20% price increase (simulated tax)
Sugar Label 1 (Information Icon)	1. Traffic Light Icon  2. Teaspoon Icon 	Applied to all products. Color-coded (Red/Amber/Green) based on sugar levels. Applied to all products. Displays number of teaspoons of sugar.
Sugar Label 2 (Warning Label)	1. No label 2. Plain text warning  3. Graphic warning 	Reference level (no additional warning). Applied only to High Sugar beverages; text-only hazard warning. Applied only to High Sugar beverages; pictorial + text warning.
Beverage Type (Alternative Specific)	1. Soft drink/Soda 2. Flavored juice 3. Sweetened tea 4. Sweetened coffee 5. Energy drink	Participants chose between these 5 distinct categories or selected a "Not purchasing" (opt-out) option.