

Supplementary Data — You Can't Have Your Cake and Eat it Too: The Paradox of the American Public Supporting Road Safety But Reluctant to Pay the Price – Evidence from A Discrete Choice Experiment

Emmanuel F. Drabo, MPhil, PhD,¹ Johnathon P. Ehsani, PhD,^{1,2} Shannon Frattaroli, PhD, MPH,^{1,2} Keshia M. Pollack Porter, PhD, MPH,^{1,2} and Jeffrey P. Michael, EdD^{1,2}

¹ Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

² Johns Hopkins Center for Injury Research and Policy, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

A. Appendix A: Design of the Discrete Choice Experiments (DCEs)

A.1. Efficient Fractional Factorial Design

For both DCEs, we used an efficient fractional factorial design which maximized D-efficiency. D-efficiency measures the goodness of a design relative to a hypothetical orthogonal design and is function of the number of points in the design, independent variables in the model, and the maximum standard error prediction over the design points. With this chosen efficient design, we could estimate all main effects and some two-way interactions between attributes.

A.2. DCE Questionnaire Prompts and Examples of Choice Profiles

Figure 1. Example of choice scenario included in DCE: Web-based survey.

For the following questions, we would like you to assume that you are in charge of government decisions for your community and tell us how you would make the following choices about road safety.

Suppose that your community averages 100 traffic deaths per year.

The budget you control pays for road maintenance and improvements, and also for other public programs such as replacing aging city water pipes.

You can adjust speed limits for all roads in your community and decide whether to use more or less of your city budget to improve road safety. Your decisions will affect everyone in the community, including you.

If you had to choose between option A and option B below, which would you select?

Attributes	Option A	Option B
Speed limits in your community	Same speed limits as now	Same speed limits as now
Public spending in your community	More on road safety and less on healthier water	Less on road safety and more on healthier water
Resulting number of annual traffic deaths in your community	25 fewer deaths per year	25 more deaths per year

1. I would prefer Option A
2. I would prefer Option B
3. I would prefer neither of these options

Figure 2. Example of choice scenario included in DCE: Phone-based survey.

For the following questions, we would like you to assume that you are in charge of government decisions for your community and tell us how you would make the following choices about road safety.

Suppose that your community averages 100 traffic deaths per year.

The budget you control pays for road maintenance and improvements, and also for other public programs such as replacing aging city water pipes.

You can adjust speed limits for all roads in your community and decide whether to use more or less of your city budget to improve road safety. Your decisions will affect everyone in the community, including you.

If you had to choose between option A and option B below, which would you select?

Option A: Same speed limits as now, spend more on road safety and less on healthier water, resulting in 25 fewer deaths per year.

Option B: Same speed limits as now, spend less on road safety and more on healthier water, resulting in 25 more deaths per year.

1. You would prefer Option A
2. You would prefer Option B
3. You would prefer neither of these options

B. Appendix B: Additional Results

Table 1. Results from the pilot test of the DCE survey instrument.

Policy Attributes and Levels	Support for Policy	
	MNL, Est. (95% CI)	MIXL/RPL, Est. (95% CI)
Estimated Coefficients		
Opt-out ASC (ref. Support for policy)	-0.082 (-0.555, 0.391)	-0.952** (-1.831, -0.073)
Speed limit, mph	-0.001 (-0.036, 0.035)	-0.009 (-0.068, 0.049)
Traffic fatalities, n	-0.049*** (-0.067, -0.030)	-0.077*** (-0.117, -0.038)
Public Spending (ref. Same as now)		
Less on road safety	0.515 (-0.146, 1.176)	0.792 (-0.194, 1.778)
More on road safety	-0.999*** (-1.609, -0.389)	-1.719*** (-2.802, -0.636)
SD of random parameters distributions		
Opt-out ASC (ref. Support for policy)		2.255*** (1.423, 3.088)
Speed limit, mph		0.091** (0.017, 0.166)
Traffic fatalities, n		0.048*** (0.011, 0.084)
Observations	198	198
Respondents	22	22
Choice scenarios	9	9
Alternatives	3	3
Log Likelihood	-182.777	-144.210
McFadden Pseudo-R-squared	0.159	0.241
Akaike Information Criterion (AIC)	375.553	304.421
Bayesian Information Criterion (BIC)	391.994	328.328

Abbreviations: DCE, discrete choice experiment; MNL, multinomial logit model; MIXL, mixed logit model; RPL, random parameter logit model; CI, confidence interval; SD, standard deviation.

Notes: Statistical significance: *p<0.1; **p<0.05; ***p<0.01.

Table 2. Americans' preferences for safe system approaches to road safety – based on the unrestricted sample (n=2,060)

Variables	Conditional Logit Models		Random Parameter Logit Models	
	Model 1 Est. (95% CI)	Model 2 Est. (95% CI)	Model 3 Est. (95% CI)	Model 4 Est. (95% CI)
Random parameters (OR)				
Opt-out ASC (ref. Support for policy)	1.31*** (1.25, 1.37)	0.70** (0.55, 0.88)	0.65*** (0.62, 0.69)	0.18*** (0.14, 0.23)
Speed limit, mph	0.99*** (0.98, 0.99)	0.99*** (0.98, 0.99)	0.98*** (0.98, 0.98)	0.98*** (0.98, 0.98)
Avoided traffic fatalities, n	0.97*** (0.97, 0.97)	0.97*** (0.97, 0.97)	0.96*** (0.96, 0.97)	1.04*** (1.04, 1.05)
Public spending in community (ref. Same as now)				
Less on road safety, more on healthier water	2.65*** (2.50, 2.80)	2.67*** (2.52, 2.82)	3.16*** (3.02, 3.31)	3.16*** (3.02, 3.31)
More on road safety, less on healthier water	1.13*** (1.06, 1.19)	1.13*** (1.06, 1.20)	1.17*** (1.12, 1.22)	1.17*** (1.12, 1.22)
Interactions with the Opt-out ASC (OR)				
Age group, y (ref. 18-29)				
30-44	–	1.00 (0.90, 1.11)	–	0.93 (0.82, 1.04)
45-59	–	1.28*** (1.14, 1.44)	–	1.39*** (1.25, 1.54)
≥60	–	1.23** (1.08, 1.40)	–	1.47*** (1.33, 1.64)
Female (ref. Male)	–	1.29*** (1.21, 1.38)	–	1.63*** (1.52, 1.75)
Race and ethnicity (ref. Non-Hispanic White)				
Non-Hispanic Black	–	1.16** (1.05, 1.29)	–	0.99 (0.89, 1.11)
Non-Hispanic Other	–	1.85*** (1.42, 2.43)	–	3.50*** (2.51, 4.88)
Hispanic	–	0.92+ (0.84, 1.01)	–	0.82*** (0.74, 0.90)
Non-Hispanic Multiple	–	0.38*** (0.30, 0.47)	–	0.17*** (0.12, 0.22)
Non-Hispanic Asian	–	1.09 (0.93, 1.29)	–	1.07 (0.92, 1.25)
Education (ref. Less than High School)				
Highschool graduate or equivalent	–	1.41*** (1.20, 1.65)	–	2.67*** (2.35, 3.03)
Bachelor's degree or equivalent	–	1.12 (0.97, 1.30)	–	1.83*** (1.61, 2.09)
Post-graduate study or professional degree	–	1.00 (0.85, 1.18)	–	1.54*** (1.32, 1.80)
Married (ref. Not married)	–	1.01 (0.94, 1.09)	–	0.93* (0.86, 1.00)
Employed Status (ref. Unemployed)				
Employed	–	1.10 (0.96, 1.26)	–	1.27** (1.07, 1.50)
Not in the labor force	–	1.24** (1.07, 1.44)	–	1.39*** (1.17, 1.66)
Household Income, \$ (ref. <30,000)				
30,000-59,999	–	1.37*** (1.24, 1.51)	–	1.52*** (1.39, 1.65)
60,000-99,999	–	1.31*** (1.18, 1.46)	–	1.45*** (1.32, 1.58)
≥100,000	–	1.15* (1.02, 1.28)	–	1.23*** (1.10, 1.37)
Number of children <18 y, n	–	1.04** (1.01, 1.06)	–	1.08*** (1.04, 1.12)
Region, (ref. Northeast)				
Midwest	–	0.82*** (0.74, 0.92)	–	0.66*** (0.59, 0.73)
South	–	0.81*** (0.73, 0.90)	–	0.73*** (0.67, 0.79)
West	–	0.87* (0.78, 0.98)	–	0.81*** (0.74, 0.89)
Metropolitan area (ref. Nonmetropolitan area)	–	1.06 (0.96, 1.17)	–	1.23*** (1.12, 1.34)
Heterogeneity in the mean random parameters (SD)				
Opt-out ASC	–	–	13.86*** (12.92, 14.87)	13.21*** (12.24, 14.25)
Speed limit, mph	–	–	1.00 (0.98, 1.01)	1.00 (0.98, 1.01)
Avoided traffic fatalities, n	–	–	1.01*** (1.01, 1.01)	1.01*** (1.01, 1.01)
Public spending in community (ref. Same as now)				
Less on road safety, more on healthier water	–	–	1.04 (0.85, 1.28)	1.03 (0.83, 1.28)
More on road safety, less on healthier water	–	–	1.05 (0.90, 1.22)	1.04 (0.87, 1.25)
Observations	18,540	18,540	18,540	18,540
Number of respondents	2,060	2,060	2,060	2,060
Number of choice tasks per respondent	9	9	9	9
Log-likelihood	-19,117	-18,897	-16,149	-16,101
McFadden Pseudo R-squared	0.060	0.071	0.079	0.082
Wald Chi-squared	2,453***	2,893***	3,159***	2,720***
Akaike information criterion (AIC)	38,244	37,851	32,317	32,267

Abbreviations: Est., estimate; OR, odds ratios; CI, confidence interval; ASC, alternative-specific constant; SD, standard deviation.

Notes: Sample consists of survey participants who completed all required choice tasks. Estimates are reported as odds ratios (OR) for the means of the parameters, and as standard deviations (SD) for the heterogeneity in the mean random parameters. Robust standard errors in parenthesis. Statistical significance, + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 3. Americans' preferences for safe system approaches to road safety – based on the partially restricted sample (n=540)

Variables	Conditional Logit Models		Random Parameter Logit Models	
	Model 1 Est. (95% CI)	Model 2 Est. (95% CI)	Model 3 Est. (95% CI)	Model 4 Est. (95% CI)
Random parameters (OR)				
Opt-out ASC (ref. Support for policy)	1.37*** (1.24, 1.50)	2.47*** (1.48, 4.10)	0.75*** (0.67, 0.84)	2.16** (1.33, 3.51)
Speed limit, mph	0.98*** (0.97, 0.99)	0.98*** (0.97, 0.98)	0.97*** (0.97, 0.98)	0.97*** (0.97, 0.98)
Avoided traffic fatalities, n	1.04*** (1.04, 1.04)	1.04*** (1.04, 1.04)	1.04*** (1.04, 1.05)	1.05*** (1.04, 1.05)
Public spending in community (ref. Same as now)				
Less on road safety, more on healthier water	3.39*** (3.03, 3.80)	3.47*** (3.09, 3.89)	4.08*** (3.71, 4.49)	4.10*** (3.72, 4.51)
More on road safety, less on healthier water	1.15* (1.02, 1.29)	1.15* (1.03, 1.30)	1.19*** (1.09, 1.30)	1.20*** (1.09, 1.31)
Interactions with the Opt-out ASC (OR)				
Age group, y (ref. 18-29)				
30-44	–	1.38* (1.06, 1.79)	–	1.42** (1.09, 1.85)
45-59	–	1.40* (1.06, 1.84)	–	1.41** (1.10, 1.80)
≥60	–	1.40* (1.06, 1.85)	–	1.33* (1.03, 1.70)
Female (ref. Male)	–	1.13+ (0.98, 1.30)	–	1.39*** (1.21, 1.60)
Race and ethnicity (ref. Non-Hispanic White)				
Non-Hispanic Black	–	1.64*** (1.30, 2.08)	–	1.79*** (1.32, 2.43)
Non-Hispanic Other	–	0.68 (0.25, 1.89)	–	1.20 (0.62, 2.32)
Hispanic	–	1.09 (0.88, 1.35)	–	1.03 (0.84, 1.27)
Non-Hispanic Multiple	–	0.44** (0.26, 0.75)	–	0.22* (0.05, 0.92)
Non-Hispanic Asian	–	2.02*** (1.41, 2.88)	–	2.92*** (2.14, 3.98)
Education (ref. Less than High School)				
Highschool graduate or equivalent	–	0.64** (0.46, 0.89)	–	0.72** (0.57, 0.91)
Bachelor's degree or equivalent	–	0.36*** (0.27, 0.49)	–	0.27*** (0.21, 0.35)
Post-graduate study or professional degree	–	0.34*** (0.24, 0.48)	–	0.25*** (0.18, 0.34)
Married (ref. Not married)	–	1.19* (1.01, 1.41)	–	1.24* (1.05, 1.46)
Employed Status (ref. Unemployed)				
Employed	–	0.67* (0.48, 0.95)	–	0.54** (0.35, 0.84)
Not in the labor force	–	1.08 (0.75, 1.55)	–	0.97 (0.62, 1.53)
Household Income, \$ (ref. <30,000)				
30,000-59,999	–	1.49*** (1.20, 1.84)	–	1.53*** (1.30, 1.81)
60,000-99,999	–	1.26* (1.00, 1.58)	–	1.31** (1.07, 1.60)
≥100,000	–	1.26+ (0.99, 1.61)	–	1.27* (1.03, 1.57)
Number of children <18 y, n	–	0.82*** (0.77, 0.87)	–	0.76*** (0.70, 0.83)
Region, (ref. Northeast)				
Midwest	–	0.69** (0.55, 0.87)	–	0.61*** (0.50, 0.74)
South	–	0.66*** (0.52, 0.83)	–	0.54*** (0.45, 0.65)
West	–	0.48*** (0.38, 0.62)	–	0.33*** (0.27, 0.40)
Metropolitan area (ref. Nonmetropolitan area)	–	1.28** (1.06, 1.55)	–	1.42*** (1.21, 1.68)
Heterogeneity in the mean random parameters (SD)				
Opt-out ASC	–	–	9.43*** (8.39, 10.61)	8.01*** (7.01, 9.15)
Speed limit, mph	–	–	1.00 (0.96, 1.04)	1.00 (0.97, 1.04)
Avoided traffic fatalities, n	–	–	1.01*** (1.00, 1.01)	1.01*** (1.01, 1.01)
Public spending in community (ref. Same as now)				
Less on road safety, more on healthier water	–	–	1.08 (0.78, 1.51)	1.16 (0.91, 1.50)
More on road safety, less on healthier water	–	–	1.11 (0.82, 1.52)	1.09 (0.77, 1.55)
Observations	4,860	4,860	4,860	4,860
Number of respondents	540	540	540	540
Number of choice tasks per respondent	9	9	9	9
Log-likelihood	-4,855	-4,711	-4,244	-4,213
McFadden Pseudo R-squared	0.088	0.115	0.109	0.115
Wald Chi-squared	939***	1,227***	190***	97***
Akaike information criterion (AIC)	9,721	9,479	8,507	8,491

Abbreviations: Est., estimate; OR, odds ratios; CI, confidence interval; ASC, alternative-specific constant; SD, standard deviation.

Notes: Sample consists of survey participants who completed all required choice tasks. Estimates are reported as odds ratios (OR) for the means of the parameters, and as standard deviations (SD) for the heterogeneity in the mean random parameters. Robust standard errors in parenthesis. Statistical significance, + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 4. Americans' preferences for safe system approaches to road safety – based on the restricted sample (n=346)

Variables	Conditional Logit Models		Random Parameter Logit Models	
	Model 1 Est. (95% CI)	Model 2 Est. (95% CI)	Model 3 Est. (95% CI)	Model 4 Est. (95% CI)
Random parameters (OR)				
Opt-out ASC (ref. Support for policy)	0.97 (0.85, 1.10)	0.46+ (0.21, 1.03)	0.32*** (0.26, 0.39)	0.07*** (0.03, 0.19)
Speed limit, mph	0.97*** (0.96, 0.97)	0.97*** (0.96, 0.97)	0.96*** (0.95, 0.96)	0.96*** (0.95, 0.96)
Avoided traffic fatalities, n	1.05*** (1.05, 1.05)	1.05*** (1.05, 1.05)	1.06*** (1.05, 1.06)	1.06*** (1.05, 1.06)
Public spending in community (ref. Same as now)				
Less on road safety, more on healthier water	5.12*** (4.42, 5.94)	5.25*** (4.51, 6.10)	6.73*** (5.96, 7.60)	6.75*** (5.95, 7.66)
More on road safety, less on healthier water	1.23** (1.05, 1.43)	1.24** (1.06, 1.44)	1.36*** (1.22, 1.51)	1.36*** (1.21, 1.53)
Interactions with the Opt-out ASC (OR)				
Age group, y (ref. 18-29)				
30-44	–	0.88 (0.61, 1.27)	–	0.72 (0.47, 1.11)
45-59	–	1.23 (0.85, 1.78)	–	1.24 (0.89, 1.72)
≥60	–	0.96 (0.65, 1.42)	–	0.59* (0.39, 0.89)
Female (ref. Male)	–	0.63*** (0.52, 0.77)	–	0.61*** (0.48, 0.78)
Race and ethnicity (ref. Non-Hispanic White)				
Non-Hispanic Black	–	1.88*** (1.33, 2.66)	–	1.67+ (0.99, 2.82)
Non-Hispanic Other	–	0.98 (0.11, 8.83)	–	1.81 (0.73, 4.52)
Hispanic	–	0.85 (0.61, 1.19)	–	0.60** (0.41, 0.88)
Non-Hispanic Multiple	–	0.63 (0.30, 1.30)	–	0.18+ (0.03, 1.03)
Non-Hispanic Asian	–	5.65*** (3.49, 9.13)	–	12.49*** (6.94, 22.47)
Education (ref. Less than High School)				
Highschool graduate or equivalent	–	1.99* (1.03, 3.86)	–	6.20** (1.73, 22.17)
Bachelor's degree or equivalent	–	1.45 (0.80, 2.65)	–	3.63* (1.06, 12.50)
Post-graduate study or professional degree	–	1.14 (0.60, 2.17)	–	2.99+ (0.83, 10.77)
Married (ref. Not married)	–	1.26+ (0.99, 1.61)	–	1.27 (0.95, 1.71)
Employed Status (ref. Unemployed)				
Employed	–	0.54** (0.34, 0.86)	–	0.42+ (0.15, 1.16)
Not in the labor force	–	0.64+ (0.39, 1.05)	–	0.60 (0.22, 1.66)
Household Income, \$ (ref. <30,000)				
30,000-59,999	–	1.28 (0.90, 1.81)	–	1.13 (0.74, 1.75)
60,000-99,999	–	2.00*** (1.42, 2.81)	–	2.62*** (1.71, 4.01)
≥100,000	–	1.57* (1.10, 2.24)	–	1.54* (1.03, 2.31)
Number of children <18 y, n	–	0.96 (0.89, 1.05)	–	0.96 (0.85, 1.10)
Region, (ref. Northeast)				
Midwest	–	1.61* (1.11, 2.34)	–	1.94** (1.28, 2.95)
South	–	1.51* (1.04, 2.21)	–	1.75** (1.17, 2.61)
West	–	0.87 (0.58, 1.30)	–	0.51** (0.31, 0.82)
Metropolitan area (ref. Nonmetropolitan area)	–	1.30+ (0.99, 1.71)	–	2.01*** (1.49, 2.70)
Heterogeneity in the mean random parameters (SD)				
Opt-out ASC	–	–	14.90*** (12.30, 18.06)	12.38*** (9.85, 15.56)
Speed limit, mph	–	–	1.00 (0.96, 1.04)	1.00 (0.96, 1.04)
Avoided traffic fatalities, n	–	–	1.01*** (1.00, 1.02)	1.01*** (1.00, 1.02)
Public spending in community (ref. Same as now)				
Less on road safety, more on healthier water	–	–	1.04 (0.54, 2.01)	1.09 (0.66, 1.79)
More on road safety, less on healthier water	–	–	0.93 (0.59, 1.47)	1.06 (0.66, 1.71)
Observations	3,114	3,114	3,114	3,114
Number of respondents	346	346	346	346
Number of choice tasks per respondent	9	9	9	9
Log-likelihood	-2,825	-2,754	-2,427	-2,411
McFadden Pseudo R-squared	0.144	0.166	0.177	0.182
Wald Chi-squared	951***	1,094***	246***	389***
Akaike information criterion (AIC)	5,661	5,564	4,874	4,887

Abbreviations: Est., estimate; OR, odds ratios; CI, confidence interval; ASC, alternative-specific constant; SD, standard deviation.

Notes: Sample consists of survey participants who completed all required choice tasks. Estimates are reported as odds ratios (OR) for the means of the parameters, and as standard deviations (SD) for the heterogeneity in the mean random parameters. Robust standard errors in parenthesis. Statistical significance, + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.