



Development of the Dietary Habits and Colon Cancer Beliefs Survey (DHCCBS): An Instrument Assessing Health Beliefs Related to Red Meat and Green Leafy Vegetable Consumption

Kristen S. Smith, Savannah Rundquist, Michael W. Greene, Andrew D. Frugé
Department of Nutrition, Dietetics and Hospitality Management, Auburn University



BACKGROUND

- A positive association between colon cancer (CC) risk and red meat (RM) consumption is supported by epidemiological studies.
- Diets high in green leafy vegetables (GLV) may reduce the risk for CC.
- Herein, we developed and validated a survey instrument using the Health Belief Model (HBM) to better understand United States adults' behaviors and attitudes toward diet and CC risk.

METHODS

Participants:

1075 adults in the United States were recruited through Amazon Mechanical Turk. We obtained 990 valid surveys for analysis.

Instrument:

The HBM was used to assess perceived CC susceptibility and severity, perceived benefits, barriers, and cues to action.

RM and GLV consumption were quantified using select DHQII items, capturing the previous 30 days' intake.

A subsample (n=47) completed a 2-week follow-up for test-retest reliability

Table 1. Health Belief Model questions by domain

HBM Question	HBM Component
Susceptibility	
Q1	Please rate your perceived risk for developing colon cancer in your lifetime:
Severity	
Q2	Colon cancer can severely decrease my quality of life
Q3	Colon cancer could lead to death
Perceived Benefits	
Q4	If I eat less red meat I could decrease my risk of developing colon cancer
Q5	If I eat more green leafy vegetables I could decrease my risk of developing colon cancer
Perceived Barriers	
Q6	I don't like the taste of other protein-rich foods
Q7	I don't like the taste of green leafy vegetables
Q8	I can't imagine never eating red meat
Cues to Action	
Q9	A healthcare provider has recommended that I eat less red meat
Q10	A friend or family member has recommended that I eat less red meat
Q11	A healthcare provider has recommended that I eat more green leafy vegetables
Q12	A friend or family member has recommended that I eat more green leafy vegetables

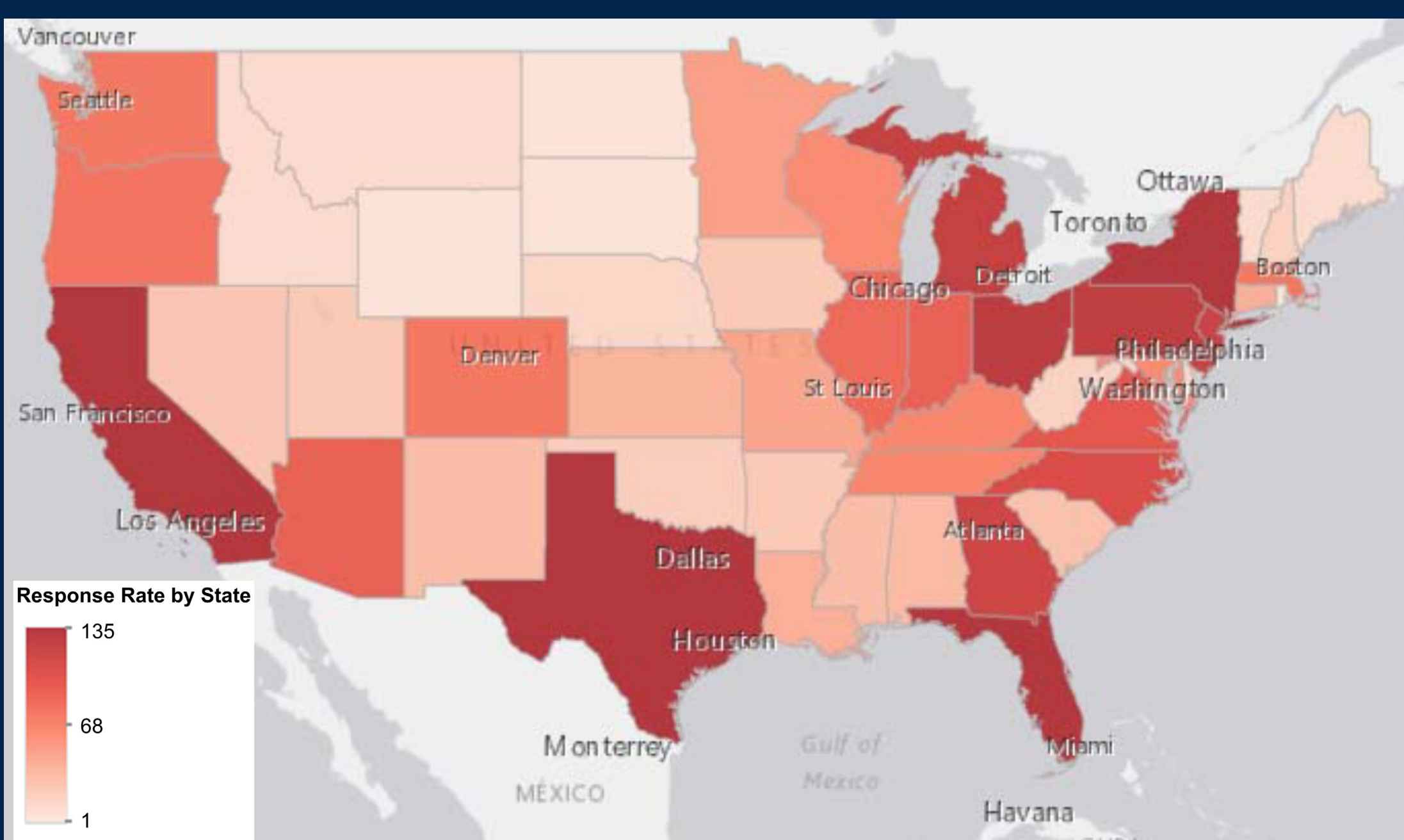


Figure 1. Heat map of survey response frequencies in the United States; colors represent number of respondents in each state.

RESULTS

- Each factor corresponded to the questions within each domain, thus validating the construct of domain questions.
- The loading scale scores were 0.916, 0.847, 0.662, and 0.773 for severity, benefits, barriers, and cues to action, respectively.
- Cronbach's alpha coefficients ranged from 0.478-0.845 for each domain, which indicated internal consistency of the questionnaire.
- Correlation between the 47 valid retests and the respondents' original responses deemed reliability was acceptable ($r = 0.697$, $p = 5.22 \times 10^{-8}$).

Table 2. Demographic characteristics of study participants (n=990)

	n	%		n	%
Sex			Education		
Male	468	47.3	<HS	4	0.4
Female	522	52.7	HS Grad/GED	93	9.4
Age			Some College	242	24.4
18-24 years	85	8.6	Associate's Degree	111	11.2
25-34 years	402	40.6	Bachelor's Degree	395	39.9
35-44 years	227	33.9	Master's Degree	110	11.1
45-54 years	124	12.5	Professional Degree	25	2.5
55-64 years	114	11.5	Doctorate	10	1
65-74 years	37	3.7	Marital Status		
75+	1	0.1	Single	401	40.5
Race			Married	483	48.8
Asian	87	8.8	Widowed	13	1.3
Native American	12	1.2	Divorced	83	8.4
Black	55	5.6	Separated	10	1
Pacific Islander	2	0.2			
White	788	79.6			
More than one race	46	4.6			

- Men and women consumed similar amounts of GLV, averaging half a cup per day; however, men consumed significantly more red meat ($p = 9.0 \times 10^{-7}$).
- BMI was positively associated with RM ounces per week ($r = 0.147$, $p < 0.001$)
- A significant correlation was observed between GLV and statements evaluating perceived benefits (Q4: $r = .073$, $p = .021$; Q5: $r = .147$, $p < .001$).
- All perceived barrier responses were positively and significantly associated with RM intake (Q7: $r = .104$, $p = .001$; Q8: $r = .148$, $p < .001$; Q9: $r = .303$, $p < .001$).

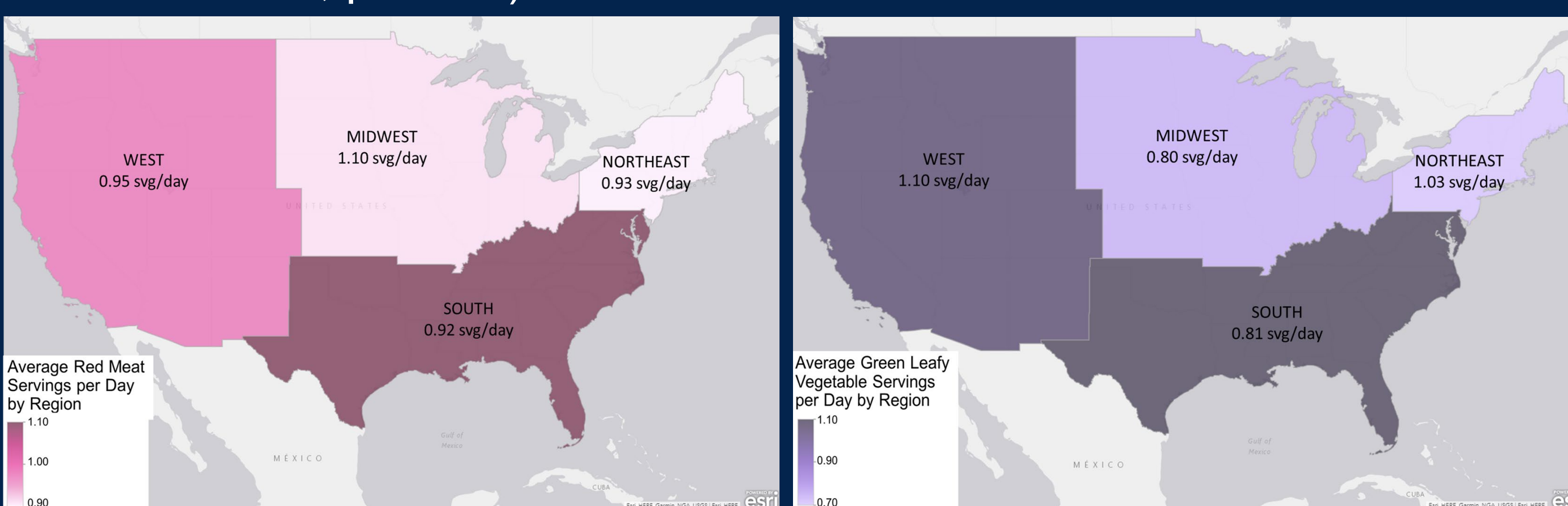


Figure 2. Heat maps of average daily servings of red meat and green leafy vegetables by US Census defined regions. a) Colors represent average red meat servings per day b) Colors represent average green leafy vegetable servings per day.

RESULTS

Table 3. RM and GLV intake and HBM score differences between sexes by normal and overweight BMI

	Female (n=522)		Male (n=468)	
	BMI<25 (n=264)	BMI>25 (n=268)	BMI<25 (n=206)	BMI>25 (n=262)
GLV cups Per Week	3.74 (+/-4.21)	3.14 (+/-3.44)	3.61 (+/-4.58)	3.47 (+/-3.83)
RM ounces Per Week	13.0 (+/-13.7)	16.2 (+/-15.9)*	16.8 (+/-13.6)	21.9 (+/-19.5)*
Susceptibility				
Q1	2.00 (+/-0.60)	2.14 (+/-0.60)*	2.12 (+/-0.55)	2.18 (+/-0.63)
Severity				
Q2	4.70 (+/-0.71)	4.68 (+/-0.83)	4.68 (+/-0.62)	4.68 (+/-0.79)
Q3	4.76 (+/-0.60)	4.72 (+/-0.78)	4.68 (+/-0.61)	4.71 (+/-0.74)
Perceived Benefits				
Q4	3.83 (+/-0.94)	3.74 (+/-1.01)	3.80 (+/-1.01)	3.79 (+/-0.95)
Q5	4.18 (+/-0.85)	4.20 (+/-0.83)	4.18 (+/-0.82)	4.14 (+/-0.85)
Perceived Barriers				
Q6	2.03 (+/-0.95)	2.20 (+/-1.10)	2.10 (+/-1.02)	2.11 (+/-1.02)
Q7	1.82 (+/-1.15)	1.91 (+/-1.22)	1.90 (+/-1.06)	2.09 (+/-1.20)
Q8	2.83 (+/-1.54)	3.38 (+/-1.49)*	3.15 (+/-1.53)	3.50 (+/-1.47)*
Cues to Action				
Q9	1.51 (+/-0.94)	1.55 (+/-0.93)	1.71 (+/-1.03)	1.86 (+/-1.09)
Q10	1.63 (+/-1.07)	1.83 (+/-1.20)*	1.83 (+/-1.18)	2.04 (+/-1.25)*
Q11	2.52 (+/-1.41)	2.63 (+/-1.49)	2.56 (+/-1.42)	2.88 (+/-1.46)*
Q12	2.58 (+/-1.48)	2.59 (+/-1.47)	2.66 (+/-1.43)	3.06 (+/-1.46)*

*score is significantly higher in BMI group ($p < 0.05$)

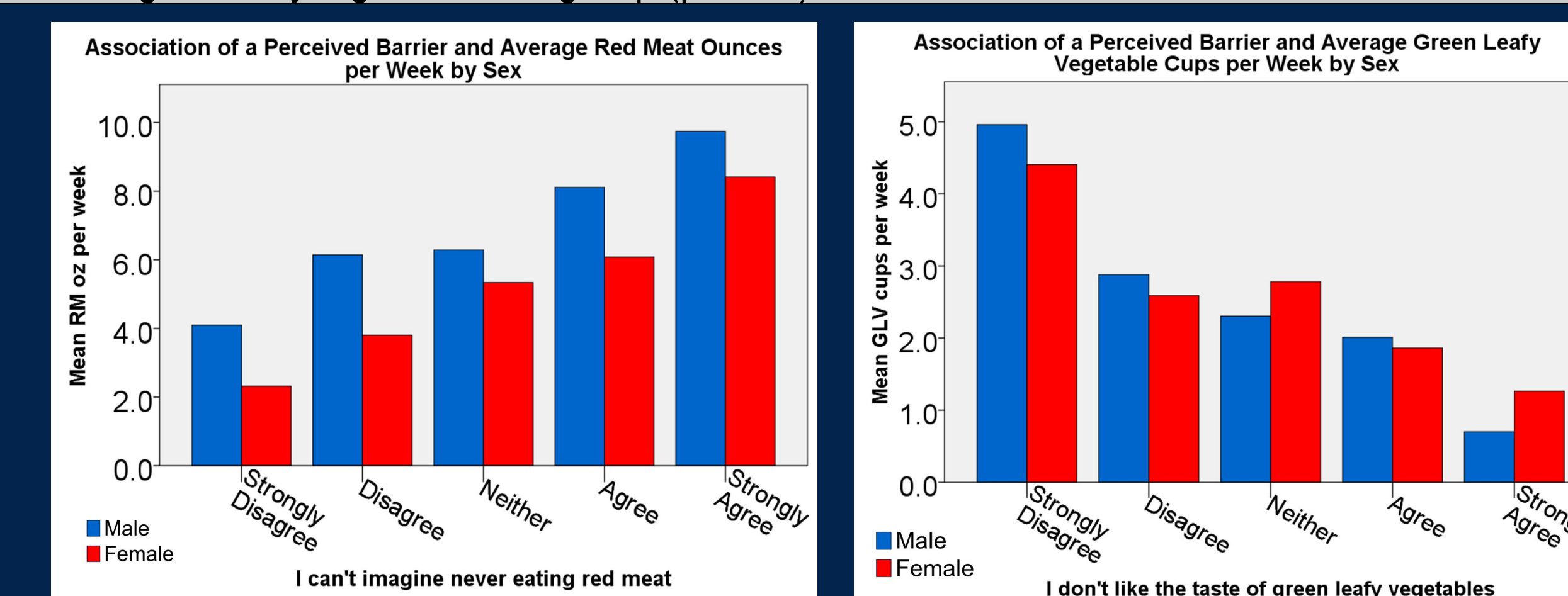


Figure 3. a) Perceived Barrier Q8 association with average red meat ounces per week grouped by sex. 55.3% of men agreed or strongly agreed with Q8.; 50.7% of women agreed or strongly agreed with Q8. b) Perceived barrier Q7 association with average green leafy vegetable cups per week grouped by sex. 14.5% of men agreed or strongly agreed with Q7. 14.9% of women agreed or strongly agreed with Q7.

CONCLUSIONS

Based on the results of this study, DHCCBS is a valid and reliable survey instrument to assess dietary behavior related to colon cancer risk and will be used in conjunction with similarly aligned dietary interventions. Additionally, these findings suggest increasing GLV consumption may be more feasible than reducing RM intake if found to be equally beneficial in reducing CC risk. Future studies will be conducted to determine validity in underrepresented populations.

FUNDING

This study was made possible by the Auburn University Research Initiative in Cancer and the Auburn University College of Human Sciences