

# Transitioning the FDA Food Safety and Nutrition Survey from RDD to ABS: Comparison of Bias Due to Mode Effects

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## Introduction

The 2019 FDA Food Safety and Nutrition Survey (FSANS) is a nationally representative survey of U.S. adult consumers' self-reported practices, knowledge and attitudes related to food safety, health, diet, and nutrition. Prior to the 2019 FSANS, FDA had been conducting two separate repeated, cross-sectional Random Digit Dialing (RDD) interview-administered surveys -- The Food Safety Survey and the Health and Diet Survey.

The 2019 FSANS was designed to transition the Food Safety Survey and Health and Diet Survey from an RDD sample interview-administered phone survey (RDD FSANS) to an address-based sample (ABS) self-administered address-based web and teleform survey (ABS FSANS). In order to assess the effects of the changes in survey administration mode undistorted by temporal effects, the 2019 FSANS survey was set up as a mixed-mode parallel design with 4,398 respondents assigned to ABS and 834 respondents assigned to RDD.

The three collection modes RDD (phone interviews), ABS (pencil and paper: teleform), and ABS (self-administered web) were compared to assess if they **measure** respondents differently; i.e. if mode measurement bias exists.

Detailed information on the 2019 FSANS survey methods can be found at: <https://www.fda.gov/food/science-research-food/2019-food-safety-and-nutrition-survey-report>

Table 1. Levels of Measurement Equivalence

Type of Measurement Equivalence	Number of constraints	mode			Latent variable variances equal	Interpretation
		Factor loadings equal	Intercepts equal	Residual variances equal		
Configural	0					Ascertains whether a relationship exists between observed variables and their underlying latent construct.
Metric	1	X				Respondents from the three modes attribute the same meaning to the latent variable.
Partial scalar	2	X	X			Respondents from the three modes attribute the same meaning to both the latent variable and to the observed survey questions.
Strict scalar	3	X	X	X		Latent variables are <b>measured</b> with the same precision across mode.
Latent factor variance	4	X	X	X	X	Latent variables <b>have</b> the same precision across mode.

## Materials and Methods

Mode measurement equivalence was assessed using multiple group confirmatory factor analysis (MG-CFA) through a series of increasingly stringent models: 1) configural invariance, 2) metric invariance, 3) partial scalar invariance, 4) strict scalar invariance, and 5) latent variable variance equivalence. Configural equivalence is the weakest form of measurement equivalence and factor variance invariance is the strongest form of equivalence (Table 1).

Three models addressing different food safety and nutrition survey sections were assessed:

- 1) The Food Safety model: has 3 latent variables, representing food safety risk perceptions regarding 1) Specific Food, (raw chicken, raw eggs, raw vegetables and raw shellfish); 2) Behavior, (hand washing prior to cooking, veggies touching raw chicken, unthoroughly cooked chicken, cooked chicken left at room temp); and 3) General, perception about foodborne illness risks from the way food is prepared at home, restaurants and about bacteria in food.
- 2) The Nutrition model: has 2 latent variables representing nutrition awareness: 1) Healthy Diet (with respect to heart disease, cancer, long term-health, and choice of healthy foods,) and 2) Calories (caloric intake to maintain weight, and knowledge thereof)
- 3) The Food Handling Behavior model: has 2 latent variables assessing respondent behavior with respect to: 1) Hand Washing, during food prep (with soap and after cracking raw eggs, and 2) Food Thermometer, use of a food thermometer during cooking (whole chickens, beef, chicken parts, baked egg dishes, beef hamburgers).

Observed questions were ordered such that increasing values for the questions and their underlying latent variables represent increased food safety perception, improved food handling behavior or increased nutrition awareness.

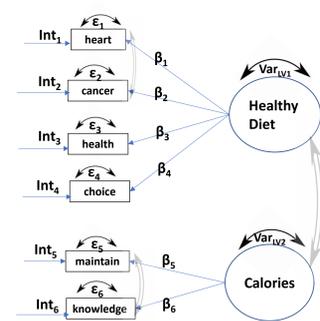


Figure 1. Nutrition model. Square boxes are observed survey questions, circles are latent variables, ( $\beta$ ) are the factor loadings, (Int) are the intercepts, the double-headed double-lined gray arrows are covariances, double-headed single-lined black arrows are residual variances.

## Results and Discussion

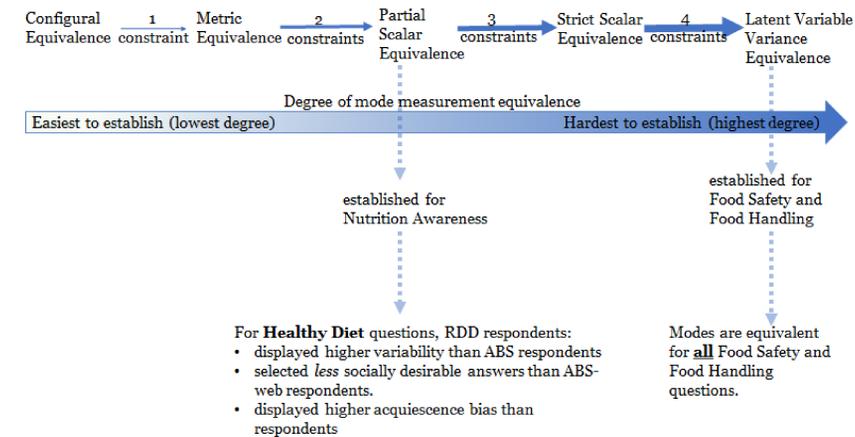


Figure 2. Levels of mode measurement equivalence established for the Food Safety, Nutrition and Food Handling Behavior models



Figure 3. Distribution of the Nutrition Awareness standardized latent variables Healthy Diet and Calories, by mode for the full sample and unconstrained model. In blue are the 95% confidence interval around the mean.

## Conclusion

While there was mode measurement bias for diet health-related questions, we find that the ABS mode is sufficiently equivalent to the RDD mode to justify transitioning FSANS to an entirely mail-push-to-web self-administered survey.

Current and future web-administered FSANS data can therefore be compared to previous phone-administered data released, for food safety, food handling behavior and calorie-related topics. Trend analysis can also be conducted for healthy diet related questions with extra care such as weighting adjustments to account for higher ABS variability or mode/year covariate adjustment.

This poster was constructed using information from "Transitioning the FDA Food Safety and Nutrition Survey from RDD to ABS: Comparison of Bias Due to Mode Effects," currently in review by the *Journal of Survey Statistics and Methodology*.

Latent variable variance equivalence was established for the Food Safety and Food Handling Behavior models. The ABS and RDD modes are therefore considered equivalent for survey topics related to food safety and food handling behavior.

Partial scalar was established for the Nutrition. ABS and RDD respondents attributed the same meaning to survey questions and their underlying constructed related to nutrition. However, higher variability was observed for healthy diet related questions for RDD respondents. Furthermore, RDD respondents were more likely to select less socially desirable. (i.e. lower values) (Figure 3) and displayed higher acquiescence bias for healthy diet questions.