Effects of Item Order Randomization in an Online National Drug Use Survey

Amioka EC[1], Black JC[1], Iwanicki JL[1,2], Dart RC[1,2]

[1]Rocky Mountain Poison & Drug Safety - Denver Health, Denver, CO; [2]University of Colorado Health Sciences Center - Denver, CO

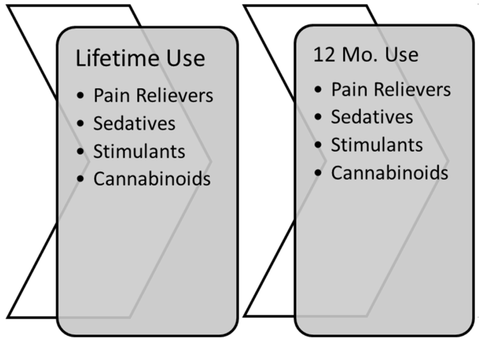
Introduction

- The Survey of Non-Medical Use of Prescription Drugs (NMURx) Program deploys a national survey designed to provide accurate and timely estimates of prescription drug non-medical use (NMU) among the general population.
- Multiple levels of question block randomization are utilized in order to reduce order effects on endorsements of items while maintaining question flow.
- This analysis quantifies order effects and the consequences of lengthening survey questions using data collected during the 1st Quarter of 2019. These are important considerations for optimal design of an online survey instrument.

Methods

Survey Design:

- The NMURx Program deploys a cross-sectional, anonymous, opt-in online questionnaire via a company that utilizes survey panels to contact respondents who complete the questionnaire in their own settings on their own devices.



• Respondents are asked if they have ever used a series of drugs and then asked follow-up questions based on skip logic.

• The order in which each of the following appears is randomized once per respondent:

  - Drug class (pain relievers, sedatives, stimulants, cannabinoids)
  - Active pharmaceutical ingredients (APIs) within each drug class

Analysis:

• The odds of drug endorsement based on position of appearance on the survey were modeled. Parameters were estimated by generalized estimating equations (GEE) using the SAS procedure GENMOD and an exchangeable working correlation matrix. All analyses were conducted using SAS 9.4 (Cary, NC).

• The position on the survey (indicating order of appearance) coefficient from these models was used to develop a naïve approach to estimating the loss in the number of endorsements as the length of the set of questions increases:

$$(prevalence)[\sum_{i=1}^{50}(\frac{n}{i}) + \sum_{j=1}^{i-1}(\frac{n}{i})(\frac{\exp(\beta_1(i+1))}{1+\exp(\beta_1(j+1))})]$$

where i = number of survey items; n = number of respondents

Results

Figure 1: Use Endorsements by Order of Appearance Within a Drug Class

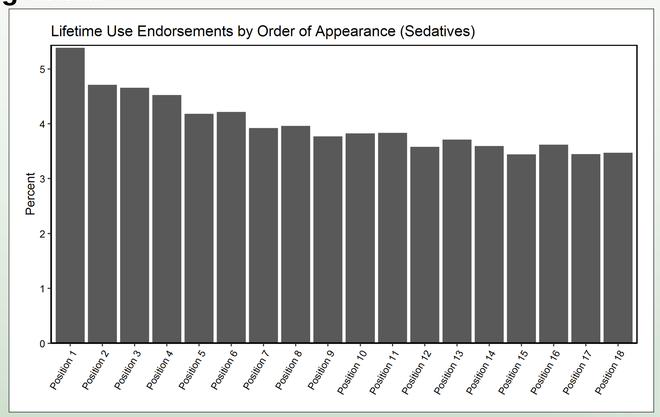


Figure 2: Use Endorsements by Order of Appearance For All APIs

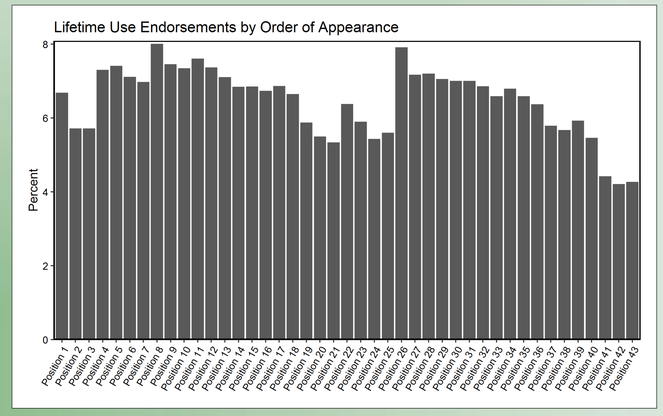
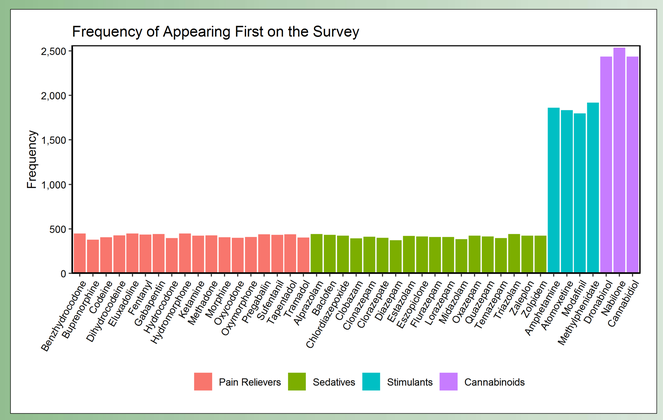
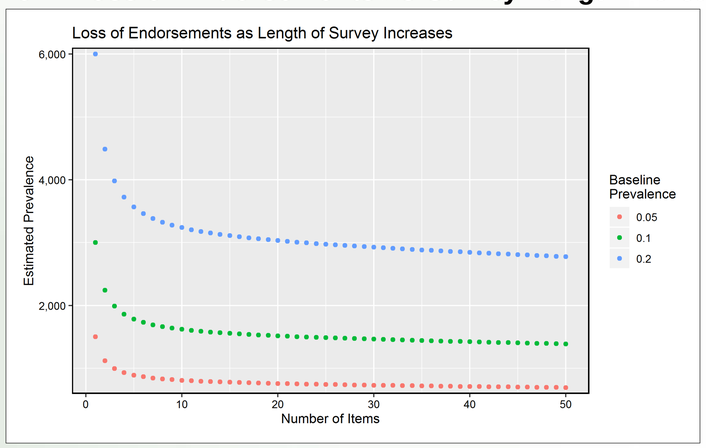


Figure 3: Frequency of Appearing First



Results (continued)

Figure 4: Loss of Endorsements As Survey Length Increases



- Even with randomization, the first drug seen on the questionnaire was endorsed more often than the last (OR: 1.38; 95% CI 1.33, 1.43; p<0.001), regardless of drug type.
- Block randomization is useful in keeping together drugs with similar properties, but has the consequence of creating unequal probabilities of drugs being seen first.
- Assuming a baseline prevalence as ground truth, estimates of lifetime drug use asymptotically approach half of what the true prevalence is as the number of survey items increases.

Conclusions

- Randomization of survey items helps mitigate order effects from the first drugs on the survey being more likely to be endorsed, but it doesn't eliminate it.
- The consequences of block randomization and lengthening the number of questions asked in a row need to be considered when designing an online survey instrument.
- The ability to implement question order randomization is a clear advantage of online surveys over paper surveys on drug use that ask about the same drug first for all survey respondents.

Limitations

- The loss of endorsements estimation assumes a linear and uniform decrease in odds of endorsements for each one item increase in survey length. It also assumes an estimated baseline prevalence as truth.
- 10% of Americans do not use the internet, which represents a gap in the sampling frame

The RADARS System is supported by subscriptions from pharmaceutical manufacturers, government and non-government agencies for surveillance, research and reporting services. RADARS System is the property of Denver Health and Hospital Authority, a political subdivision of the State of Colorado. Denver Health retains exclusive ownership of all data, databases and systems. Subscribers do not participate in data collection nor do they have access to the raw data.

ROCKY MOUNTAIN POISON & DRUG SAFETY
Saving lives with answers.™

DENVER HEALTH est. 1860