

Gender-Based Analysis for Variable Selection in Logistic Model Building

Developed in Women, Gender and Health 207:
Advanced Topics of Women, Gender, and Health,
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Appropriate HSPH Core Courses:

B10 210 (Statistical Methods for Rates and Proportions), or any introductory biostatistics course, including logistic regression [see attached PPT slides to be included in lecture]

Brief Background

Students will have learned the basics of building logistic regression models and will be starting to learn about variable selection methods (e.g., Lecture 13 in Spring 2016 with Dr. Robert Glynn), including methods of forward and backward selection. Students will also be learning techniques to “force” specific variables into the model (e.g., age, sex), which will provide the instructor the opportunity to discuss the importance of gender-based analysis and the motivation behind requiring certain factors be included in analyses. Additional implications will include the proper interpretation of adjusted models and the expectation of testing for effect measure modification.

In particular, this example will look at the effects of body image concerns on body mass index (BMI). Since the association between body image concerns and BMI is not well known, this will open up the discussion of how to decide which factors should be included in the model while also seeking parsimony. From Calzo et al. (2015) we know body image concerns differ by subgroups (e.g., sexual minority males were more likely than completely heterosexual males to be Lean-Concerned than Muscle-Concerned at ages 17–18 and 19–20 years). From Katz-Wise (2014), we also know BMI differs by subgroups (e.g., Latina bisexual females had higher BMI than Latina heterosexual females). This provides the subject matter motivation that these factors should be “forced” into the model and analyzed by each stratum.

Learning Objectives for Students:

The instructor will utilize this teaching example during lecture, with the student learning objectives as follows:

- 1) To learn how to conduct variable selection methods, including forward selection, forward stepwise selection, backward selection, and backward stepwise selection.
- 2) To understand the motivation for “forcing” variables into models, taking a gender-based and intersectional approach to consider age, sex, sexual orientation, and race/ethnicity.
- 3) To practice interpreting findings adjusted for age, sex, sexual orientation, and race/ethnicity, even when these measures may not adequately distinguish between the biological and social.
- 4) To build the habit of testing effect measure modification with a deeper understanding of how intersectional effects may be multiplicative and not simply additive.

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Teaching Methods:

- Instructor will present the question of interest: *What is the effect of body image concerns on BMI? What other factors do we think we might need to test for as potential confounders or effect measure modifiers?*
- Instructor can ask class what factors they think should be included. Students may engage by shouting out a variety of answers or by not responding. In either case, instructor can justify the need to use a stepwise approach in testing variables: *Since we are not sure about the best set of variables related to body image concerns to predict BMI, we can use a stepwise model to test each one.* [Instructor continues with lecture on how automatic selection models function.]
- Instructor introduces concept of forced variables, and sets up context for gender-based analysis: *Additionally, we have the opportunity to force certain variables to be included in all models at each step. There are both theoretical and empirical motivations for including certain required variables in our model, such as age, sex, sexual orientation, and race/ethnicity. All of these factors may be of interest due to their allegedly innate biological differences (for example, what we consider biological sex) or due to the associated culture-bound conventions about norms and relationships (for example, what we consider gender). In this case, our exposure of interest is body image concerns, which are at least partly formed by social influences. Unfortunately, in our research we often do not have a clear conceptual model for considering both biological and social constructs simultaneously, so we must do our best to interpret models with the variables we have.* [Instructor continues with procedure for conducting the forward stepwise selection.]
- Instructor presents the summary findings and interpretations after adjusting for the forced variables. This then sets up the instructor to emphasize the importance of testing for effect measure modification by these variables and for possible interaction effects.
- If time permits, instructor is set up to introduce the context for interactions: *We also want to consider interactions. Again, there are both theoretical and empirical motivations for doing so. Prior research has demonstrated interaction effects for body image concerns and for BMI. Theoretically, intersectionality refers to the idea that for individuals who experience multiple dimensions of inequity, the effects may not simply be an additive sum of independent effects but is instead how these dimensions may interact simultaneously to shape and influence human experiences.*

Glossary:

- **Body shape concerns:** Concerns about one's weight or shape, such as feeling fat, worrying about being fat, wanting to be thin, wanting to be muscular.
- **Sex vs. gender:** Distinguishing between differences due to biological sex (e.g., metabolic differences) and those due to sociocultural norms (e.g., thinness ideals).
- **Sexual orientation:** Sexual orientation is composed of multiple dimensions including identity, attraction, and gender of sexual partners.
- **Sexual minorities:** Categorization of any non-heterosexual-identified individuals, although there can be differences depending on orientation dimensions listed above.
- **Intersectionality:** Multiple experiences of inequity (e.g., both female and a sexual minority) are not just additive, but may interact simultaneously.

References:

Calzo, J. P., Masyn, K. E., Corliss, H. L., Scherer, E. A., Field, A. E., & Austin, S. B. (2015). Patterns of body image concerns and disordered weight-and shape-related behaviors in heterosexual and sexual minority adolescent males. *Developmental psychology*, *51*(9), 1216.

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Katz-Wise, S. L., Blood, E. A., Milliren, C. E., Calzo, J. P., Richmond, T. K., Gooding, H. C., & Austin, S. B. (2014). Sexual orientation disparities in BMI among US adolescents and young adults in three race/ethnicity groups. *Journal of obesity*, 2014.

Krieger, N. (2003). Genders, sexes, and health: what are the connections—and why does it matter?. *International journal of epidemiology*, *32*(4), 652-657.