

Gender Analysis, Effect Modification, & Environmental/Occupational Exposures

Developed in Women, Gender and Health 207: Advanced Topics in Women, Gender, and Health
Harvard T.H. Chan School of Public Health, Spring 2017
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Teaching Example Authored by Katelyn Ferreira

Appropriate Courses:

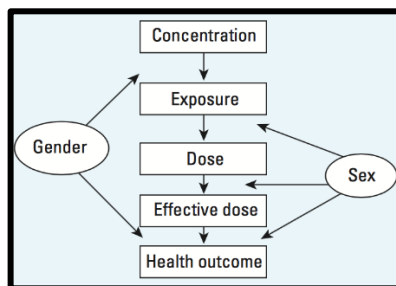
- At the Harvard T.H. Chan School of Public Health, this teaching example could be used in **EH 201** (Introduction to Environmental Health), **EH 202** (Principles of Environmental Health), or comparable courses. Students should be familiar with the concepts of effect modification and confounding prior to this assignment.

Learning Objectives for Students:

- Students will consider and illustrate effect modification as it relates to environmental exposures and relevant health outcomes
- Students will understand the respective roles of sex and gender in environmental exposures, and will begin to consider their relative implications for interventions

Brief Background:

- **Gender** is a social construct, including “cultural norms, roles, and behaviors shaped by relations among women and men and among girls and boys”¹
- **Sex** is a biological construct “based on physiologic differences enabling reproduction, defined by physiologic characteristics (especially reproductive organs) or chromosomal complement.”¹
- Many studies suggest that health differences in response to environmental exposures (including air pollution) are patterned by sex or gender.¹
 - Sex and gender often *modify* the effects of environmental exposures on health outcomes.
- Many of these studies, however, conflate sex and gender, or do not attempt to disentangle their respective influences.¹
- However, delineating the unique effects of sex and gender is necessary for understanding the pathways at work.¹
- Understanding these unique pathways can have important implications for environmental scientists, not only for improving scientific understanding, but also for intervention design and policy advocacy.
- Sex and gender are likely *both* at play for many exposures. For other exposures, *one* or *neither* may be important.
- Jane E. Clougherty offers the following example of the respective effects of sex and gender¹:



Reference (in-text and original graphic source):
Clougherty J. A growing role for gender analysis in air pollution epidemiology. 2010; 118(2): 167-176. doi: 10.1289/ehp.0900994.

Note: for more details on related sex/gender terminology, please see: Dr. Carl J. Streed’s [Terminology Related to Sexual Orientation, Gender Identity, and More](#) created for Harvard Medical School’s Office for Diversity, Inclusion, & Community Partnership.

Homework Assignment (approx. 10 minutes to introduce):

In the class period prior to the in-class activity, students will be divided into small groups (of 4-5). Each group will be assigned one of the following environmental exposures: **(1) cooking in the home** (Hint: often referred to as a type of “indoor air pollution”), **(2) cosmetic use** (Hint: Phthalates are a significant area of research on this topic.), or **(3) construction work**. Students will complete homework based on their group. All students will read the piece by Clougherty et al.,¹ which focuses on air pollution epidemiology, but provides helpful and relevant background for considering other environmental exposures. Students will also be assigned additional reading based on their group, and should **perform further subject-matter**

research regarding their assigned exposure, in order to consider and **provide brief answers to the following questions**

(bullet points are fine) in preparation for the in-class activity:

- (1) Who (gender) tends to encounter to the exposure? Why might this be? What other groupings (e.g. racial/ethnic, socioeconomic) might be important to consider here?
- (2) What sex-linked biological differences, if any, could account for differences in health outcomes? How might exposure, dose, and effective dose be different for males and females?
- (3) What coexposures and health-seeking behaviors may be patterned by gender?
- (4) How are “gender,” “sex,” and associated terms used in the readings? Are there places sex and gender are not discussed, but you feel that they should be? When they are used, are these terms defined?

Required Reading for All Students:

- ¹Clougherty J. [A growing role for gender analysis in air pollution epidemiology](#). *Environmental Health Perspectives*. 2010; 118(2): 167-176. doi: 10.1289/ehp.0900994.

Additional Required Readings by Assigned Exposure Group:

Cooking in the home:

- World Health Organization. Household Air Pollution and Health. World Health Organization Media Centre. <http://www.who.int/mediacentre/factsheets/fs292/en/>. Updated February 2016. Accessed April 17, 2017.
- Perez-Padilla R, Schilman A, Riojas-Rodriguez H. [Respiratory health effects of indoor air pollution](#). *The International Journal of Tuberculosis and Lung Disease*. 2010;14(9): 1079-1086(8).

Cosmetic use:

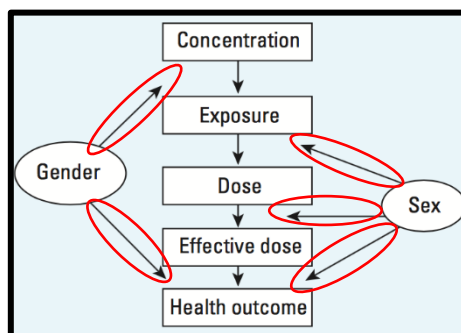
- Huang T, Saxena AR, Isganaitis E, James-Todd T. [Gender and racial/ethnic differences in the associations of urinary phthalate metabolites with markers of diabetes risk: national health and nutrition examination survey 2001–2008](#). *Environmental Health*. 2014; 13(6). doi: 10.1186/1476-069X-13-6.
- Larson A. Story of Stuff Project. The Story of Cosmetics [Video]. YouTube. <https://www.youtube.com/watch?v=pfq000AF1i8>. Published July 21, 2010. Accessed April 19, 2017. [Annotated script available at http://storyofstuff.org/wp-content/uploads/movies/scripts/SoCosmetics_Annotated_Script.pdf]

Construction work:

- Occupational Safety and Health Administration (OSHA). Health Hazards in Construction. Occupational Safety and Health Administration (OSHA). https://www.osha.gov/dte/grant_materials/fy09/sh-19495-09/health_hazards_workbook.pdf. Accessed April 23, 2017. [Read pages: 59-69, 127-130, 142, 201-202]
- Williams M. Where are all the women? Why 99% of construction site workers are male. *The Guardian*. <https://www.theguardian.com/careers/careers-blog/2015/may/19/where-are-all-the-women-why-99-of-construction-site-workers-are-male>. Published May 19, 2015. Accessed April 20, 2017.
- *Optional:* Scarselli A, Corfiati M, Di Marzio D, Iavicoli S. [Evaluation of workplace exposure to respirable crystalline silica in Italy](#). *Int J Occup Environ Health*. 2014;20(4): 301–307. doi: 10.1179/2049396714Y.0000000078.

In-class activity (approx. 20 minutes for activity and 10 minutes to share):

In your groups, **provide explanations for the arrows circled in red below** (e.g. for the upper-most arrow, describe *how* gender might influence the relationship between concentration and exposure.) If you don't think sex or gender influence a particular relationship, note that and explain why. Also consider if another arrow should be added to the diagram provided (e.g. directly from gender to exposure → dose). You may discuss one specific exposure (e.g. one type of cooking fuel) and one health outcome, or several of each. If you're having trouble, refer back to pages 167-168 in the Clougherty et al. paper.¹ You may have a hard time considering the three arrows point out of “sex” distinctly; do the best you can, and consider multiple arrows together if need be. A larger version of the graphic (attached) will be provided to each group so that you can take notes. With your group, also **discuss how “gender” and “sex” were used in the readings**. What was missing? **What are the implications of sex and gender for intervention design?** After this activity, each group should share major points of their explanations and discussion with the rest of the class.

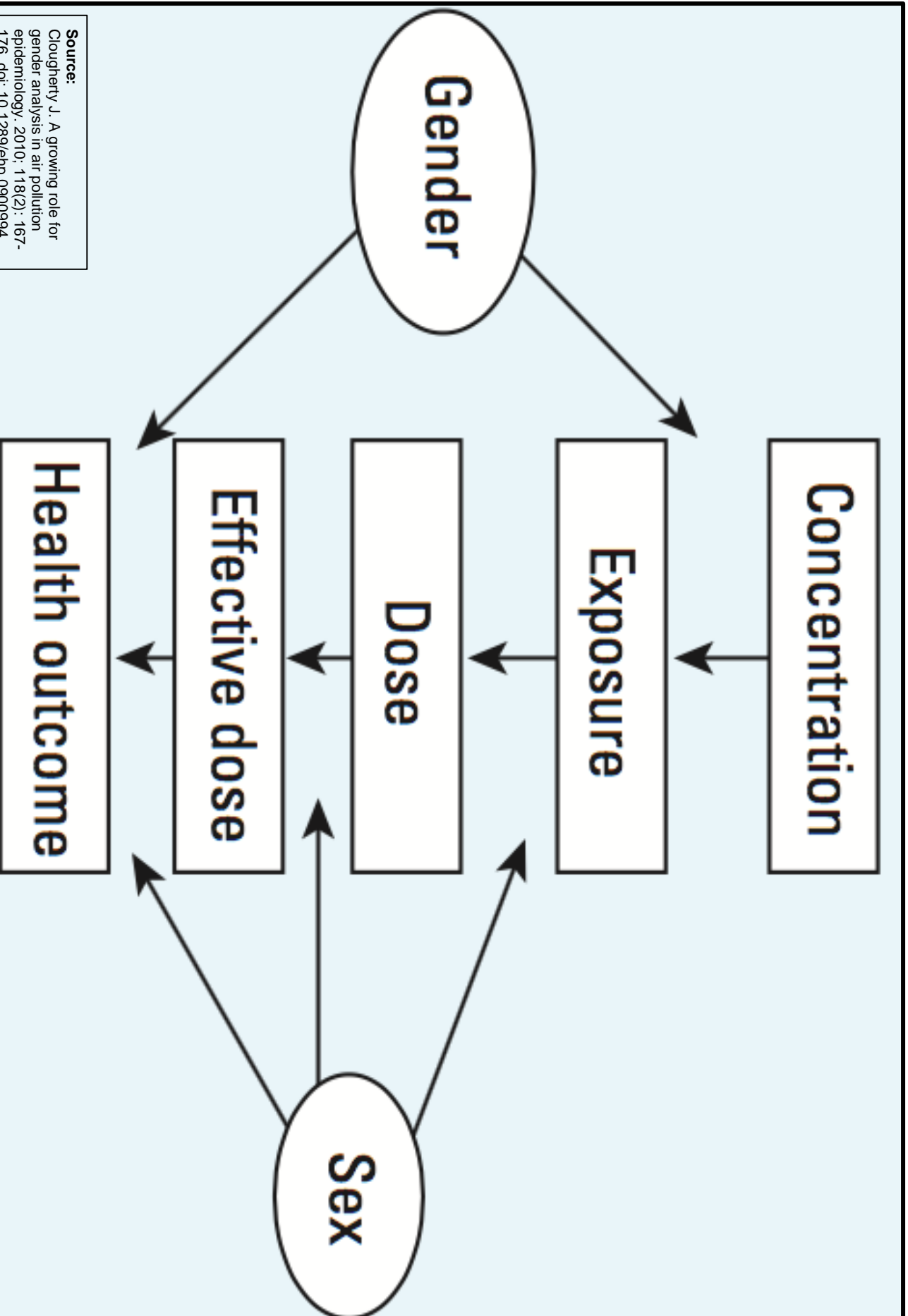


Reference
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Questions and discussion points to cover as instructors

(during and after report-back from groups):

- What explanations did you come up with for each arrow?
 - Example answer: “More women than men cook in the home, and therefore are exposed more often to indoor cooking fuels.”
 - Example follow-up: Why do you think that is? How might this vary across contexts?
 - Example answer: “The relationship between effective dose and health outcomes can be affected by sex-linked biology because only people with certain ‘female’ reproductive organs can become pregnant. Phthalate exposure can have important consequences for the health of babies.”
 - Example follow-up: Pregnancy is, indeed, related to sex-linked biology. How might gender also influence pregnancy and prenatal/perinatal care?
- This diagram focused on effect modification. How would sex, gender, both, or neither confound the relationships examined? What might this look like?
 - Follow-up: Thinking of a concrete example may be difficult. What would this look like on a diagram? Did you find it difficult to avoid conflating sex and gender when thinking of examples?
- What (explanatory, red-circled) arrows might be missing?
 - Follow up: When might gender influence relationships between exposure and dose, as well as between dose and effective dose?
 - Example answer: biomedical interventions in gender-affirmative care (e.g. hormone therapy)
- How else might gender come into play regarding these health exposures for people who identify as transgender, genderqueer, gender non-conforming, or non-binary? How might identifying with one of the above terms shape exposure patterns?
 - Example answer: Gender expression may affect the types of families and communities people form, including how tasks including household labor are divided. It may affect use of cosmetics products, as well, including those used as part of gender-affirming practices. In many contexts, discrimination against transgender and nonbinary people also affects career opportunities.
- Why is it important to disentangle sex and gender in environmental health research and advocacy?
 - Example answer: We have to understand the pathways at work (biological and/or social) if we want to interrupt them to improve health outcomes. For example, knowing that a given exposure is patterned by gender could inform strategies for communication and intervention design.



Source:
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