Sex and Gender Data Collection in Nutrition Research: Considerations through an Inclusion, Diversity, Equity, and Access Lens

Heather E. Schier; Carolyn Gunther; Matthew J. Landry; Sarah D. Ohlhorst; Whitney Linsenmeyer

SEX AND GENDER ARE SEPARATE CONSTRUCTS IN which sex is assigned at birth based on assessment of external genitalia, reproductive organs, chromosomes, and gonads, and gender or gender identity refers to a person’s internal sense of self and how they fit into the world with respect to gender.1,2 However, sex and gender are often conflated in research, clinical, and administrative settings in which survey or questionnaire respondents are prompted to select a male or female designation. This practice perpetuates the erasure of gender minorities and violates the construct validity of gender as a fluid notion.

Sex and gender are separate health determinants; conflation of these terms in data collection undermines the precision and generalizability of nutrition research conducted with human subjects.3,4 This has particular relevance to transgender and gender nonconforming populations whose sex and gender identity differ. Restricted collection of sex and gender contributes to the erasure of gender diverse groups in data, the subsequent fragmented understanding of the nutritional health and needs across genders, and misinformed policies. These are key issues at the heart of diversity, equity, and inclusion. A sex- and gender-informed approach to research design, analysis, and reporting has the potential to increase the overall quality of data, comparability (harmonization of data), and impact of nutrition research, especially for gender minorities.3

The purpose of this commentary is to discuss sex and gender data collection in nutrition research in response to the Academy of Nutrition and Dietetics’ commitment to inclusion, diversity, equity, and access (IDEA).3 This commentary provides a particular focus on the application of the National Institutes of Health (NIH) endorsed 2022 National Academies of Sciences, Engineering, and Medicine (NASEM) report, Measuring Sex, Gender Identity, and Sexual Orientation, and the 2016 Sex and Gender Equity in Research (SAGER) guidelines.6,7 The NASEM report is the product of the most robust investigation to date on evidence-based practices for capturing sex, gender, and sexual orientation as separate constructs. The SAGER guidelines offer researchers a guide to ensuring gender equity is realized across all research stages.

SEX AND GENDER DATA COLLECTION IN NUTRITION RESEARCH

Accurate collection of sex and gender data applies across nutrition research domains including nutritional epidemiology, clinical and translational research, and basic nutrition science. Central issues of internal and external validity span these domains. Internal validity is the degree to which a measure is valid for the sample being studied, whereas external validity is the degree to which a measure is valid for individuals outside of the study sample, or the general population.8 When sex and gender data are systematically collected and reported, researchers can accurately describe their study sample and make inferences about the generalizability (or lack thereof) of study findings to the broader population.

Nutritional Epidemiology

Nutrition monitoring and surveillance survey and questionnaire data are requisite to nutritional epidemiology and investigations regarding the nature of diet–disease relationships at the population level. Among nutrition and health surveillance programs in the United States, the National Health and Nutrition Examination Survey (NHANES) queries “gender” as male or female with “don’t know” and “refused to answer” options (Fig 1).9 Surveyors are instructed to ask about gender “if not obvious,” assuming a person’s gender poses the risk of mis-gendering a research participant. Other surveys collect restricted gender identity data under the LGBTQ+ umbrella. For example, the Behavioral Risk Factor Surveillance System (BRFSS) includes an optional module regarding sexual orientation and...
gender identity data (Fig 1).\textsuperscript{10} The American Community Survey (ACS) queries sex, but not gender.\textsuperscript{11} The National Center for Health Statistics is currently testing approaches to querying sex and gender. Although some progress has been made in more accurately capturing sex and gender data, the generalizability of findings using NHANES, BRFSS, and ACS data are limited by the wide variability in question and response wording. Consistent inclusion of sex and gender identity data has the potential to catalyze research on diet–disease relationships among gender minority subgroups.\textsuperscript{3,5}

### Clinical and Translational Nutrition Research

Clinical and translational nutrition research centers on testing the effects of dietary interventions on human subjects. These studies ultimately inform dietary guidelines, public health messaging, and health policies.\textsuperscript{12} Given the reliance on human subjects, accurate collection of not only sex, but also gender, may significantly inform the internal and external validity of the research. For example, a clinical trial involving a new treatment approach for patients with eating disorders may be effective for a cisgender (gender is congruent with sex assigned at birth) female adolescent population, but not a transgender (gender is not congruent with sex assigned at birth) female adolescent population if transgender participants were not included in the study sample. By accurately collecting the sex and gender of the study sample, researchers can expand the impact of study findings to be more inclusive of subpopulations who could benefit from targeted health promotion interventions and improve health care services or therapy.
Basic Nutrition Science
Basic or preclinical nutrition science research relies on cells, tissues, or animals. Sex as a biological variable is widely accepted in this sector of nutrition science second to a fundamental understanding of biological differences in male and female animal subjects. Recent attention has centered on the need to accurately report data on sex and refrain from extrapolating studies on one sex to both males and females. The NIH now expects that sex as a biological variable is factored into research design, analysis, and reporting in both animal and human studies.

CHALLENGES OF ASSESSING GENDER IDENTITY
Adopting these practices poses challenges. Terminology related to gender is evolving. Demographic surveys will need to be reassessed to accommodate evolving terms. This increases burden on the data team. Extensive testing of question terminology is required to ensure sensitivity and specificity of the questions. Major concerns include maintaining the confidentiality and privacy of participants, risk of “false positives” in which participants mistakenly identify themselves as a gender minority, and the limited statistical power with small sample sizes. Another concern is that changes to surveys creates a potential burden or challenge to examining data longitudinally. These challenges are being considered by agencies and organizations such as the National Center for Health Statistics, the NIH, and the NASEM to develop the most evidence-based practices that prioritize validity, statistical power, and participant privacy.

BENEFITS OF CAPTURING SEX AND GENDER IDENTITY SEPARATELY
Adopting a standard practice of querying sex and gender separately, offering gender responses beyond the male–female binary, and including an open-text option for respondents to write in their gender offers several benefits. First, doing so increases the construct validity of the survey (sex and gender are separate constructs). This step is paramount to improving inclusion of gender minorities and elucidating the nutrition-related health disparities across genders. Furthermore, doing so offers respondents autonomy and respect to self-identify, improving trust and retention across settings. In light of paucity of data, lack of nutrition care guidelines, and burgeoning discriminatory policies, researchers and clinicians have an opportunity to act.

THE NASEM REPORT
To standardize federal data collection efforts, the NASEM published a report in March 2022: Measuring Sex, Gender Identity, and Sexual Orientation. A committee convened to produce this report in response to an NIH charge to produce evidence-based recommendations for specific measures of sex, gender identity, and sexual orientation for use across research, clinical, and administrative settings. The NIH has since endorsed the recommendations across the agency and broadly promoted their use in future research and across the federal landscape. For example, the NIH Sexual and Gender Minority Research Office promotes the NASEM recommendations on the Sexual and Gender Minority Research Office website and intends to provide technical support across the NIH, US Department of Health and Human Services, and interagency work groups in application of the current recommendations and testing future recommendations.

The NASEM adopted five guiding principles to inform their recommendations: Inclusiveness (all people deserve to count and be counted; precision (use of precise terminology to accurately capture the complex and multidimensional nature of sex, gender, and sexual orientation); autonomy (respect for a person’s identity or sense of self); parsimony (collection of only the necessary data); and privacy (data collection in a way that respects the privacy and confidentiality of the data).

The NASEM report provides nuanced recommendations for research, clinical, and administrative settings; those seeking to accurately apply the recommendations are encouraged to review the publicly available report. For the purpose of research across the nutrition science domains, Figure 2 highlights the recommended language for collecting sex and gender data. This two-step approach facilitates inclusivity and autonomy of participants to select responses that more accurately represent them. The use of more precise terms corresponding to sex and gender ensures construct validity. Ultimately the driving determinant of whether these questions should be included in a survey or questionnaire lie at the heart of parsimony, or the notion to only collect data essential to the primary research objective. For example, sex and gender data are critical to understanding nutrition-related health disparities among subsets of the United States population. However, these data may not be necessary in certain nutrition studies such as sensory evaluations of a food product. Finally, data should be carefully collected.
stored, and maintained in a manner that ensures the privacy and confidentiality of participants.6

THE SAGER GUIDELINES

Complementary to the NASEM recommendations, the SAGER guidelines offer an international and systematic approach to reporting sex and gender throughout the research process.7

The guiding principles of the SAGER guidelines align with the NASEM guiding principle of precision (Fig 3).

Although the NASEM recommendations provide guidance on how to collect sex and gender data, the SAGER guidelines specify how to report sex and gender data in study design, data analyses, results, and interpretation (Fig 3). Nutrition researchers can rely on the SAGER guidelines especially when preparing scientific manuscripts for publication. The Journal of the Academy of Nutrition and Dietetics encourages authors to follow these guidelines.19

CONSIDERATIONS FOR THE ACADEMY OF NUTRITION AND DIETETICS

The NASEM’s guiding principle of inclusion speaks to the Academy of Nutrition and Dietetics’ (AND) commitment to achieving IDEA across the organization.1 In particular, goal 4 of the AND IDEA Action Plan addresses the vision for research as: “Advance food and nutrition research, policy and practice through a holistic IDEA lens” with the strategy to “Ensure that research protocols include anti-bias practices.”20

A holistic IDEA lens requires attention not only to distinction between sex and gender, but also to gender beyond the male–female binary. Gender minorities (transgender, genderqueer, nonbinary populations, among others) experience marked physical and mental health disparities (eg, elevated rates of cancer, human immunodeficiency virus, acquired immunodeficiency syndrome, eating disorders, food insecurity, suicidality, anxiety, and depression) secondary to gender-based stigma, bias, and discrimination.21,22 As a result, for research purposes, the NIH recognizes gender minorities as a health disparate population. As existing research on the nutrition-related considerations of the transgender population is highly limited. A sound body of evidence is needed to ultimately inform nutrition practitioners in providing optimal gender-affirming nutrition care.24

CONCLUSIONS

Sex and gender are separate constructs that are often conflated and reduced to a male–female binary in nutrition research. The NASEM recommendations and SAGER guidelines provide nutrition researchers and clinicians with standardized language and principles to accurately collect and report sex and gender identity data. Ubiquitous adoption of this approach will improve the quality of data collection and...
impact of findings, and thus will advance research, health promotion interventions, and policy across nutritional epidemiology, clinical and translational nutrition research, and basic nutrition science. A sex- and gender-informed approach is aligned with the AND IDEA Action Plan and can catalyze nutrition research on gender minority populations as we strive toward health equity.

References
1. Academy of Nutrition and Dietetics. Nutrition Terminology Reference Manual (eNCPD): Dietetics language for nutrition care. Accessed May 6, 2022. https://www.ncpro.org/
2. Deutsch MB. Guidelines for the primary and gender-affirming care of transgender and gender nonbinary people. 2016. Accessed June 9, 2022. http://www.thetaskforce.org/static_html/downloads/reports/ntds_full.pdf
3. Linsenmeyer W, Waters J. Sex and gender differences in nutrition research: Considerations with the transgender and gender non-conforming population. Nutr J. 2021;20(1):1-3.
4. Rich-Edwards JW, Kaiser UB, Chen GL, Manson JAE, Goldstein JM. Sex and gender differences research design for basic, clinical, and population studies: Essentials for investigators. Endocr Rev. 2018;39(4):424-439.
5. Advancing equity: The Academy’s commitment to supporting inclusion, diversity, equity, and access. J Acad Nutr Diet. 2022;122(1):159-165.
6. National Academies of Sciences, Engineering, and Medicine. Measuring Sex, Gender Identity, and Sexual Orientation. Washington, DC: National Academies Press; 2022. https://doi.org/10.17226/26424
7. Heidari S, Babor TF, De Castro P, Tort S, Curno M. Sex and gender differences research design for basic, clinical, and population studies: Essentials for investigators. Endocr Rev. 2018;39(4):424-439.
8. Advancing equity: The Academy’s commitment to supporting inclusion, diversity, equity, and access. J Acad Nutr Diet. 2022;122(1):159-165.
9. NHANES 2021-2022 Questionnaire Instruments. Accessed April 28, 2022. https://www.cdc.gov/nchs/nhanes/questionnaires/qtr-05/nhanes-2021-2022/questionnaire_instruments.html
10. Centers for Disease Control and Prevention. Statistical brief using sexual orientation, gender identity, sex, and sex-at-birth variables in analysis. Accessed August 12, 2022. https://www.cdc.gov/bfrss/data_documentation/pdf/BFRSS-SOGI-Stat-Brief-508.pdf
11. Bureau UC. Sample ACS & PRCS Forms and Instructions. Accessed August 19, 2022. https://www.census.gov/acs-forms-and-instructions
12. Zoellner J, Van Horn L, Gleason PM, Boushey CJ. What is translational research? Concepts and applications in nutrition and dietetics. J Acad Nutr Diet. 2015;115(7):1057-1071.
13. Lee SK. Sex as an important biological variable in biomedical research. BMJ Rep. 2010;4(4):167-173.
14. Office of Research on Women’s Health. NIH policy on sex as a biological variable. Accessed August 19, 2022. https://orwh.od.nih.gov/sx-gender/nih-policy-sex-biological-variable
15. Rioux C, Paré A, London-Nadeau K, et al. Sex and gender terminology: a glossary for gender-inclusive epidemiology. J Epidemiol Community Health. 2022;76:764-768.
16. NCHS—Events and Announcements. Accessed August 19, 2022. https://www.cdc.gov/nchs/events/webinars.htm
17. Tabak L. NIH-Funded NASEM report highlights critical need for SGM-related data collection | National Institutes of Health (NIH). Accessed August 19, 2022. https://www.nih.gov/about-nih/who-we-are/nih-director/statements/nih-funded-nasm-report-highlights-critical-need-sgm-related-data-collection
18. Parker KL. Measuring sex, gender identity, and sexual orientation: A consensus study report by the National Academies commissioned by the National Institutes of Health. Accessed April 6, 2022. https://www.nationalacademies.org/our-work/measuring-sex-gender-identity-and-sexual-orientation-for-the-national-institutes-of-health
19. Guide for authors—Journal of the Academy of Nutrition and Dietetics—ISSN 2212-2672. Accessed September 6, 2022. https://www.eatrightpro.org/practice/practice-resources/diversity-and-inclusion
20. Inclusion, Diversity, Equity and Access Hub. Accessed August 19, 2022. https://www.eatrightpro.org/practice/practice-resources/diversity-and-inclusion
21. Rahman R, Linsenmeyer WR. Caring for transgender patients and clients: Nutrition-related clinical and psychosocial considerations. J Acad Nutr Diet. 2019;119(5):727-732.
22. James SE, Herman JL, Rankin S, Keisling M, Mottet MA, Koyanagi A, Starcic P, Venetianer H, Smith EM. The Report of the 2015 U.S. Transgender Survey. 2016. Accessed May 27, 2022. https://www.transequality.org/sites/default/files/docs/USTS-Full-Report-FINAL.PDF
23. Pérez-Stable EJ. Director’s message: Sexual and gender minorities formally designated as a health disparity population for research purposes. 2016. Accessed August 19, 2022. https://www.nimhd.nih.gov/about/directors-corner/messages/message_10-06-16.html
24. Rozga M, Linsenmeyer W, Cantwell Wood J, Darst V, Gradwell EK. Hormone therapy, health outcomes and the role of nutrition in transgender individuals: A scoping review. Clin Nutr ESPEN. 2020;40:42-56.

AUTHOR INFORMATION
H. E. Schier is a graduate research associate, Department of Human Sciences, Human Nutrition Program, The Ohio State University, Columbus, OH. C. Gunther is an associate professor, The Martha S. Pitzer Center for Women, Children and Youth, College of Nursing, The Ohio State University, Newton Hall, Columbus, OH. M. J. Landry is a postdoctoral scholar, Stanford Prevention Research Center, School of Medicine, Stanford University, Stanford, CA. S. D. Ohlhorst is a chief science policy officer, American Society for Nutrition, Rockville, MD. W. Linsenmeyer is an assistant professor, Nutrition and Dietetics, Doisy College of Health Sciences, Saint Louis University, St. Louis, MO.

Address correspondence to: Heather E. Schier, MS, Department of Human Sciences, Human Nutrition Program, The Ohio State University, 1787 Neil Avenue, Columbus, OH 43210 E-mail: schier.8@osu.edu

FUNDING/SUPPORT
No funding or support was received for the data collection or writing of this article.

AUTHOR CONTRIBUTIONS
HS constructed the first draft with contributions from MJL, SDO, WL, and CG. All authors reviewed and commented on subsequent drafts of the manuscript.