



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

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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).⁵ 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

Agency/organization	Survey program	Method of capturing sex and gender with response options ()
Centers for Disease Control and Prevention (CDC)	National Health and Nutrition Examination Survey (NHANES) (2021) ⁹	Interviewers ask respondents about “gender” “if not obvious” (male, female, don’t know, refused to answer)
	The Youth Risk Behavior Surveillance System (YRBSS) (2021) ¹²	What is your sex? (female, male); gender not queried
	The Behavioral Risk Factor Surveillance System (BRFSS) (2021) ¹⁰	Are you male or female? (male, female, don’t know/not sure, refused); Optional Modules ^a : <i>Sex assigned at birth</i> What was your sex assigned at birth? Was it male or female? (male, female, don’t know/not sure, refused) <i>Sexual orientation and gender identity (SOGI)</i> Do you consider yourself to be transgender? (yes, transgender male-to-female; yes, transgender female-to-male; yes, transgender, gender nonconforming; no; don’t know/not sure; refused)
	Adolescent Behaviors and Experiences Survey (ABES) (2021) ¹³	What is your sex? (female, male); gender not queried
Department of Health and Human Services (DHHS)/Bureau of Primary Health Care (BPHC)	Health Center Patient Survey (HCPS) ¹⁴	What is your gender? (male, female); If age >13: (female-to-male transgender male/trans male/female-to-male, male-to-female transgender female/trans woman/male-to-female, gender queer, other, specify)
US Census Bureau	The American Community Survey (ACS) (2022) ¹¹	What is Person X’s sex? Mark ONE box (male, female); gender not queried
^a Optional modules in the BRFSS, <i>sex assigned at birth</i> and <i>sexual orientation and gender identity (SOGI)</i> , have been available to states since 2014. In 2020, the following states included both optional modules: California, Georgia, Hawaii, Iowa, Louisiana, Minnesota, New Mexico, New York, Ohio, Utah, Vermont. ¹⁵		

Figure 1. Major survey programs that collect nutrition-related information in the United States and methods of capturing sex and gender.

gender identity data (Fig 1).¹⁰ The American Community Survey (ACS) queries sex, but not gender.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.^{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.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.¹³ The NIH now expects that sex as a biological variable is factored into research design, analysis, and reporting in both animal and human studies.¹⁴

CHALLENGES OF ASSESSING GENDER IDENTITY

Adopting these practices poses challenges. Terminology related to gender is evolving.¹⁵ 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.¹⁶ 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*.⁶ 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.¹⁷ 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.¹⁸

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).⁶

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.⁶ 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,

<p>Q1: What sex were you assigned at birth, on your original birth certificate?</p> <ul style="list-style-type: none"> - Female - Male <p>(Don't know) (Prefer not to answer)</p>
<p>Q2: What is your current gender? [Mark only one]</p> <ul style="list-style-type: none"> - Female - Male - Transgender - [If respondent is American Indian/Alaska Native (AIAN):] Two-Spirit - I use a different term: [free text] <p>(Don't know) (Prefer not to answer)</p>
<p>Source: https://nap.nationalacademies.org/catalog/26424/measuring-sex-gender-identity-and-sexual-orientation.</p> <p>License: Reprinted with permission CC license ID 1259821-1</p>

Figure 2. The National Academies of Science, Engineering, and Medicine (NASEM) recommended language to query sex and gender.⁶

General principles	
Authors should use the terms <i>sex</i> and <i>gender</i> carefully to avoid confusing both terms.	
Where the subjects of research comprise organisms capable of differentiation by sex, the research should be designed and conducted in a way that can reveal sex-related differences in the results, even if these were not initially expected.	
Where subjects can also be differentiated by gender (shaped by social and cultural circumstances), the research should be conducted similarly at this additional level of distinction.	
Recommendations per section of the article	
Title and abstract	If only one sex is included in the study, or if the results of the study are to be applied to only one sex or gender, the title and the abstract should specify the sex of animals or any cells, tissues, and other material derived from these and the sex and gender of human participants.
Introduction	Authors should report, where relevant, whether sex or gender differences may be expected.
Methods	Authors should report how sex and gender were taken into account in the design of the study, whether they ensured adequate representation of males and females, and justify the reasons for any exclusion of males or females.
Results	Where appropriate, data should be routinely presented disaggregated by sex and gender. Sex- and gender-based analyses should be reported regardless of positive or negative outcome. In clinical trials, data on withdrawals and dropouts should also be reported disaggregated by sex.
Discussion	The potential implications of sex and gender on the study results and analyses should be discussed. If a sex and gender analysis was not conducted, the rationale should be given. Authors should further discuss the implications of the lack of such analysis on the interpretation of the results.
Table Title: "Sex and Gender Equity in Research (SAGER) guidelines".	
Author: Shirin Heidari et al.	
Source: Sex and Gender Equity in Research: rationale for the SAGER guidelines and recommended use.	
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Figure 3. Sex and Gender Equity in Research (SAGER) guidelines on reporting sex and gender throughout the research process.⁷

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.⁷ 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.⁵ 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, gender-queer, 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.²³ 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.

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