



Editorial

Conference on ‘Understanding the role of sex and gender in nutrition research’

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Nutrition plays a pivotal role in health and disease prevention and management and through its interactions with social and personal factors, influences an individual's growth, development and life chances, as well as long-term health and longevity. These factors include amongst others, genetic inheritance, ethnicity, socio-cultural context, sex and gender. Although different interpretations exist, in general sex refers to the genetic, biological and physiological attributes that distinguish females, males and intersex whereas gender refers to socio-cultural and politically constructed roles and behaviours associated with a feminine, masculine or non-binary identity, which vary from society to society. Sex has implications for key biological processes involving food and nutrients as well as life-stage differences in nutritional requirements. Sex and gender may have implications in how individuals engage in different dietary behaviours and respond to nutrition interventions. The Irish Section Nutrition Society 2023 Conference sought to enhance understanding of the role of sex and gender in nutrition research; explore the influence of sex and gender on risk of non-communicable diseases and examine sex- and gender-specific considerations across the life course. This short editorial provides an overview and highlights of the conference.

In June 2023, the Irish Section Nutrition Society Conference was organised and hosted by the Technological University of the Shannon. Over the course of 3 d the conference programme focused on three separate, but inter-related symposia with the aim of improving our understanding of how to identify and interpret sex and gender differences in nutrition research and understand how these differences might affect or influence nutrition interventions and outcomes, to consider the influence of sex and gender on risk of non-communicable diseases, and to explore sex- and gender-specific considerations across the life course.

Sex and gender are regarded as distinct constructs. Although different interpretations exist, sex refers to a set of biological attributes in humans and animals and is generally associated with physical and physiological

features such as chromosomes, gene expression, hormone levels and function and reproductive/sexual anatomy⁽¹⁾. Sex is usually categorised as female or male but there is variation in the biological attributes that comprise sex and how those attributes are expressed. In humans, sex refers to the biological attributes that distinguish male, female and intersex⁽¹⁾. The nutritional needs of individuals and population subgroups vary and biological and social differences between women, men, girls, boys and gender-diverse people are important considerations. Sex has implications for bioavailability, metabolism, distribution and elimination of food and nutrients as well as life-stage differences in nutritional requirements. Several factors can influence these differences. Intrinsic factors (e.g. genetics, hormones, body size, sex-specific physiology), extrinsic factors (e.g. diet, sociocultural issues,

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environment), phenotypic differences and/or interactions among these factors. Additionally, hormonal changes at the onset of puberty, during the menstrual cycle, during pregnancy and during the transition from premenopause, to perimenopause, to post-menopause may also impact health outcomes. Evidence would also suggest that disease can manifest differently in women than in men. Gender refers to the socially constructed roles, behaviours, expressions and identities of girls, women, boys, men, gender diverse people and non-binary identity which vary from society to society⁽¹⁾. Both sex and gender may have implications in how individuals engage in different dietary behaviours and respond to nutrition interventions.

Opening the conference, Professor Ineke Klinge (The European Commission) introduced the topic of sex- and gender-based research including the policy context from an European Union perspective and discussed the development of tools available to researchers to apply a sex and gender approach to analysis and innovation through Gendered Innovations⁽²⁾. Professor Klinge also highlighted that dietary patterns may affect a range of physiological and health outcomes, but these are rarely examined from a sex and gender perspective. Dr Whitney Linsenmeyer (St Louis University, USA) reviewed the current state of sex and gender data collection in nutrition science research and the effects of conflating or omitting sex and gender data. Dr Linsenmeyer also considered food and nutrition for transgender populations and the ethical considerations when conducting research with transgender populations. Professor Sophie Moore (King's College London) provided an overview of her research which examined differential patterns of growth and brain development between boys and girls. Her work identified that sex differences exist in the growth of children growing up in resource-limited settings, with boys vulnerable to early growth deficits. The data suggest that such deficits impact functional outcomes, including neurocognitive development. It would appear that sex differences in growth across childhood are driven by both biological and social risks, though it is likely that earlier effects are driven by biological effects. Professor Moore concluded that in the context of nutritional vulnerability, all infants and children under age 5 (as well as caregivers) should be seen as a high-priority group for targeted interventions. Dr Sharon Madigan (Sport Ireland Institute) concluded symposium one with a summary of the growing body of research on sex and gender differences in sports nutrition and highlighted the gaps and limitations in the current understanding of this field.

Symposium two focused on the impact of sex and gender on risk of non-communicable diseases. Dr Martin Blomberg Jensen (Herlev Hospital, Denmark) examined the role of vitamin D and calcium in male reproductive health including the role of vitamin D for oestrogen signalling and sperm motility and how vitamin D supplementation increases testosterone/luteinising hormone ratio and insulin sensitivity compared with placebo in infertile men. This was followed by Professor Deborah Clegg (Texas Tech University) who focused on how

endogenous and environmental oestrogens regulate adipose tissue deposition and metabolic health and explored the sex differences with regard to obesity-associated health risks. Professor David Armstrong (Western Health & Social Care Trust, Northern Ireland) discussed the influence of sex hormones in the development of the human skeleton and the role of oestrogen deficiency in the development of osteoporosis and how this can be managed in men, women and trans populations. Professor Armstrong also considered gender inequalities in diagnosis and management and discussed potential strategies to address these. Dr Briar McKenzie (University of New South Wales and the George Institute for Global Health, Australia) presented on the need for sex and gender considerations when investigating the diet-related burden of non-communicable diseases and provided detailed and considered examples of sex differences research in dietary assessment methods, diet behaviours and the relationship of dietary intake with the leading causes of death for men and women. Dr Briar emphasised the need to 'prioritise the routine collection and analysis of data disaggregated by sex, gender, and other intersecting characteristics to track progress towards targets and identify and address barriers that impede women, girls and other groups experiencing marginalisation from accessing health promotion, prevention, diagnosis, treatment and care'.

The third and final symposium addressed sex- and gender-specific considerations across the life course. Dr Claire Reynolds (University College Dublin) examined the impact of artificial sweeteners on fertility, maternal and child health outcomes and demonstrated differential effects in male and female offspring in response to *in utero* exposure to artificial sweeteners in animal models. Dr Matthew Pontifex (University of East Anglia) then considered cognitive health in women who are disproportionately affected by Alzheimer's disease. Dr Pontifex examined the heightened risk of female apolipoprotein E4 genotype carriers and how this may be related to changes that occur in and throughout the menopause transition and concluded that apolipoprotein E4 females (~13% UK population) are a population subgroup at higher risk of cognitive decline and dementia who may particularly benefit from precision nutrition approaches. Dr Catherine Hughes (NICHE, Ulster University) further explored sex differences in dementia and depression, presenting findings from the Trinity-Ulster-Department-of-Agriculture study. Dr Hughes emphasised the importance of focusing on modifiable risk factors in middle life and how considering sex and gender differences may play an important role in prevention of dementia in later life. Dr Liz Simpson (Ulster University) concluded with an overview of menopause and the importance of considering the role of sex and gender particularly when utilising behaviour change models to design effective diet and lifestyle interventions.

Recognition of postgraduate research and the Julie Wallace Award

A highlight of the Irish section Nutrition Society conference is the postgraduate symposium which recognises



the research contribution from early career researchers in the field of nutrition. Simone Dunne (University College Dublin) discussed the recent evidence for variation in CVD risk from different food matrices, and the need to consider more accurate risk markers. This was followed by Caroline Donovan (University College Dublin) who appraised recent evidence relating to weight status trends and the key determinants of obesity while considering these in the context of respective policy measures. Niamh Walsh (University College Cork and Munster Technological University) considered micronutrient intakes in adolescents from nationally representative dietary surveys in the Western World highlighting the need for targeted dietary strategies in improving intakes in this vulnerable group. Finally, Daniel Hazley (Technological University Dublin) examined how people define healthy and sustainable eating and how they perceive their own food choices in relation to these concepts, focusing on adults in the UK and Ireland. The Julie Wallace Award, in memory of Professor Julie Wallace (Ulster University) is an award that recognises early-stage scientific excellence in the field of nutrition and was presented to Dr Fiona Malcomson (Newcastle University) who delivered an overview of her research into the role of diet and lifestyle in colorectal risk with a focus on the current evidence and underlying mechanisms.

Summary

Over the course of the 3 d, the conference presented plenty of informative, enjoyable and stimulating conversations and discussions regarding the role of sex and

gender in nutrition research. The review papers from this conference highlight the importance of a sex- and gender-based approach to improve the quality of study design, data collection, analysis and interpretation, thus further advancing nutrition research, implementation and policy.

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Conflict of Interest

None.

Authorship

P. H. planned, wrote and edited the manuscript.

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