

# Introduction to the special issue on Balanced diets in food systems: emerging trends and challenges for human health and wellbeing

Voster Muchenje\*

Department of Livestock and Pasture Science, University of Fort Hare, P/Bag, X1314, Alice 5700, South Africa E-mail address: [vmuchenje@ufh.ac.za](mailto:vmuchenje@ufh.ac.za)

Felicitas E. Mukumbo

Department of Livestock and Pasture Science, University of Fort Hare, P/Bag, X1314, Alice 5700, South Africa

Adriana M. Descalzo

Instituto Tecnología de Alimentos, Centro de Investigación de Agroindustria, Instituto Nacional de Tecnología Agropecuaria (INTA), CC 77(B1708WAB), Morón, Buenos Aires, Argentina

Hettie C. Schönfeldt

Department of Animal and Wildlife Sciences, Institute of Food, Nutrition and Well-being, University of Pretoria, Pretoria, South Africa

\* Corresponding author. Tel.: +27406022059; fax: +27866282967.

Diets are constantly changing, creating new challenges to existing food systems to deliver the food to meet these requirements. With a new focus on the outcomes of food systems in terms of human health and well-being, the question arises: what are the emerging trends and challenges that are critical to be considered in order to meet these needs.

Dietary consumption patterns differ significantly amongst consumers from different regions of the world as well as between societies amongst people with different socio-demographic backgrounds. However for several decades, the amount of energy in the food supply has increased, and inexpensive, processed, energy dense foods have become widely marketed and available ([Drewnowski & Darmon, 2005](#)). Consumption of inadequate nutrients is associated with the double burden of malnutrition and disease; as poor quality diets are associated with increasing rates of overweight, obesity and diet-related chronic diseases on one hand, while micronutrient deficiencies lower immunity leading to infectious diseases on the other ([Hawks, 2006](#)). Global changes in dietary patterns throughout human history have been influenced by an array of factors including income levels, technological advances, culture and urbanisation. The nutrition transition refers to the emergent trend where the level of income rises and as populations become more urban, diets which are higher in complex carbohydrates and fiber are replaced by more energy dense diets that are higher in sugar and fats ([Drewnowski, 2000](#)). Particularly, a paradoxical shift has been reported over the years with developed countries moving towards a more grain, fruit and vegetable-based diet, versus a shift towards replacing fibre and grain-rich traditional diets with a greater

proportion of processed foods high in fat and sugar in developing countries ([Drewnowski and Popkin, 1997](#), [Drewnowski, 2000](#), [Mathijs, 2015](#)). For example, there was a significant increase in the proportion of energy derived from meat and vegetable oils and a decrease in energy derived from cereals in the Middle East and North Africa over 47 years (1961-2007) ([Golzarand et al., 2012](#)). On a global level, evidence suggests that with rising household income levels, a more varied diet is likely to be consumed; with more non-staple food items including animal-sourced food (meat, fish and dairy), vegetable oils, fruits and vegetables; as well as processed foods high in fat, sugar and salt ([FAO Food and Agriculture Organisation of the United Nations, 2017](#)) with associated overconsumption of energy due to portion size distortion.

An increasing body of evidence supports the fact that the nutrition transition has indeed led to an epidemiological transition away from infectious diseases towards more non-communicable diseases. Chronic illnesses or non-communicable diseases (NCDs) associated with nutrient deficiencies and excesses are a growing global epidemic. Since 2002, the occurrence of NCDs surpassed the rate of communicable diseases in some regions and accounted for 60% of mortalities worldwide, mainly in low and middle income countries. Within the last decade, the number of deaths worldwide caused by NCDs increased by an average of 14.1% and stood at 39.8 million in 2015, in contrast with a decline in the death rate due to communicable diseases ([GBD Global Burden of Disease 2015 Mortality and Causes of Death Collaborators\\*collaborators listed at the end of the article, 2016](#)). Current statistics estimate that 815 million people worldwide are chronically undernourished. Over two thirds (around 580 million) of these people live in low-income and low-middle income countries; where an estimated 1.75 billion people survive on less than US\$3.10 a day ([FAO Food and Agriculture Organisation of the United Nations, 2017](#)). In 2015, the prevalence of micronutrient deficiencies was reported amongst 2 billion people worldwide, translating into productivity losses estimated to the value of US\$ 3.5 trillion per year ([Loewenburg, 2015](#)). The linkage between dietary patterns and the incidence of dietary-related non-communicable diseases such as diabetes, cardiovascular diseases, hypertension, cancer, osteoporosis and obesity is evident ([Bloom et al., 2011](#)).

With the failure of countries worldwide to deliver sufficiently on the Millennium Development Goals (MDGs) the focus shifted at the ICN2. The 17 Sustainable Development Goals (SDGs) and 169 targets were adopted by all countries in 2015 with the aim to eradicate hunger, poverty and achieve food security and improve nutrition globally by 2030. Nutrition contributes directly to achieving SDG2 (End hunger, achieve food security and improved nutrition, and promote sustainable agriculture) and is a decisive enabler of SDG3 (Ensure healthy lives and promote well-being for all at all ages) ([WHO, 2017](#)). The consumption of sufficient quantities, safe and nutritious food for the maintenance of a healthy and active life is a critical component of food security. In the global fight against food insecurity, the challenge of insufficient quantity has in the past often been more evident than and prioritised over the challenge of inadequate nutritional quality.

However, as the prevalence of diseases linked to the consumption of unbalanced diets has been on the increase, efforts and research to encourage the consumption of healthy, balanced diets have intensified. The World Health Organisation (WHO), in 2004, initiated the Global strategy on Diet, Physical Activity and Health; an international public health initiative

developed in response to a rising concern over the rapid increase in cases of non-communicable diseases. Unhealthy diet, physical in-activity and the excessive consumption of potentially harmful substances (tobacco, alcohol and carcinogenic compounds) are predominant risk factors to the rising rate of clinical nutritional problems. The 2030 Agenda for Sustainable Development and the United Nations (UN) Decade of Action on Nutrition 2016-2025 have revitalized momentum for improving nutrition ([WHO, 2017](#)). The SDGs and the UN Decade of Action on Nutrition provide a new platform for achieving health impact, and the global momentum for fighting malnutrition in all its forms is on the rise.

The acceleration of technological advances, economic development and globalisation greatly impact dietary and lifestyle habits and have drastically changed the playing field. Of particular importance is the emerging dependence on information technology and social media to inform the consumption and lifestyle patterns of people from all age groups. Furthermore, demographic and socio-economic factors influence, and are intertwined with, nutritional needs across the globe; and a careful synopsis of the complex interaction between the driving forces is necessary and informs the contextually relevant interventions with the potential to increase the affordability and availability of healthier foods relative to less healthy foods. It is therefore necessary to continually consolidate past trends and information with more recent information regarding the state and impact of nutritional inadequacies in both developed and developing countries; in relation to dietary, consumption and lifestyle patterns.

While many poor households produce own fresh produce, the majority of food accessed and consumed is procured through the formal or informal food systems. The importance of the agriculture and food sectors should thus not be ignored and is critical to human health in all regions of the world. This special issue is composed of current reviews and original research papers on emerging trends and technology concerning balanced diets and human health. The regional prevalence of undernourishment, child stunting, wasting and mortality is highest in Sub-Saharan Africa (SSA). [May \(2017\)](#) reviewed the dynamic interactions or 'keystones' of important socio-economic factors (including economic growth and rapid urbanization; inequality and a growing middle class; obesogenic food environments and an increasing prevalence of diet-related non-communicable diseases); and how they influence diets in SSA. The review highlights that while the prevalence of diet-related non-communicable diseases is increasing in SSA, the policy response has been limited. New forms of diet-related inequality are developing in the region, such as emerging obesogenic food environments, which affect the prospects for balanced diets. Ultimately, consumers and governments require new capabilities to manage diet transitions such as food-sensitive urban planning, support of food literacy and fiscal management of consumption ([May, 2017](#)). Globally, the environmental impact of agriculture and food production remains critical for sustainable food security. However, environmental sustainability is rarely taken into account in the development of food-based dietary guidelines. In their study, [van de Kamp et al. \(2017\)](#) compared the differences in environmental impact and nutrient content of the current Dutch diet with four healthy diets aimed at lowering greenhouse gas (GHG) emissions; demonstrating that the incorporation of environmental sustainability into the development of dietary guidelines can lead to substantial reduction in GHG emissions. The safety of red and processed meat consumption came under intense scrutiny following the International Agency for Research on Cancer (IARC) evaluation on the carcinogenicity of red

and processed meat consumption (Bouvard et al., 2015). Aside from the carcinogenic risks associated with some meat cooking/processing techniques and additives, nutritional health implications associated with meat consumption are largely linked to its fat content and fatty acid composition. Chikwanha, Vahmani, Muchenje, Dugan & Mapiye (2017) reviewed the nutritional strategies used to enhance the fatty acid profile of meat from sheep and innovative strategies with the potential to enrich sheep meat with fatty acids which may have human health benefits. Santeramo et al. (2017) placed emerging trends in diets, the food industry and food supply chains (including fruits and vegetables, meat, and seafood) under the spotlight; highlighting the importance of attributes associated with food safety, the relevance of the labels and packaging, increasing consumer attention to sustainability issues, environmental efficiency and animal welfare, and innovations in the food industry towards novel and functional foods.

Political instability is a root cause of inadequate nutrition and food insecurity, especially in the developing world. Reports indicate that around a third of the 25 million people projected to be in need of urgent humanitarian response to acute food insecurity are people who have fled their countries as refugees or who have been displaced within their borders due to internal conflicts (Loewenburg, 2015). Displaced groups and individuals are vulnerable to emotional pain, metabolic imbalances, chronic illnesses and non-communicable diseases associated with stressed livelihood and restricted access to balanced diets. Fayemi, Muchenje, Yetim & Ahhmed (2017) discussed novel health-promoting bioactive peptides in a variety of meats, health-promoting bioactive substances and analgesics in restructured organ meat products; and propose their utilisation as an affordable diet-based intervention, considering the potential benefits of nutrient synergy and analgesic constituents in offal/organ meat. With technological advances in the digital age, there is increased access to and an emerging reliance on information technology and social media to inform the consumption and lifestyle patterns of people of all age groups. Ghelfi et al. (2017) reviewed the effect of the increasing amount of health-related information available on cancer patients' eating habits. Tendencies towards increased consumption of fruit and vegetables and decreased consumption of red meat, fats and sugary foods were more likely in younger patients with higher educational levels and with a longer period of time since their diagnosis of cancer. In South Africa, Swart, Schutte, van Rooyen & Mels (2017) investigated the associations of selenium with blood pressure (BP) and hemodynamic measures in a cross-sectional study across socio-demographic groups, revealing lower serum selenium levels in black populations from the same geographical region as their white counterparts, which may impact on the loss of vasculoprotective effects of selenium and selenoproteins in the hypertension prone black population. Laurie, Faber and Claasen (2017) reviewed the potential of orange fleshed sweet potato incorporation in South African food systems as a strategy for improved nutrition and towards alleviating vitamin A deficiency; discussing multiple avenues available, policies and interventions recommended to up-scale production, marketing and increase demand. In a review on fruits and vegetables as a source of nutritional compounds and phytochemicals, Septembre-Malaterre et al. (2017) discussed the transformation and modifications of health-related properties in bioactive compounds during fermentation, improvement of compositional bioaccessibility and bioavailability; highlighting interactions between ingested fermented food, intestinal microbiota and their correlations to metabolomics profiles and health represent an important perspective deserving to be further explored. Anyasi et al.,

(2017) assayed the essential mineral profile as well as phenolic compounds present in unripe banana flour (UBF) from different cultivars and organic acid pre-treatment concentrations. While rich in essential minerals, the presence of phytochemicals in banana fruit can also act as a mineral inhibitor. [Ramashia, Gwata, Meddows-Taylor, Anyasi & Jideani \(2017\)](#) determined the physical properties of finger millet grains and the functional properties of its flour; detailing valuable information important for agricultural and food engineers, designers, scientists and processors in the design of equipment for finger millet grain processing and potential fortification. [Jastera et al. \(2017\)](#) investigated the antioxidant activity and physicochemical properties of yogurt enriched with concentrated strawberry pulp obtained by block freeze concentration, in comparison with commercial trademarks. Enriching natural yogurt with strawberry cryoconcentrated pulp resulted in a product with 3-fold more anthocyanins content and antioxidant activity; producing a beverage with higher nutritional characteristics. [Xue et al. \(2017\)](#) explored the lipid metabolism potential and mechanism of CPe-II peptide, which exhibits the highest antioxidant capacity among chickpea albumin hydrolysates; and cholesteryl ester transfer protein, revealing that CPe-III effectively lowered lipids in hyperlipidemic mice and can reverse liver damage induced by a high fat diet, providing theoretical support for the antihypercholesterolemia effects of CPe-III in humans. [Farouk et al. \(2017\)](#) investigate the development of novel meat-enriched foods for older consumers, in a series of trials in which they developed red meat enriched versions of bread, spaghetti, yoghurt, ice cream and chocolate; with the aim of boosting nutritional composition and creating novel texture and taste experiences that could help the elderly improve their consumption of red meat in various forms including meals, snacks, desserts and treats.

Making food systems more nutrition-enhancing so that food is available, accessible, diverse and nutritious is important, but so is assisting consumers in making healthy food choices. Apart from nutritional messages, it is recommended that behaviour-change interventions should also combat food waste and contribute to the sustainable use of resources ([Schönfeldt, Hall and Pretorius; 2018](#)). It is our hope that the papers in this issue will make a valuable contribution towards the consumption of balanced diets towards increased human health. It is not exhaustive on the factors affecting or affected by dietary needs. Some areas of importance not covered in this issue include food-based dietary guidelines, dietary requirements for children, pregnant women, mentally ill, many dietary related non communicable diseases such as diabetes, indigenous fruits and vegetables, sustainability in food consumption and genetically modified foods, to mention but a few.

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